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INTERNATIONAL EDUCATIONAL TECHNOLOGY CONFERENCE

IETC 2012

July 11-13, 2012

National Central University, Taoyuan, Taiwan

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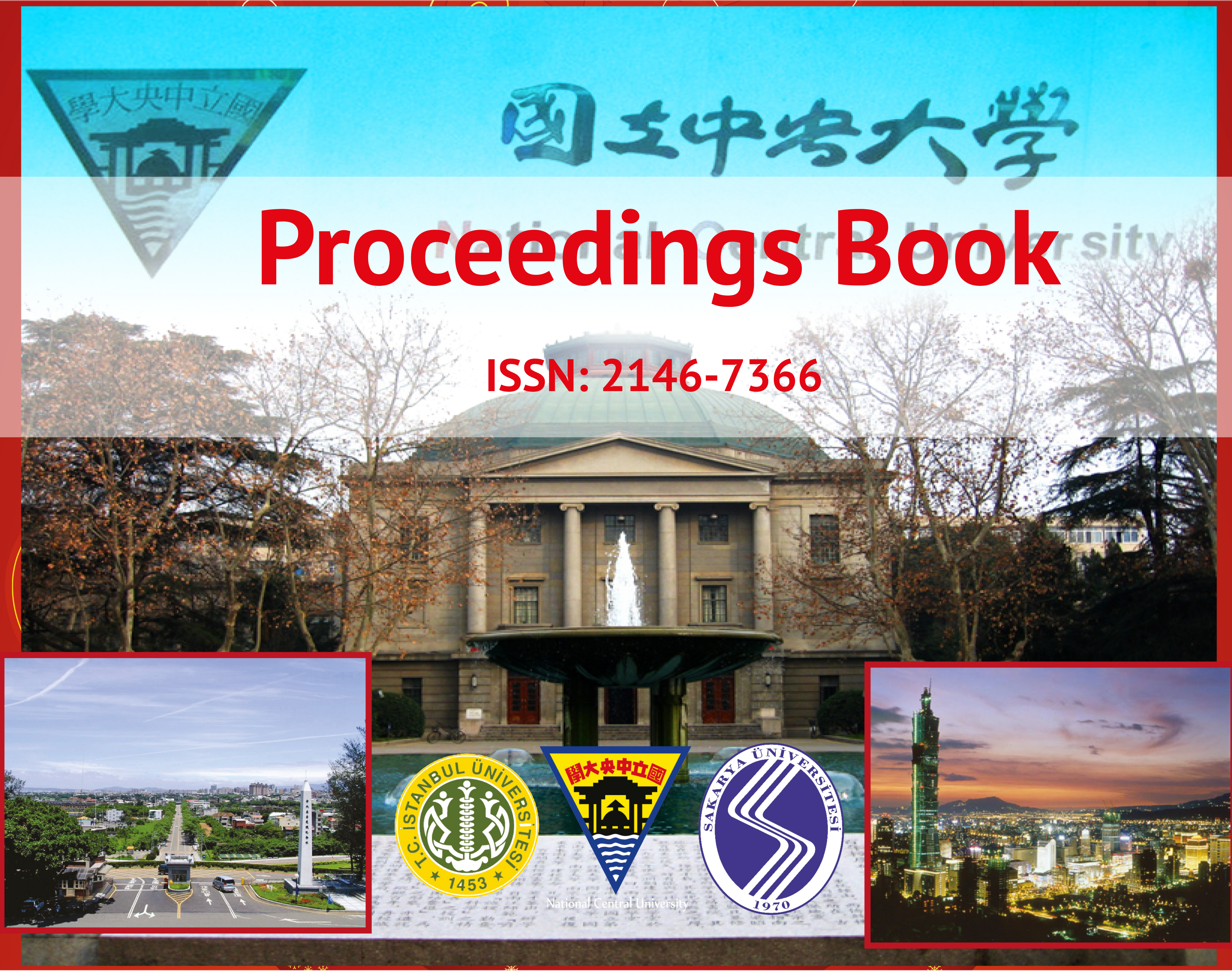

Proceedings Book

ISSN: 2146-7366

All accepted English papers will be published in Procedia-Social and Behavioral Science Journal by ELSEVIER and will be indexed in ScienceDirect

Acknowledgement

Dear Guests…

Welcome to the 12th International Educational Technology Conference IETC-2012.

"The International Educational Technology Conference (IETC)" series is an international educational activity for academics, teachers and educators. This conference is now a well-known educational technology event and the number of paper submissions and attendees increase every year. It promotes the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conference activities, the conference proceeding book, and the Turkish Online Journal of Educational Technology (TOJET). Its focus is to create and disseminate knowledge about the use of instructional technology for learning and teaching in education. This year, IETC-2012 received almost 380 applications. The conference academic advisory board accepted 220 applications.

The first of "The International Educational Technology Symposium (IETS)" and the second of "The International Educational Technology Symposium (IETS)" were held at Sakarya University in Turkey in 2001 and 2002. The third one was at Eastern Mediterranean University in the Turkish Republic of Northern Cyprus in 2003, and the fourth one at Sakarya University in Turkey in 2004. The fifth International Educational Technology Conference (IETC) was organized at Sakarya University in Turkey in 2005.The Sixth International Educational Technology conference was held in Turkish Republic of Northern Cyprus. In 2007, the seventh conference was organized at Near East University in the Turkish Republic of Northern Cyprus. After then The 8th International Educational Technology Conference was held at Anadolu University in Turkey in 2008. The 9th International Educational Technology Conference was organized at Hacettepe University in Turkey in 2009. IETC-2010 was organized at Bogazici University in 2010. IETC-2011 was conference organized at Istanbul University in 2011. IETC-2012 conference is organized at National Central University.

The International Educational Technology Conference aims to diffuse the knowledge and researches among academicians and lead to development in educational technology and instructional technologies.

Without the authors and participants, IETC-2012 would, of course, have been impossible. We would like to sincerely thank all of you for coming, presenting, and joining in the academic activities. We would also like to thank all of those who contributed to the reviewing process of the “IETC - 2012” conference papers, which will be also published in TOJET. And finally, we would like to thank Sakarya University - National Central University organizing team and The Turkish Online Journal of Educational Technology (TOJET) for successfully organizing and hosting “IETC-2012” in Taoyuan, Taiwan.

We have lots of participants from 25 different countries. Should you have any enquiries regarding IETC conference, please do not hesitate to contact with us for any additional information you may require.

Finally, we would like to wish you all a pleasant stay in Taoyuan-Taiwan and safe return back home. I hope that IETC-2012 will be a meeting you will pleasantly remember.

I hope we will meet again at the 13th International Educational Technology Conference - IETC-2013.

Thank you...

Prof. Dr. Aytekin İŞMAN

General Coordinator & Founder of IETC

Editor in Chief of TOJET

July, 03 2012

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AGENT-BASED MULTIMEDIA LEARNING: THE IMPACT ON THE PERFORMANCE AND MOTIVATION OF MIDDLE SCHOOL STUDENTS' PHYSICS LEARNING

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Abstract

As new technologies enable the creation of powerful multimedia learning environments for all students, incorporation of learning agent into instructional content has attracted many attentions. Although the provision of agent in student learning was studied previously, the benefits on student learning and motivation were not always consistent. The study examined the effects of learning agent (present and absent) and different formats of instructional content (text narrative and animated narrative) on student learning and motivation. A 2x2 factorial design was employed and 139 7th grade students participated in this study. The provision of learning agent was found to significantly interact with the format of instructional content on student posttest performance. The provision of learning agent affected student performance when reading animation narrative content. Meanwhile, the provision of learning agent did not affect student motivation when reading either text or animated narrative contents. The implications of current study extends what we know about the benefits of agent in learning and offers important insights on how to better design or integrate agent in the instructional content to enhance performance and motivation to learn.

Keywords: Learning agent; formats of instructional content; performance; motivation; physics learning

Introduction

How can multimedia instructional content be designed to optimize its instructional effectiveness? Multimedia instructional content typically has different formats or representations such as text, animation, narrative, audio, video, etc. Several researchers have found that certain instructional content delivered through computer can enhance the relation between abstract and concrete concepts, in which learners can explore the underlying principles by using different presentation modes (e.g., Akbulut, 2008; Clark & Paivio, 1991; Moreno & Mayer, 1999; Paivio, 1986). Since multimedia learning have become most frequently used in e-learning because they can be developed easily and are cost-efficient due to hardware and software improvements in recent years. However, implementation of multimedia instructional contents does not imply that learning effectiveness will be improved. The purpose of the present study was to investigate how multimedia instruction should be designed to optimize its instructional effectiveness.

The following section presents (a) problems results from learning with multimedia learning and (b) the provision of learning agent to overcome these challenges. An experiment is followed to test different solution approaches.

Review of Relevant Literature

As new technologies emerge that enables the creation of powerful multimedia learning environments for all students, the interest in incorporating various formats of instructional contents have increased. However, processing information encoded in different formats of instructional contents can be cognitive demanding because of the limited capacity of working memory of each individuals (R. E. Mayer, 2001). Mayer (2001) proposed a cognitive theory of multimedia learning based on Paivio's (1986) dual-coding theory and Sweller's (1994) cognitive load theory indicating that learners process text and pictorial information through two channels

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namely visual and verbal channels respectively in working memory. Because of the limited capacity of working memory, processing excessive amount of information in memory can overload one's cognitive capacity. The learner's cognitive ability plays an detrimental role in determining the effectiveness of multimedia on one's understanding of learning contents encoded in multimodalities. Therefore, more research should investigate what type of multimedia design is effective in delivering instructional contents in today's learning environments. Recent studies have investigated the impact of multimedia environments on learning in science and social science domains (add citations).

In the multimedia-based learning environment, the availability of teachers can be alternated by virtual humans (Kim, Baylor, & Group, 2006). Implementing virtual humans such that the assistance given to students is tailored to their individual needs is a new and promising direction of research. Accordingly, virtual humans are as learning companions or pedagogical agents, and they not only serve to delivery knowledge, but play as communicative and interactive bridge with students (Baylor & Kim, 2009). Since many researchers have explored the roles (i.e., appearance, facial expression, gesture) of agents on student's learning. Moreno et al. (2001a) found that students had more positive attitudes and better achievement when the lesson was taught by an agent rather than by on-screen text. Atkinson (2002) also found that narrative embodied agent was more effective at fostering learning than a text-based learning environment. In addition, the agent may use gestures or gaze to direct student's attention. It was found that agent played as a visual indicator to bring the student's attention to the relevant or important materials (Jeung, Chandler, & Sweller, 1997). Therefore the agent can help the learner to focus their limited cognitive resources on the important information, which ease the external cognitive load.

Currently, there are a number of pedagogical agents used in a variety of computer-based multimedia learning environments. For instance, Herman the Bug, a talkative agent, would provide students real time advice intended to focus on botanical anatomy (Moreno, Mayer, Spires, & Lester, 2001b). Peedy the Parrot, an animated agent, would fly across the screen and use gesture or gaze to help the learners associate verbal information with visual information (Atkinson, 2002). Dr. Phyz, another example of agent, would use his voice to answer questions popped on the screen while moving to point on the explanatory visuals (R. Mayer, Dow, & Mayer, 2003). Additionally, Baylor explores how multiple animated agents can be incorporated to help learners develop multiple perspectives (Baylor, 1999, 2000, 2002). Nevertheless, the research findings on whether an animated pedagogical agent can facilitate learning are mixed. Moreno et al. (2001a) found that the visual presence of the agent did not affect students learning. Mayer and Moreno (1998) indicated the presence of the agent has neither a positive nor a negative effect on performance, but it should be used with caution because it may produce a split-attention effect.

A number of studies have examined the provision of agent on learner's affection such as motivation or attitude. Baylor and Kim (2005) found that college students showed higher motivation and positive perceptions of agents after they had worked with a male agent than a female agent. The mere presence of an humanlike agent also has positive effect on the student's motivation to use the environment (Lester, Towns, Callaway, Voerman, & FitzGerald, 2000; Mumm & Mutlu, 2011). However, others have found that the presence of agents without any feedback on student's performance reported the lowest levels of intrinsic motivation (Mumm & Mutlu, 2011).

To shed additional light on these mixed findings regarding the effects or effectiveness of learning agents, the current study was designed to examine the present of agent in different formats of instructional contents among middle school students while learning about "Force and Motion" from a web-based multimedia learning environment. The major independent variable of the present study was two levels: the provision of agent and formats of instructional content. The dependent variables included learner performance in order to examine the degree and depth of learning. The dependent measures also included motivation.

Research Questions and Hypotheses

The purpose of this study was to examine the influence of learning agent on different formats of instructional contents, namely text narrative and animated narrative. Specifically, this study would address the following questions.

Question 1. Does the present of learning agent influence student performance?

Question 2. Does the present of learning agent influence student motivation?

Question 3. Does the present of learning agent influence student performance and motivation when reading text narrative contents?

Question 4. Does the present of learning agent influence student performance and motivation when reading animated narrative contents?

Hypothesis 1. Students who receive learning agent perform better than students who do not receive.

Hypothesis 2. Students who receive learning agent show higher motivation than students who do not receive.

Hypothesis 3. Students who receive learning agent when reading text narrative contents show better performance and higher motivation than students who do receive learning agent when reading animated narrative contents.

Method

Participants and Design

The participants of this study were 7th grade students from four classes, and the average age of the participants was 14. The participants had not learned what the instruction would be covered in this study. The quasi-experimental research design was employed to examine the research questions. Students were randomly assigned to four groups (as illustrated in the table 1). A 2x2 factorial design was used to study the effects of different formats of instructional content (text narrative and animation narrative) and learning agent (present and absent). The dependent variable in this study was students' scores on the summative assessment. The score on the assessment for learning was used as a measure of previous knowledge; this variable was used as a covariate in order to control for initial differences between students.

Instrument

The instruments used in this experiment were: an assessment for learning; instructional materials motivation survey; and time log. A paper-and-pencil assessment for learning was used prior to the study and after the completion of the study. The assessment was intended to measure student knowledge and understanding of the subject matter. The assessment consisted of 21 multiple-choice items with four response options each, which is the regular type of assessment for the course in which the assessment was administered. The items in the assessment included different types of tasks, namely knowledge, comprehension and application. The scoring for different types of tasks was differed; for example, student would receive 1 point if the student answered the knowledge type of tasks correctly, receive 2 point if answered the comprehension type of tasks correctly, and receive 3 points if answered the application type of tasks correctly. The maximum assessment score was 42 points.

The instructional materials motivation survey (IMMS Keller, 1983) assesses the motivational effects of instructional situations. The survey was constructed according to the ARCS model (Killer, 1983) with four respective subscales, namely Attention (e.g., ''There was something interesting at the instructional content that got my attention''), Relevance (e.g., ''It was clear to me how the content was related to things I already know''), Confidence (e.g., ''As I read the instructional content, I was confident that I could learn the content''), and Satisfaction (e.g., ''Completing the content gave me a satisfying feeling of accomplishment''). The scales contained, in order, twelve, nine, nine, and six items and were measured with a 5-point rating scale ranging from 1 (completely not true) to 5 (completely true). Reliabilities of the measures for this study were Cronbach's alpha .89, .76, .88, and .82 for the attention, relevance, confidence, and satisfaction subscales, respectively.

The amount of time (in seconds) that each student spent in the study was collected to use as an indication of attention needed to complete the learning tasks. Time logs were also used to investigate whether there was a difference between the behaviors of the experiment groups.

Materials

The learning environment was developed using Flash MX, and it contained instructional content in the force and motion domain, dealing with how an external force will affect the speed and direction of an object's motion. Participants in the text narrative content condition received text instructional content with narration explaining the text meaning (see Figure 1). Participants in the animated narrative content condition received the animated instructional content with narration explaining the animation. Figure 2 and 3 illustrated the conditions for text narrative content and animated narrative content with learning agent appearing on the right hand side of the screen. The learning agent was designed to incorporate in each phases of instructional content. In addition to the appearance of the learning agent, it also provides hints or cues for students to think or reflect.

Figure 1. Text narrative condition

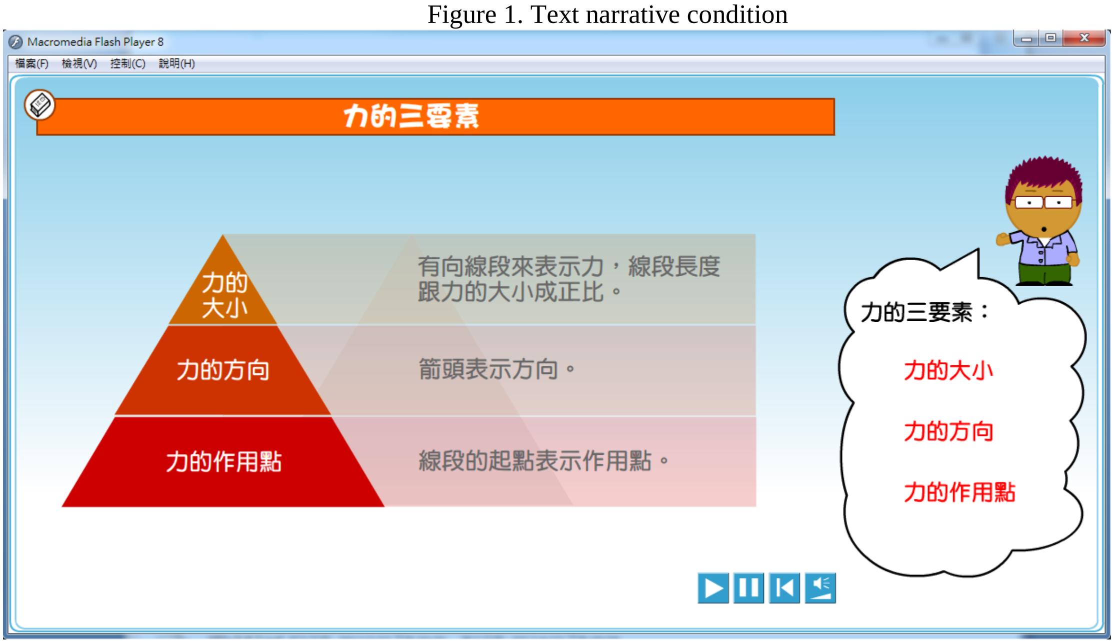

Figure 2. Text narrative with learning agent condition

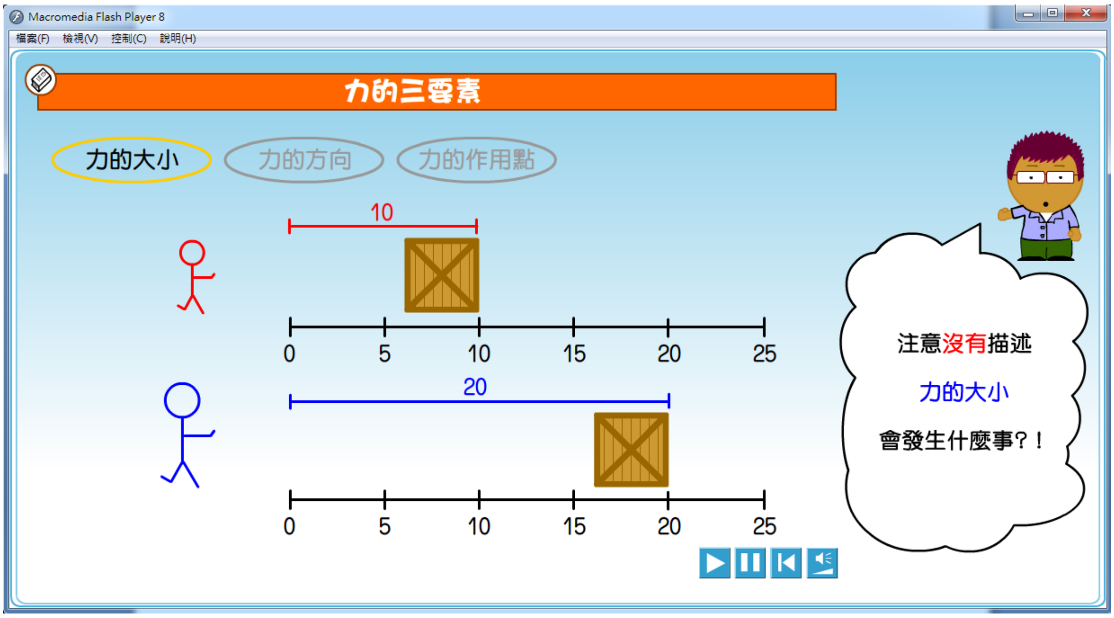

Figure 3. Animated narrative with learning agent condition

Procedure

In this study, four intact classes of participants were randomly divided into four groups. Each of the groups participated in the study for two days over a period of two weeks, dedicating one hour and 45 minutes of instructional time on each day. Only those students who were present all phases of the study, and for whom completed data were obtained, were included in the final analysis.

The actual study took place in the computer classroom with a teacher and three researchers present throughout. On the first day of the study, participants arriving in the computer classroom were seated in front of a computer. Once seated, participants were introduced to the research team, informed of the general purpose of the study, and given a description of the procedures. After the orientation, students were given approximately 15-20 minutes to individually complete a pretest.

Upon the completion of the pretest, students assigned to one of the four groups. The assessment procedures were identical for all treatment groups, and the assessment itself was carried out two days after each group received their treatment. All groups were told to individually complete assessments in the following order: posttest and motivation questionnaires.

Anticipated Results

Performance

A comparison of pretest and posttest performance within four treatment groups was conducted, and the results showed that all groups made significant improvement after completion of this study. This indicated that the designed instructional materials were effectively promoting student posttest performance.

A significant of main effect from different formats of instructional content on student post test performance was found, but there was no significance on the provision of learning agent. The one-way ANOVA showed that there was a significant different between treatments on the performance, $F(3, 138)=5.07$，$p<.01$. A following post-hoc was conducted and indicated that the significance resided in Aanc, NAanc, and Atnc. Specifically, the posttests of Aanc (M=24.31, SD=5.84) and Nanc (M=24.69, SD=7.38) were significantly higher than Atnc (M=19.48, SD=5.91). The mean and standard deviation of each subgroup is presented in table 1.

Table 1. Different subgroup students' performance on the pretest and posttest

	Text narrative content (tnc)			Animated narrative content (anc)		
	N	Pretest M(SD)	Posttest M(SD)	N	Pretest M(SD)	Posttest M(SD)
Learning agent (A)	33	15.24(5.51)	19.48(5.91)	35	21.40(5.94)	24.31(5.84)
No learning agent (NA)	35	15.23(6.16)	20.74(7.65)	36	17.19(6.75)	24.69(7.38)

Motivation

A significant of main effect from different formats of instructional content on student motivation was found, but there was no significance on the provision of learning agent. The one-way ANOVA showed that there was a significant different between treatments on the motivation, specifically relevance $F(3, 183)=14.26$, confidence $F(3, 183)=8.15$ and satisfaction $F(3, 183)=7.24$. The mean and standard deviation of each subgroup is presented in table 2.

Table 2. Different subgroup students' motivation

	Formats of instructional content		Provision of learning agent	
	Text narrative content (tnc)	Animated narrative content (anc)	Learning agent (A)	No learning agent (NA)
Attention	3.46(0.78)	3.56(0.62)	2.35(1.06)	3.58(0.63)
Relevance	3.21(1.29)	3.97(0.63)	2.21(1.29)	3.31(0.80)
Confidence	3.39(1.20)	3.70(0.56)	2.34(1.20)	3.50(0.77)
Satisfaction	3.77(0.73)	3.91(0.90)	2.57(1.12)	3.67(0.68)

Discussion and Conclusion

The purpose of this study was to examine the influence of learning agent on different formats of instructional contents, namely text narrative and animated narrative. The results showed that the provision of learning agent was found to significantly interact with the format of instructional content on student posttest performance. The provision of learning agent affected student performance when reading animation narrative content. However, the provision of learning agent did not affect student motivation when reading either text or animated narrative contents. Differed from previous studies, this study did not find positive effects of present or absence of the learning agent (Lester, Towns, Callaway, Voerman, & FitzGerald, 2000; Mumm & Mutlu, 2011). One reason might be the design of the learning agent appearance or its purpose did not meet the needs of the students. Another reason is that the instructional contents were new to these students, therefore much cognitive capacity was focused on the understanding of the content itself, fewer attention can be split to other tasks. In digital age, emerging technologies have changed the formats of instructional content can be presented; however the design of instruction is still perceived as an important component in determining the effectiveness of digitized learning methodology on student learning. This study found the provision of learning agent embedded with different formats of instructional content (text or animation) seemed to have an impact on learners' processing different formats of instructional content.

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AN APPLICATION OF TABLET PC TO ENHANCE THE CHINESE READING LITERACY OF STUDENTS

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Abstract

In this study, the reading comprehension process is defined as IEA's PIRLS Assessment as follows:
1. Focus on and Retrieve Explicitly Stated Information
2. Make Straightforward Inferences.
3. Interpret and Integrate Ideas and Information.
4. Examine and Evaluate Content, Language, and Textual Elements
One hundred and nine third-grade students of four classes participate the experimentation. Fifty four students of two classes assigned as experimental group and others are control group. After the experimentation, We investigate the students’ reading literacy after the adaptive learning combined with Tablet PC and LSA-based Chinese Vocabulary Learning System.

*Keywords:*LSA; latent semantic analysis; reading literacy; E-bag; Tablet PC; LSA-based chinese vocabulary learning system

AN ASSESSMENT OF STUDENTS' MOBILE SELF-EFFICACY, READINESS AND PERSONAL INNOVATIVENESS TOWARDS MOBILE LEARNING IN HIGHER EDUCATION IN MALAYSIA

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Abstract

Mobile learning, or M-learning, has become a new educational paradigm, gaining popularity especially at institutions of higher learning in Malaysia. Using the latest technology in M-learning, students are able to choose when and where they wish to learn anything. The main aim of this study was to assess learners' self-efficacy, readiness and personal innovativeness towards Mobile learning. This study also examined the relationship between learners' self-efficacy and readiness towards M-learning with learners' perception of the effectiveness of M-learning. The respondents in this study were 137 trainee teachers who had enrolled in various education programs at the Faculty of Educational Studies, University Putra Malaysia. The findings of this study indicated that the respondents had a high level of personal innovativeness and mobile readiness. However, their level of mobile self-efficacy was only moderate.

Keywords: M-learning; mobile self-efficacy; personal innovativeness; readiness.

Introduction

Mobile learning or M-learning is a new concept of learning via mobile technology. In an M-learning environment, knowledge can be transmitted via the mobile phones, laptops, tablet PCs and PDAs and etc. M-learning places emphasis on the fact that the teaching and learning process can take place without being constrained by time and location (Kukulska-Hulme & Traxler, 2005). In other words, teaching and learning can be carried out at anytime and anywhere. There is greater learner mobility. Using their mobile phones, students can receive and share notes and materials. They do not need a computer to download notes because the mobile phone with internet access can carry out this function anywhere and at anytime. Information also can be relayed by lecturers to their students using either blogs or SMS. Furthermore, there are companies which provide services for sending bulk SMS to registered users. Such services would help lecturers send instructional materials to their students at reasonable rates.

Implementing M-learning requires a high level of commitment from both lecturers and students; otherwise it would neither be feasible nor effective. Accessing the internet, sending and replying SMS involve certain expenses. Besides that, it is also important to ascertain students' technology readiness before implementing M-learning. Technology readiness is defined as the propensity to embrace and use new technologies for accomplishing goals in home life and at work (Parasuraman, 2000). Meanwhile, M-learning readiness refers to students' readiness and preference in using mobile technology such as the mobile phone as part of the learning process. Previous studies have shown that students' technology readiness is an important factor in an M-learning environment. For example, in a study on learning via SMS, involving 117 university students in New Zealand (Petrova & Sutedjo, 2004) showed that students had great interest in M-learning. Further investigations showed that the students were able to integrate M-learning into the conventional learning process. A local study conducted by Abas, Loi Peng, and Manso (2009) on 2837 students at the Open University Malaysia found that 63.71% students were ready to use M-learning within 12 months of its introduction. Meanwhile, Andaleeb, Idrus, Ismail, and Mokaram (2010) reported that most students had a high level of readiness for M-learning.

Besides students' readiness for M-learning, students' self-efficacy is also an important factor to consider in the discussion on information technology acceptance. Self-efficacy is defined as one's judgment of his or her

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ability to organize and execute a course of action required to attain a designated type of performance (Bandura, 1977). Self-efficacy in this study is related to the respondents' belief that they can integrate M-learning with the conventional learning process. Lu and Viehland (2008) in their study to identify factors related to students' acceptance in an M-learning environment indicated that mobile self-efficacy had the highest ranking compared to other factors. Tsai, Tsai, and Hwang (2010) developed an instrument to measure students' attitude and self-efficacy using the Personal Digital Assistant (PDA) in a ubiquitous learning (U-learning) environment. Findings based on responses by 414 grade 3 and 6 pupils showed that the respondents had a positive mobile self-efficacy in a U-learning environment. A cross-sectional study by Kenny, Park, Van Neste-Kenny, and Burton (2010) among nursing students and staff also showed that the respondents had a very high level of mobile self-efficacy.

Personal innovativeness in the domain of information technology as a factor in M-learning was introduced by Agarwal and Prasad (1998). Based on Rogers' Theory, personal innovativeness in information technology is defined as the willingness of an individual to explore new technology. According to Agarwal and Prasad (1998), personal innovativeness plays an important role in understanding new information technology and the intention to use it. Studies on personal innovativeness in technology have been conducted in various areas such as online shopping (Bigné-Alcañiz, Ruiz-Mafé, Aldás-Manzano, & Sanz-Blas, 2008), virtual learning (van Raaij & Schepers, 2008), blog (Wang, Chou, & Chang, 2010), wireless mobile services (Lu, Liu, Yu, & Wang, 2008; Lu, Yao, & Yu, 2005) and others.

Studies have shown that mobile self-efficacy, personal innovativeness and students' readiness are important variables in the new learning environment involving information technology. It is important for researchers to investigate these variables before deciding to implement a learning process that involves the use of the mobile phone for learning purposes.

Research objectives

The objectives of this study are:
to explore students' mobile self–efficacy in M-learning
to explore students' readiness for M-Learning
to investigate students' personal innovativeness in M-learning.

Research Methodology

This study was carried out in a local university in Malaysia involving 210 respondents from the Faculty of Education. M-learning in this study refers to the use of Short Messaging Service (SMS) as a medium of communication between the respondents and their lecturers throughout one semester (14 weeks). For this purpose, we used a portal for sending Bulk SMS to the respondents. Every week each student was sent an SMS regarding their studies. The contents of the SMS were in form of announcements, information related to their courses, motivation SMS and quizzes. For quizzes SMS, the respondents were required to give their answers as part of their course evaluation. Students could also communicate with their lecturers via SMS. After 14 weeks, questionnaires were distributed to the respondents to gather the necessary data for this study.

Research Instrument

For the purpose of the study, three external variables related to M-learning were identified, namely mobile self-efficacy, personal innovativeness and students' readiness. For mobile self-efficacy, we adapted the items from Compeau and Higgins (1995). For personal innovativeness, we used the items by Agarwal and Prasad (1998), and for mobile readiness we adapted items from an instrument by Hussin, Manap, Amir, and Krish (2011). Students were given five options to respond to; the items assessed the utility of each factor. A 5-point likert scale was used. The options are SA (strongly agree), A (agree), N (neutral), DS (disagree), and SDS (Strongly disagree). The reliability index of each construct or factor was obtained. The alpha cronbach reliability measures for each factor were as follows: students' mobile self-efficacy (.638), personal innovativeness (.742), and students' readiness towards M-Leaning (.812). To determine the classification level for each factor, we divided it into three levels, i.e. 1 – 2.33 as low, 2.34 – 3.67 as moderate and 3.68 – 5.00 as high levels.

Research Findings

The discussion for these research findings is based on the three factors studied and also on the research objectives.

Overall mean

The overall mean for the three factors studied are as shown in Table 1. The highest mean obtained was for students' mobile readiness (M=3.82, SD=0.76) followed by personal innovativeness (M=3.71, SD=0.75) and students' mobile self-efficacy (M=3.63, SD=0.68). This study shows that respondents were highly rated in the readiness of using m-learning as part of the teaching and learning process. Respondents also showed high personal innovativeness in using m-learning. However, in term of mobile self-eficacy, respondents were at moderate level.

Table 1. Overall mean for the three factors

Factors	Number of items	Mean	SD	Level
Mobile Self-efficacy	6	3.63	0.68	Moderate
Personal Innovativeness	6	3.71	0.75	High
Mobile readiness	8	3.82	0.76	High

Students' Mobile Self-efficacy

The first variable investigated in this study was students' mobile self-efficacy. Students must have a high level of confidence in using mobile technology as part of their teaching and learning process; this is essential to ensure that M-Leaning would be successful. Six items were used in this study to measure students' mobile self-efficacy in an M-Learning environment (Table 2). The findings indicated that only two items were classified at a high level, namely the item: "I would be able to use M-learning if I had first gone through a lesson on how to use it". This item scored a mean = 3.94 (SD=1.07). The other item "I would be able to use M-learning if I could refer to someone for help if I face difficulties" had a mean = 3.90 (SD=0.99). Meanwhile the item with the lowest mean was "I would be able to use M-learning only if I had seen someone else experience it before I try it myself" with a mean = 3.23 (SD=1.15). These findings showed that the respondents had a moderate level of self- efficacy in using M-learning.

Table 2. Students' Mobile Self-efficacy

Items	Mean	SD	Level
I would be able to use M-learning even if there was no one around to tell me how it works.	3.60	1.00	Moderate
I would be able to use M-learning even if I had never been exposed to m-learning before.	3.60	1.01	Moderate
I would be able to use M-learning only if I had seen someone else experience it before I try it myself	3.23	1.15	Moderate
I would be able to use M-learning if someone assisted me to get started.	3.49	1.18	Moderate
I would be able to use M-learning if I had first gone through a lesson on how to use it.	3.94	1.07	High
I would be able to use M-learning if I could refer to someone for help if I face difficulties.	3.90	0.99	High

Students' Personal Innovativeness

Students' Personal Innovativeness is another important factor to be assessed in an M-learning environment. For the purpose of this study, we adapted a questionnaire from Agarwal and Prasad (1998) which also consisted of six items (Table 3). The item with the highest mean was for being interested in trying out new technology (M=4.05, SD=0.95), followed by the respondents' liking to utilize new technology (M=3.99, SD=0.94). One negative item, viz. "I don't want to explore the new mobile technology" (M=2.16, SD = 0.98) indicated that respondents were also willing to use the new technology but they did not want to be the first to try it.

Table 3. Students' Personal Innovativeness

Items	Mean	SD	Level
When I hear about new mobile technology, I look for possibilities to use it.	3.94	1.02	High
*I don't want to explore the new mobile technology.	2.16	0.98	Low
I am usually the first to try new information technology.	2.77	0.92	Low
I like to explore the new information technology.	3.65	0.95	Moderate

I think it is very interesting to try new technology.	4.05	0.95	High
Generally speaking, I like to utilize new technology.	3.99	0.94	High

*negative items

Students' Readiness

Students' readiness to embrace innovation is essential for effective M-learning. Eight significant items were adapted from Hussin et al. (2011) for the purpose of this study (Table 4). Overall, seven items were highly rated by the respondents except one item, namely "I will upgrade my hand phone if M-learning is going to be implemented in my course", which scored a moderate level. Among the highest mean for this variable is the item, "I want to know more about M-learning" (M=4.12, SD=0.86), followed by the item, "M-learning is an alternative to LMS learning" (M=4.00, SD=0.88). This showed that the respondents were ready to use M-learning as part of their learning process.

Table 4. Students' Readiness

Items	Mean	SD	level
I want to know more about m-learning.	4.12	0.86	High
I would like my lecturer to integrate m-learning in my class together with face-to-face meetings in the class.	3.80	0.95	High
I would like my lecturer to integrate m-learning in my class besides Learning Management System (LMS) in my course.	3.73	0.98	High
M-learning will save my learning time.	3.77	0.94	High
M-learning is an alternative to LMS learning.	4.00	0.88	High
I am looking forward to be engaged in m-learning.	3.74	0.89	High
I will upgrade my hand phone if M-learning is going to be implemented in my course.	3.61	1.02	Moderate
M-learning is an alternative to conventional learning.	3.82	0.94	High

Discussion

M-learning is a new concept in the Malaysian education system even though statistics have shown that most Malaysians possess mobile phones as reported by Malaysian Communication and Multimedia Commission (MCMC) in a survey in 2010. University students often use their mobile phones mainly for communication rather than for educational purposes. This study investigated three variables which were believed to impact M-learning, namely students' mobile self-efficacy, personal innovativeness and also their readiness in an M-learning environment. During this study, the participants received SMS from their lecturers in the form of quizzes, information, motivation and others. Students were also needed to respond to certain SMSes as part of their course evaluation. For mobile self-efficacy, respondents scored 'moderate' in this respect. Students involved in this study believed that they would be able to use M-learning if they had a lesson on how to use it or they could seek help if they faced difficulties. Studies by Kenny et al. (2010), Lu and Viehland (2008), Tsai et al. (2010) also show that students have positive mobile self-efficacy in an M-learning environment.

In this study, personal innovativeness was investigated to ascertain its impact on students' intention to try new innovation and their intention to use it in future. Findings from the analysis showed that students had high personal innovativeness. They were also found to like exploring and trying out new technology. Studies by other researchers also show that personal innovativeness is one of the main factors that influence the acceptance of new technology (Hung, 2003; Yang, 2005). Students' readiness to use any innovation is essential because it will impact their intention of using it. The participants in this study had high ratings in terms of their readiness to participate in an M-Learning environment. They also indicated that they looked forward to using M-learning in future and wanted their lecturers to integrate it in their class besides using the Learning Management Systems (LMS). They felt that M-learning could save learning time and would be a viable alternative to traditional teaching and LMS. Research by Abas et al. (2009), Andaleeb et al. (2010), Petrova and Sutedjo (2004) similarly show that university students are ready to integrate M-Learning in their studies.

M-learning has a huge potential to transform and revolutionize the learning process. Mobile gadgets such as the hand phone, Personal Digital Assistant, Smart phone, and iPod not only allow the user to communicate or be entertained, but they also support M-learning. This study showed that university students have personal innovativeness and are ready embrace M-learning as an integral part of their learning process.

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AN EMPIRICAL STUDY ON THE WEBSITE USABILITY OF NAMIK KEMAL UNIVERSITY

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ABSTRACT
The aim of the study is to evaluate and to explore the usability level of Namık Kemal University (NKU) website and provide guidance to develop better and more usable web sites. The research hypotheses have posed six different theoretical factors to be positively associated with website usability. The results have revealed that five of the six factors can positively and significantly affect the web site usability perceptions of NKU members. Results also revealed that some of the demographic factors tested, such as gender and web experience, have significant impacts on usability perceptions of individual users.

Keywords: Information and Communication Technologies, Governance, Website, Usability, University.

Introduction

The university website is not only a cost efficient and timely method to communicate with various stakeholders such as students, faculty, administrative staff and visitors it is also a way for a university to shape its image. Universities need to do everything within their power to keep positive images with their various constituents, and one way to do this is to make use of the opportunities website presents.

Observations mentioned above underline the vitality of usability issue for the websites. Usability has assumed a great deal of importance in terms of satisfying web site users' needs and expectations (Patterson and Ellis, 2004). Usability has been a popular theme that is extensively studied in the field of human-computer interaction (HCI) field (Shneiderman, 1998). Aldwyn (2011) argues that usability is a requirement to survive in internet environment. Nielsen (2000) states the usability rules the web. The same author argues usability is an extremely important aspect of individual website and overall website design. So, web design must directly face users with the specific needs, and must make sure that users are pleasant to successfully complete tasks with web (Yan and Guo, 2010).

The number of studies on usability of university web sites is very limited. One of the most recent studies on usability of university websites is conducted by Caglar and Mentes (2012) the study reveals dissatisfaction and other usability problems of a European University of Lefke which is located at Northern Cyprus. Another recent study is a case study conducted by Eksioglu et. al, (2011) which aims to assess the website usability of Industrial Engineering Department of Bogazici University and reveals some design issues regarding the department's web site. The study by Sengel and Oncu (2010) assessing the usability of Uludag University website concludes that there are differences between the responses of males and females to usability. Dominic and Jati (2010) study on usability of Malaysian universities websites exhibit that most of Malaysian universities are neglecting performance and quality criteria. Bautista et. al (2010) conducted at four different universities document the challenges encountered by users during their attempt to complete the tasks in three areas, namely content presentation, information structure, and navigation.

This research, aims to measure the usability of the Namık Kemal University (NKU) web site via the five assumed factors of usability defined by WAMMI (Website Analysis and Measurement Inventory): attractiveness, controllability, helpfulness, efficiency and learnability. The research is important because the results are expected to provide guidance for developing better and more usable web sites not only for NKU but for other higher educational institutions as well.

Literature Review

According to Preece (1994) “usability is measured of in which a system can be learned and used, its safety, effectiveness and efficiency and the attitude of its users towards it.” Zaphiris and Darin (2001) define web usability as “anyone using any kind of web browsing technology must be able to visit any site and get a complete understanding of the information, as well as have the full and complete ability to interact with the site if that is necessary.” Usability refers to terms such as ease of use and ease of learning that implied providing users with systems requiring minimum cognitive and physical effort to accomplish users’ needs and expectations (Sindhuja and Surajith, 2009). Powell (2000) argues the web site usability as "the extent to which a site can be used by a specified group of users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use”.

Usability of the website plays a central role in establishing a healthy communication between the university and its stakeholders. The healthy communication between the university management and the stakeholders can undoubtedly contribute to well governance of the university in many ways. First, a well managed website with high usability can stimulate a healthy dialogue between the university and its stakeholders. Dialogue lies at the hearth of communication and plays a central role in communication (Gutierrez- Garcia, 2008).

Listening to the stakeholders’ concerns will give university administrations the opportunity to make well planned decisions. Thus, another contribution of dialogue with the stakeholders is the reduction of conflicts due to the increased confidence between the parties (Burchell and Cook, 2008). The engagement established on a healthy dialogue with stakeholders may lead to the inclusion of stakeholder demands and expectations to become a part of decisions made by the university administrators (Steinmann and Zerfaß, 1993). The inclusion of the stakeholders’ expectations shaped via dialogue to the decision process will add value to the good governance practices. Focusing on stakeholders with legitimate expectations and managing the relationships with them will contribute towards transparency (Columbine, 2009) which is the fundamental ingredient of good governance.

There are numerous tests for evaluating the website usability. WAMMI is a one of the most popular evaluation tool for websites. It was developed by Human Factors Research Group (HFRG) in 1999. WAMMI is based on a questionnaire filled by visitors of a website, and gives a measure of how useful and easy it is to use the visitors found the site (Claridge and Kirakowski, 2011).

As mentioned previously WAMMI proposes five factors to assess the usability of websites: Attractiveness, controllability, efficiency, helpfulness and learnability (http://www.wammi.com/demo/graph.html):

Research Methodology

The main purpose of this research is to measure the usability of the NKU website. The research employed non-probability convenience sampling methods to collect data from NKU students, faculty members and administrative staff. This research was conducted during the period of December 2011 to January 2012. The research was conducted by following two different methods simultaneously. First, some internal stakeholders (students, faculty members and the administrative staff) were personally asked to respond to the online questionnaire that was posted to the NKU website. Second, the link to access the questionnaire was forwarded to all internal stakeholders via NKU email system. In order to encourage the participation a 50 Turkish Liras (around 28$) gift check of an online bookstore was offered to a participant. The number of valid questionnaires reached 339 as of 16 January 2012 which was the cutoff date for the survey implementation.

The first part of the research contains the demographic profile of respondents including gender, age, and position at the NKU, internet usage duration and type of browser used. Second part is about the expectations of participants about the usability of the university website. WAMMI questionnaire is employed for the research. The WAMMI questionnaire is composed of three parts and has total of 22 questions. The questionnaire assesses website usability by asking participants to compare their expectations against what they actually find on the website on previously mentioned five dimensions, plus a 2 item construct of overall satisfaction. Five point Likert scale was used to measure usability and satisfaction of NKU web sites anchored as “strongly agree=1” to “strongly disagree=5”. The final sections of the survey were composed of the optional communication details of participants for lottery purposes and general feedbacks from participants about NKU web site as an open ended question.

Research Hypothesis

The research predicts that all five of the assumed usability factors are positively associated with the usability of the NKU website. The first assumed usability factor is attractiveness.

H1: Usability of the NKU website is positively associated with its attractiveness.

H2: Usability of the NKU website is positively associated with its controllability.

H3: Usability of the NKU website is positively associated with its helpfulness.

H4: Usability of the NKU website is positively associated with its efficiency.

H5: Usability of the NKU website is positively associated with its learnability.

H6: Usability of web sites will be related with participants' gender, age, internet experience and position at the university

The research further inquired whether participants' usability perceptions of NKU web sites have significant differences based on gender, age, internet experience and position at the university. Gender is classified as a dichotomous variable as males and females. Participants were grouped in two sections based on their age as participants below middle age and participants above middle ages. Middle age is defined as 35 years of age. Internet experience is investigated based on two groups as short term and long terms years of experience. The cutoff point is decided as 5 years of experience. Hence, participants were assigned previously mentioned two groups based on whether they have been using internet more or less than 5 years. The final participant professional characteristic is whether they are students, academic personnel or administrative personnel. Statistical differences were investigated among these three groups of professional careers.

Findings and Analysis

In this section, the descriptive statistics, regression analysis results to test the research hypothesis and major findings will be presented.

The findings reveal that most of the participants were males (63,8%) and about one third were female (36,2%). More than 60% of the participants were composed of students, 28% was faculty members and the rest (10,4%) was administrative staff. More than 50% of participants were below 24 years of age. Since most of the participants were students, this finding is not surprising. Almost half of the respondents (73,2%) were at the university for less than 3 years. Since NKU is a relatively new university, established only 5 years ago, and most of the participants were students, this result is expected. More than 82% of participants have been using the internet for more than 5 years. The most frequently used internet browsers have turned out to be Chrome (45,2%) and Internet Explorer (34,1%). Finally, 37% of the respondents indicated that they spend more than 60 minutes online each time they are connected and the percentage of respondents that spend less than 5 minutes online is 27,6%.

Linear regression models were run to test six individual models. Before feeding in regression equations, the items/questions representing dependent and independent variables as six constructs of WAMMI were aggregated by using the method defined by Tavakolian (1989). In this method, the simple arithmetic average of each factor was calculated. Further to make the factors more normally distributed and continuous, each aggregated factors' logarithms were calculated. The regression results exhibit that all WAMMI constructs, except Control have turned out to be significant with high significance degrees ($p<0,001$ and $p<0,05$). The WAMMI factors are positively related with usability perceptions as it is hypothesized in underlying theory. Hypothesis 1, Hypothesis 3, Hypothesis 4 and Hypothesis 5 are accepted, however Hypothesis 2 is rejected.

The second set of regression tests are aimed to investigate whether demographic or professional differences among survey participants would have caused any statistical differences in their usability perceptions of NKU web site as proposed in Hypothesis 6. Gender has turned out to be a significant variable in predicting participants' perceptions on usability of NKU web site. Since the differences were observed based on males when coding the dummy gender variable, it can be interpreted that males find NKU web site less usable compared to their female counterparts, given the existence of negative coefficient. Age has not turned out to be a significant variable. The usability perception of participants who are 34 years and older were significantly different from the participants that are younger than 34 years. Similarly, professional differences have not caused any differences in web site usability perceptions of participants as well. However, internet usage experience has revealed significant differences in usability perceptions of participants. Participants with 5 years or more experience seem to be less satisfied with the usability of NKU web site compared to the ones who are less experienced (less than 5 years).

Conclusion

Web sites are becoming key components of an organization's survival in the globalized competition. University web sites are no exception. The university website is not only a cost efficient and timely method to communicate with various stakeholders. Statements mentioned above underline the vitality of usability issue for the websites. Usability has assumed a great deal of importance in terms of satisfying web site users' needs and expectations.

The study aims to measure the usability of the Namık Kemal University (NKU) web site via the five assumed factors of usability: attractiveness, controllability, helpfulness, efficiency and learnability.

The results reveal that four of the five usability factors are positively related with usability perception as it is hypothesized in the underlying theory. Research hypotheses that claim Usability of the NKU website is positively associated with its attractiveness (Hypothesis 1), helpfulness (Hypothesis 3), efficiency (Hypothesis 4), and learnability (Hypothesis 5) are accepted. However hypothesis that claim usability of the NKU website is positively associated with its controllability (Hypothesis 2) is rejected.

The demographics related (Hypothesis 6) findings of the study are interesting. Results show gender to be a significant variable in predicting participants' perceptions on usability of NKU web site. Male participants find NKU web site less usable compared to their female counterparts, given the existence of negative coefficient. Age has not turned out to be a significant variable. Similarly, occupational differences have not caused any differences in web site usability perceptions of participants. However, internet usage experience has revealed significant differences in usability perceptions of participants. Participants with 5 years or more experience seem to be less satisfied with the usability of NKU web site compared to the ones who are less experienced (less than 5 years).

Usability of the website plays a central role in establishing a healthy communication between the university and its stakeholders. The healthy communication between the university management and the stakeholders can undoubtedly contribute to well governance of the university in many ways. University web sites serve as platform that stakeholders can voice their concerns and demands from the university administration. Listening to the stakeholders' concerns will give university administrations the opportunity to make well planned decisions. Thus, another contribution of dialogue with the stakeholders is the reduction of conflicts due to the increased confidence between the parties. The engagement established on a healthy dialogue with stakeholders may lead to the inclusion of stakeholder demands and expectations to become a part of decisions made by the university administrators. The inclusion of the stakeholders' expectations shaped via dialogue to the decision process will add value to the good governance practices. Focusing on stakeholders with legitimate expectations and managing the relationships with them will contribute towards transparency which is the fundamental ingredient of good governance.

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AN INTEGRATED ANALYTICAL MODEL TO GAIN KNOWLEDGE FROM STUDENTS' ONLINE LEARNING DISCUSSION

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Abstract
Online learning is widely implemented particularly in higher learning institutions. Previous studies used various analytical methods to understand students' learning in online settings. However, these studies were carried out to understand either qualitative or quantitative aspects of online learning processes. This paper presents an integrated analytical model to gain knowledge on both quality and quantitative aspects of students' online learning processes. By integrating content analysis and educational data mining technique, this paper proposed that students' learning processes (such as learning pathways) are made visible and stakeholders can benefit from the results obtained using the integrated analytical model.

Keywords: Online learning; content analysis; educational data mining; analytical model

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Introduction

The widespread used of online learning particularly in higher learning institutions has raised the interest in investigating the processes involved in online learning. Many analytical techniques were applied to obtain the knowledge about the advantages of online learning towards students' learning outcome and only few studies focus on students' learning processes. Researchers used different techniques depending on the type of information that they were looking for regarding students' online learning processes. Despite the various techniques of evaluating students' online learning processes, rare works were found that integrated techniques to analyze learning processes from qualitative and quantitative aspects. For example, [1] used content analysis and social network analysis to investigate students' interaction behaviour in online learning. From this investigation they were able to show the network structure of students' interacting in online discussions [1]. However, how these interactions can be related to students online participation quantitatively was not reported. Inversely, from quantitative aspect, Macfadyen and Dawson [2] investigated students' online participation using students' server log files and were able to predict the variables that contributed to students' future better performance. They applied the data mining technique. However, the quality aspect of students' learning was neglected. As proposed in this paper, an integrated analytical approach is beneficial to overcome each other's weaknesses [3]. This paper proposed the integration of content analysis and data mining technique for a more fruitful and visible knowledge on students' online learning processes.

Content Analysis to Evaluate the Quality Aspects of Online Learning

Elo and Kyngas [4] stated that content analysis can be in deductive or inductive way and that it is where analysis of written, verbal or visual communication messages is made. Previous studies used content analysis technique to code students' online messages. As a result, they were able to obtain information such as students' knowledge construction [5], students' critical thinking [6], students' metacognition [7] or problem-solving strategies [8] in online discussions. By analyzing students' written messages, students' cognitive engagement in online learning can be 'observed' [9]. Through written messages, students are found to externalize their thoughts by arguing on statements, support and challenge other's opinions [10]. Using these written thoughts, researchers and educators are able to observe the extent of the students' argumentation skills [11], higher order thinking and critical thinking [10] as well as their knowledge construction [5, 12].

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To investigate different students' behaviours, a spesific coding scheme has to be used. Various coding schemes were developed particularly to evaluate students' cognitive activities through their written postings such as for coding students' knowledge construction [5,13], students' argumentation [11] and students' critical thinking [14]. In fact, Marra et al [15] and Weltzer-ward [16] made critical comparison of the existing coding schemes to find out the most reliable and relevant coding scheme for analyzing students' online written messages.

Data Mining Technique to Evaluate the Quantitative Aspect of Online Learning

Online learning often stands on the platform of Learning Management Systems (LMS) such as Moodle, WebCT and Blackboard. These platforms store bulks of data which can be analyze to produce useful knowledge about students' learning in online settings which make it suitable to mine these data into useful information about students' learning process in online setting [2, 17, 18]. Data mining for education is a new field where the common application of data mining is in business where entrepreneurs can benefit from data mining for the knowledge of customer relationship management, supply chain optimization or demand forecasting [19].

In the education field, data mining technique is commonly used to predict students' future performance [17,18]. Using this technique, algorithms such as clustering or decision tree are used to perform mining process and in the end, the data mining process is able to determine which variable can predict better future performance [19, 20]. However, research in the area of educational data mining often used data retrieved from LMS database [20, 21] but the data to measure the quality of students' online learning is often left out because data cannot be automatically retrieved from the LMS database but has to be manually coded from students' discussion scripts.

Qualitative and Quantitative Aspects of Online Learning

Given the current education context, it is shown that assessing both qualitative and quantitative aspect of students' online learning is of equal importance. However, what is lacking is that both qualitative and quantitative aspect of students' learning are assessed separately where instead they should both be investigated simultaneously. This is because, researchers found that students' participation in online learning is plentiful; where the students are found to be actively learning in online learning and that the density of interaction is high [22], but it does not necessarily concludes that students' are indeed 'learning' because most of them results from social regulations rather than on-task discussions [23].

In this research, we suggest an integrated approach to assess both aspects of students' online learning. To investigate the quality of online learning, students' written messages in online discussion are analyzed using content analysis technique. On the other hand, the data on students' participation in online learning for quantitative assessment is retrieved from the available Learning Management System (LMS) databases and is further analyzed using the data mining technique. We present examples on how the model can be applied for researchers and educators.

The Integrated Analytical Model

The model in Figure 1 shows how both technique; content analysis and data mining, are integrated for quality (students' discussion scripts) and quantitative (students' server log files) evaluation of students' online learning. The sequential steps for using the model are discussed accordingly.

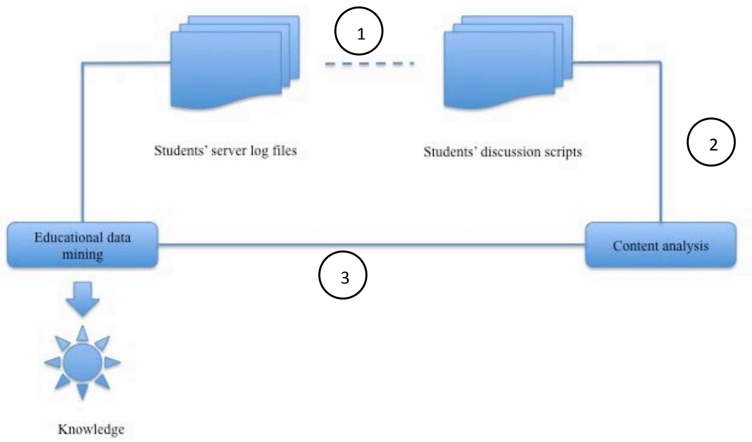

Fig. 1. The integrated analytical model for analyzing students’ online learning processes.

Step 1: Data collection from LMS database – students’ server log files and discussion scripts

The initial step is to retrieve data from LMS database. Researchers might want to consider data related to students’ login frequency, number of posted messages, frequency of viewing discussions, frequency of viewing learning resources (notes, web links) or number of assignments completed. The retrieved data can be easily imported to spreadsheet such as Microsoft Excel software or SPSS. Researchers may also want to calculate the time that they spent in online learning.

Step 2: Coding messages using content analysis technique

Students’ discussion messages can be retrieved from the LMS database or be directly copied from the online discussion’s interface. In Figure 2, researchers can see the students’ interaction explicitly such as who is responding to whom, the messages that they posted, the frequency of the messages posted or the time that they posted the message. Next, content analysis is carried out by choosing the appropriate coding scheme, unit of analysis and finally carrying out statistical analysis on the coded scripts.

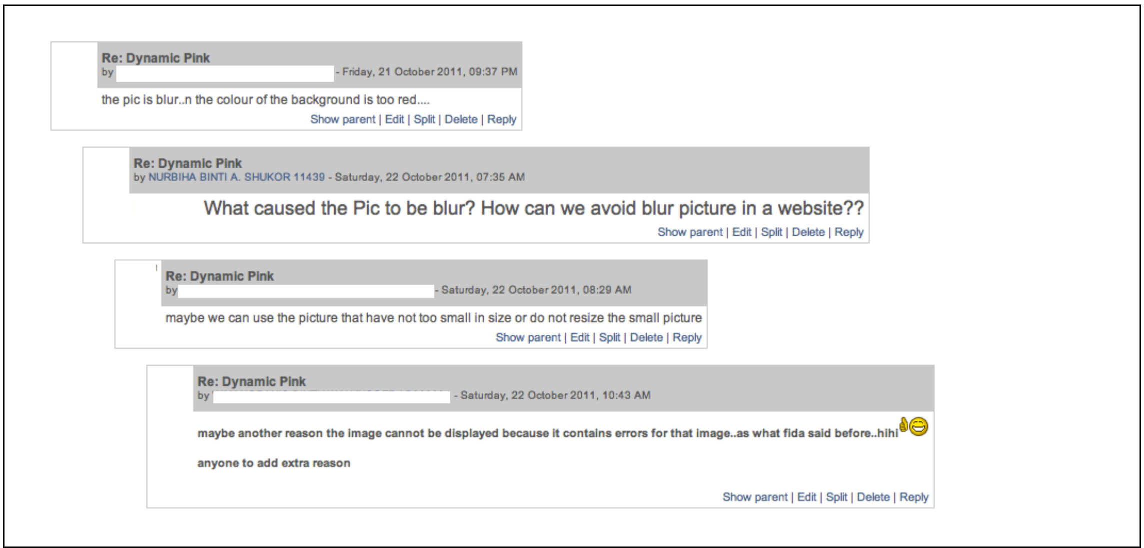

Fig. 2. Example of retrieving students’ written messages directly from the discussion board.

Choosing the coding scheme

As previously described, a coding scheme has to be chosen depending on the quality aspect that the researchers would like to investigate [24]. There are various coding schemes for investigating the quality aspects of online learning such as coding schemes on students’ knowledge construction [5], students’ critical thinking [6], students’ metacognition [7] or problem-solving strategies [8].

Choosing the unit of analysis

Next, the researchers coded the messages by deciding on which unit of analysis to be used (see further explanation in Rourke et al. [25]). For example, Shukor et al., [26] used ‘meaning’ as the unit of analysis for coding students’ level of cognitive engagement through students’ discussion scripts. Rourke et al., [25] discussed the issues on choosing the appropriate unit of analysis for coding discussion scripts as a crucial part particularly for reliability of the obtained data. To handle various drawbacks on the chosen unit of analysis, the researchers could report on the inter-rater reliability of their procedures using Cohen Kappa, percent of agreement, Scott Pi, or Krippendorf Alpha.

Statistical analysis on coded discussion scripts

Finally, researchers may want to carry out descriptive statistics to know generally the sum, mean, median, standard deviation on the coded discussion scripts. As such, the information on which codes appeared the most or vice versa can be obtained. The results can be combined with the data set from students' server log files.

In Table 1, we show an example where a coding scheme for investigating students' knowledge construction by Van der Meijden [5] was chosen and students' discussion scripts were coded by using 'meaning' as the unit of analysis. For example, Van der Meijden [5] categorized students' cognitive contributions into high and low-levels. Examples of high-level cognitive contributions are represented by codes such as CHV 2 (Asking questions that require elaboration), CI 2 (Giving information with elaborations) or CHG 2 (Answering questions with elaborations). For low-level of cognitive contributions, the representatitive codes are CIE (Evaluating the content), CI 1 (Sharing information without elaboration), CHG 1 (Answering questions without elaboration). The frequency of each codes were tallied with students' data from their server log files (such as login frequency) to produce a complete data set and now ready for data mining.

Table 1. Example of a complete data set ready for data mining

*Student	*Add post	*View Discussion	*Login	*Resource View	**High-level contribution based on coding scheme	**Low-level contribution based on coding scheme
S1	26	119	28	14	8	6
S3	42	329	120	136	11	14
S5	21	186	58	46	5	6
S8	16	194	49	33	5	5
S9	34	223	82	7	8	5
S10	14	129	71	67	3	4
S12	27	125	51	55	8	10
S15	44	176	59	29	8	8
S2	21	142	40	45	6	8
S13	42	223	77	24	8	7
S6	11	47	30	38	2	4
S14	8	249	142	115	2	4
S18	26	123	48	6	3	6
S7	21	234	97	73	6	9
S19	24	69	21	3	4	7
S20	16	51	12	8	2	3
S11	55	186	40	2	8	25
S17	25	77	24	38	2	13
S4	33	247	33	22	4	13
S16	68	243	76	44	9	23
Total	574	3372	1158	805	112	180
Mean	28.7	168.6	57.9	40.25	5.6	9

* Data retrieved from LMS database ** Data obtained from coded discussion scripts

Step 3: Educational data mining

The complete data set containing both the quality and quantity aspects of students' online learning experience is now ready for mining. A variety of data mining software can be used for this purpose. There are for commercial used (for example Statisca or Oracle Data Miner) or open source software used (for example WEKA or KNIME). First, you may want to list the variables set for filtration as shown in Table 2. The frequency of the codes resulting from content analysis technique should be included as well.

Table 2. Variables set for filtration in data mining

Variable Name	Description
ID	User ID
MarkPost	Students' post-performance test scores
LoginFre	Total frequency of LMS logins
AssCor	Total frequency of accessing course materials
NoPosting	Total number of discussion board messages posted
*NoCHV2	Total number of messages of CHV2 level posted
*NoCHG2	Total number of messages of CHG2 level posted
*NoCI2	Total number of messages of CI2 level posted
*NoACCEPT+	Total number of messages of ACCEPT+ level posted
*NoNACCEPT+	Total number of messages of NACCEPT+ level

	posted
*NoCHV1	Total number of messages of CHV1 level posted
*NoCHVER	Total number of messages of CHVER level posted
*NoCHG1	Total number of messages of CHG1 level posted
*NoCI1	Total number of messages of CI1 level posted
*NoCIT	Total number of messages of CIT level posted
*NoCIE	Total number of messages of CIE level posted
*NoACCEPT-	Total number of messages of ACCEPT- level posted
*NoNACCEPT-	Total number of messages of NACCEPT level posted
NoHCog	Total number of high-level cognitive contributions
NoLCog	Total number of low-level cognitive contributions
NoCog	Total number of discussion board messages posted

*Codes obtained from Van der Meijden (2005) coding scheme

Next, data mining can be carried out by choosing either clustering or decision tree algorithm to mine the data. A more detailed data mining procedures is discussed by Hung and Zhang [21]. An example of the overall result is illustrated in Figure 3.

Using decision tree, Figure 3 shows the integrated analytical model is able to illustrate students' pathway to achieve either high (H), high-low (HL) or low (L) level of cognitive engagement in online learning. For example, students have to share more than zero (0) messages of the CIE category and posted less than or equal to six messages from the CI 1 category to achieve high grades (H) (see Figure 3). From the result in Figure 3, it is also shown that only four variables (CI 1, CIE, CI 2 and CHG 1) are related to students' learning for achieving either H, HL or L performance. Variables such as students' frequency of logging in are not related to students' success or failure in learning processes.

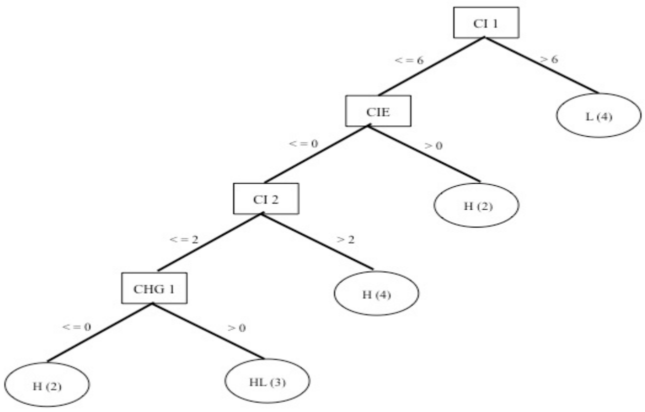

Fig. 3. Example of result by applying integrated analytical model to illustrate students' online learning processes.

Relevance of integrated model to stakeholders

The findings by using the proposed integrated model are very useful to illustrate the degree of students' learning in online learning settings. Students can benefit from the present research by being able to know their degree of learning in online settings. Being at low-level, students can further propose self-intervention to enhance their learning performance and students at the higher-level will be encouraged to maintain their current performances. Other than that, the students will be able to discover the important aspects of learning that should be emphasized for better future learning performances (for example, either sharing information or arguing is more important).

Other than that, the findings by applying the integrated model would suggest to the academicians and educators on the domains of learning that affects the students' performance the most. From the knowledge gained in this research, the educators can emphasize more in specific areas that contribute for better future learning performances. Educators can benefit by proposing early planning, mediation or intervention to their students at hand.

Conclusion

Previous studies have established the method of analyzing students' online learning processes either qualitatively or quantitatively. However, analyzing students' online discussions from both perspectives is still in its beginning stages in Educational Technology establishments. The presented integrated model for studying students' online discussions will be able to enrich the current methods of evaluating students' online learning at greater depth. Educators and researchers will both benefit from the knowledge of this paper by assistance on better evaluation on students' online learning processes which is normally difficult to be carried out.

Acknowledgements
The authors would like to thank Universiti Teknologi Malaysia (UTM) and Ministry of Higher Education (MoHE) Malaysia for their support in making this project possible. This work was supported by Research University Grant (Q.J130000.7116.00J83) initiated by UTM and MoHE.

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AN SEM MODEL BASED ON PISA 2009 IN TURKEY: HOW DOES THE USE OF TECHNOLOGY AND SELF-REGULATION ACTIVITIES PREDICT READING SCORES?

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Abstract

This study focused on the relationship between the use of technology for reading, students' attitude towards reading, and self-regulation to predict reading scores in PISA 2009. The sample of this study included 15 year-old students from Turkey (N=4996). Structural equation modeling (SEM) was used to create latent variables for technology for reading, attitude towards reading, and self-regulation; and to estimate the path coefficients between these latent variables and reading scores. Results showed that technology usage for reading and attitude towards reading were significantly related to reading scores. Self-regulation had indirect effects on reading scores through attitude towards reading and technology usage for reading.

Keywords: PISA; Technology; Self-Regulation; Structural Equation Modeling.

Introduction

As accessibility of new technologies has increased due to reduced cost, the computers and related technologies have been a substantial influence for students, teachers, and schools in the last decade. There is a widespread recognition of the positive impact of technology on educational outcomes. It is not difficult to use these technologies for today's students because "technology is assumed to be a natural part of the environment" (Oblinger, 2003, p. 38). That is why Prensky (2001) named today's students as "Digital Natives". According to Prensky (2001), students have substantially changed, and have been educated differently than their teachers. Hence, it is important to understand how "Digital Natives" utilize technology and how it can be linked to their academic performance.

There are many ways to include technology in educational settings to improve students' learning performance. Schools and teachers have embedded technology into their curriculums and teaching techniques to benefit from that. In addition to direct benefits of using technology in academic performance, there may also be indirect effects on educational outcomes. For instance, using computers for entertainment (e.g., games) may contribute to the improvement of a technology user's developmental skills such as attention and memory.

The significance of using technology in education is also connected with other learning theories such as self-regulation. Technology use and self-regulation activities are interrelated acts. Students mostly tend to use technology and enjoy it by themselves. Moreover, they regulate themselves to benefit from it for various reasons. That is why students who use self-regulatory strategies frequently may have an inclination to use more technology, and accordingly improve their learning performance. Self-regulation is a personal characteristic that can be influenced by several factors (Zimmerman, 2002) such as training (Wang, Quach, & Rolston, 2009). Hence, it is crucial for teachers to train and guide students to become more self-regulated learners by using necessary strategies (Schunk & Zimmerman, 2007) because students may not be aware of its necessity for their academic performance.

This article aims to summarize the idea that self-regulation is crucial and useful for reading ability and achievement (Souvignier & Mokhlesgerami, 2006; Swalander & Taube, 2007). Additionally, technology use for reading and its relation with using self-regulatory activities in reading are discussed. An SEM model is

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constructed to explain the relations between students' technology use, self-regulation, attitude towards reading, and reading scores.

Theoretical Framework

Self-regulation is a concept that refers to a learner's ability to regulate and control his learning process with using necessary strategies. According to Zimmerman (1998), there are three self-regulation phases: forethought, performance control, and self-reflection. There are also several strategies that self-regulated learners use to self-regulate themselves in these three phases. For example, Zimmerman (1989) listed 14 self-regulation strategies and described them. It should be noted that students have different self-regulation capabilities; therefore, they may use these strategies differently (Schunk & Zimmerman, 2007). Moreover, they tend to use these strategies when they are convinced of their benefits (Souvignier & Mokhlesgerami, 2006). Because self-regulated learning is a "dynamic and developing process" (Boekaerts & Corno, 2005, p. 208), self-regulatory activities may also foster accomplishment in some other academic factors such as self-efficacy (Schunk, 1991) and problem solving (Bielaczyc, Pirolli, & Brown, 1995). Although the benefit of self-regulated learning is widely accepted, it is very crucial for students to "select, combine, and coordinate cognitive strategies in an effective way" (Boekaerts, 1999, p. 447).

Having a better performance in reading comprehension requires students to follow several steps. Souvignier & Mokhlesgerami (2006) stated that reading can be supported by using embedded self-regulation strategies into instruction such as organizing the learning process, summarizing the text, and monitoring the understanding. As students learn and apply useful reading strategies, they can improve their reading comprehension (Paris, Lipson, & Wixson, 1983; Guthrie, Schafer, Wang, & Afflerbach, 1995; Sung, Chang, & Huang, 2008).

Many researchers have tried to show the relation between self-regulation and academic achievement. For example, Souvignier & Mokhlesgerami (2006) conducted an experimental research and provided three different programs teaching fifth-grade students how to use self-regulation reading strategies. They compared the experimental group with the control group, and found that these programs helped students to improve their reading skills as a result of learning and practicing self-regulatory strategies. Smith, Borkowski, and Thomas (2008), in a longitudinal study, examined the role of self-regulation on early reading readiness skills and later reading competence with a sample of 157 children from an at-risk group. They concluded that self-regulation is helpful for at-risk students to improve reading performance in the long term. The study also showed the importance of self-regulation in children's development. Children's potential reading and achievement problems can be eliminated by improving their self-regulatory skills at their early age (Smith, Borkowski, & Thomas, 2008).

Swalander and Taube (2007) investigated the relation between the reading ability of eight grade students with several other factors such as reading attitude, family based prerequisites, and self-concept. Family based prerequisites refer to parents' education level and students' accessibility to reading materials such as books and daily newspapers at home. After drawing an SEM model based on obtained data, it was found that attitude to reading, self-concept, and family based prerequisites are strong predictors of students' reading ability (Swalander & Taube, 2007). It was also argued by the authors that self-concept had a very high influence on reading ability either directly or indirectly (through reading attitude), and it can be fostered by a reading friendly family environment. It is important to note that immediate environment has influence on students' attitudes.

In conclusion, it is essential to explore the relation of students' technology use in immediate environments with self-regulation and their achievement. This study focuses on the relationship between technology, self-regulation, and students' reading scores in an international assessment.

Method

Data source and participants

The cross-sectional data for this study come from the 2009 administration of the Programme for International Student Assessment (PISA) that is an internationally standardized assessment jointly developed by participating countries and administered to 15-year-olds in schools. PISA is an assessment of domains such as reading, mathematical, and scientific literacy. In addition to content assessments, PISA includes student, parents, and school surveys that have questions related to students' and parents' background, students' attitude towards reading and information and communication technologies (ICT).

The target population of this study was 15-years old students who participated in PISA from Turkey. The data included 4996 students (male=2551, female=2445) from 170 schools in Turkey. 169 of 170 schools were public schools while only 1 school was privately funded. Table 1 provides a summary of gender and grade level information from the sample of this study.

Table 1. A summary of Turkish students who participated in PISA 2009

	Female		Male		Total	
Grade	N	%	N	%	N	%
7	6	.2	18	.7	24	.5
8	42	1.7	71	2.8	113	2.3
9	483	19.8	775	30.4	1258	25.2
10	1796	73.5	1597	62.6	3393	67.9
11	112	4.6	84	3.3	196	3.9
12	6	.2	6	.2	12	.2

Observed variables

The observed variables used in this study were the questions in PISA Main Student Survey and reading scores in 2009 PISA results. Three main questions and their sub-questions were used: 1) Q24: How much do you agree or disagree with these statements about reading? 2) Q26: How often are you involved in the following reading activities? 3) Q27: When you are studying, how often do you do the following? Question 24 had eleven sub-questions related to students' attitude towards reading. Answers were based on a 4-point scale (strongly disagree, disagree, agree, strongly agree). Question 26 had seven sub-questions related to students' reading behaviors using technology. Answers were based on a 5-point scale (don't know what it is, never or almost never, several times a month, several times a week, several times a day). Question 27 had sub-questions related to students' study behaviors. It had originally 13 sub-questions but only eight of them, which refer to self-regulation activities, were used in this study. Answers were based on a 4-point scale (almost never, sometimes, often, and almost always). These questions were provided in Appendix. The only continuous variable obtained from the PISA data was reading scores. In PISA, five different reading scores were reported using different sample weights. In this study, the average of those five reading scores was used as a single reading score.

Missing values

Missing data is a ubiquitous problem in social science data. Respondents do not answer every question, countries do not collect statistics every year, archives are incomplete, and subjects drop out of panels (Honaker, King, & Blackwell, 2011). Missing responses makes the conduct of statistical analyses as well as the calculation of scores difficult (Finch, 2010). The data from PISA Student Main Survey also have lots of missing observations. Listwise deletion of missing observations would have removed 80% of the data. Therefore, in order to preserve the original structure of the data, Amelia II software (Honaker, Joseph, King, Scheve, & Singh, 2002) program was used for handling missing data. Amelia II performs “multiple imputation” that is a general approach to data with missing values. This method creates multiple imputed versions of the incomplete data set so that all the information in data with missingness can be appropriately used for data analysis. Amelia II draws imputations of the missing values using a novel bootstrapping approach based on the expectation maximization with bootstrapping (EMB) algorithm (Honaker, King & Blackwell, 2011). After missing data were replaced by the imputed data from Amelia II, all observations from the 4996 participants in PISA were available for data analysis.

Structural equation models

This study employed a structural equation modeling (SEM) approach to analyze the 2009 PISA data and used AMOS 18 software. AMOS 18 uses a maximum likelihood (ML) method for obtaining estimates of the parameters. By using ordinal items and reading score from PISA, three SEM models were fit the data. The first model included two latent factors: *Self-regulation* and *attitude towards reading*. *Technology for reading* latent factor was added to the second and third models. *Technology for reading* was based on the items from Question 26. *Self-regulation* was based on the items from Question 27. *Attitude towards reading* was defined based on the items from Question 24. Reading scores were used as the dependent variable in all analyses. First, the measurement model was validated through confirmatory factor analysis and fit the structural model through path analysis with latent variables (Kline, 2005). The modification indices obtained from each analysis in AMOS 18 were used to modify items defining latent dimensions and the paths between the variables.

First model defined two latent dimensions (*Attitude towards Reading* and *Self-Regulation*). These two latent dimensions were used to predict reading scores. In the second model, *Technology for Reading* dimension was added to the model and this dimension was also used to predict reading scores. In the last model, two items defining *Technology for Reading* dimension were removed based on the modification indices and the model was fit with the rest of the items.

Evaluation of model fit

Goodness-of-fit criteria, including root mean square error of approximation (RMSEA), Tucker-Lewis Index (TLI), and comparative fit index (CFI), were used to determine the overall data-model fit for the SEM models. The literature contains different recommendations about the type, number, and cut-off values for goodness-of-fit required to be reported. TLI and CFI values greater than 0.90 are considered acceptable, and values greater than 0.95 are considered a good fit (Browne and Cudeck, 1993; Hu & Bentler, 1999; Kline, 2005). RMSEA values smaller than 0.05 are usually considered as a close fit, values equal to or greater than 0.10 as a poor fit (Browne and Cudeck, 1993; Hu & Bentler, 1999; Kline, 2005). In addition to these fit indices, the chi-square ($\chi 2$) test of model fit was provided as an indicator of model fit.

Results

In Model 1, two latent variables (*Self-Regulation* and *Attitude towards Reading*) and reading score were used to examine their relation. Before the analyses, the two latent variables were checked to see whether observed variables were measuring the corresponding latent variables. It was verified by the confirmatory factor analysis that the observed variables were measuring the latent variables appropriately. It was important to see how reading score could be predicted by using self-regulation activities in reading and attitude towards reading. SEM analysis was conducted using maximum likelihood (ML) method. The Chi-square was 475.44 with the degrees of freedom of 168, which also indicated a significant result ($p<0.000$). TLI (.876), CFI (.891), and RMSEA (.056) were in acceptable range in terms of an acceptable fit. According to the theoretical framework, this result was anticipated. However, when the modification indices were checked, the path from *Self-Regulation* to *Reading Score* was not significant. Therefore, the path was deleted in the next model and a new latent variable named *Technology for Reading* was added to see its relation with reading score as indicated in the theoretical framework.

In Model 2, *Technology for Reading* was added into the model as a new latent variable to test the relation of using technologies for reading with other latent variables and reading score. First, a CFA analysis was conducted with the observed variables to see if those items were measuring the *Technology for Reading* adequately. As indicated above, the path from *Self-Regulation* to *Reading Score* was deleted due to its insignificance. Two paths were added into the model; from *Self-Regulation* to *Technology for Reading*, and *Technology for Reading* to *Reading Score*. In this model, all paths were significant. The Chi-square was 1004.85 with the degrees of freedom of 319, which also indicated a significant result ($p<0.000$). However, goodness-of-fit criteria were indicating less fit compared to Model 1. The reason for having poorer TLI (.856), CFI (.869), and RMSEA (.057) results were examined and decided to modify *Technology for Reading* latent variable based on the modification indices. As a result, two observed variables were deleted from the model.

In Model 3, two observed variables were removed from the *Technology for Reading* latent variable. The removed variables were Chat Online and Group Discussions. These variables were less related to the use of technology for reading than other variables because these variables were based on entertainment-focused acts. Also, since we wanted to relate self-regulation with technology, it was proper to keep the variables that were self-based and remove group-based variables, which were Chat Online and Group Discussions. In this model, the Chi-square was 691.2 with the degrees of freedom of 270, which also indicated a significant result ($p<0.000$). In terms of goodness-of-fit criteria, Model 3 had better fit results than previous models (TLI (.891), CFI (.901), and RMSEA (.048)). Additionally, all paths were significant. Reading Score was significantly predicted by the latent variables, *Attitude towards Reading* and *Technology for Reading* variables. Figure 1 presents the standardized factor loadings and parameter estimates for the paths of the final structural model.

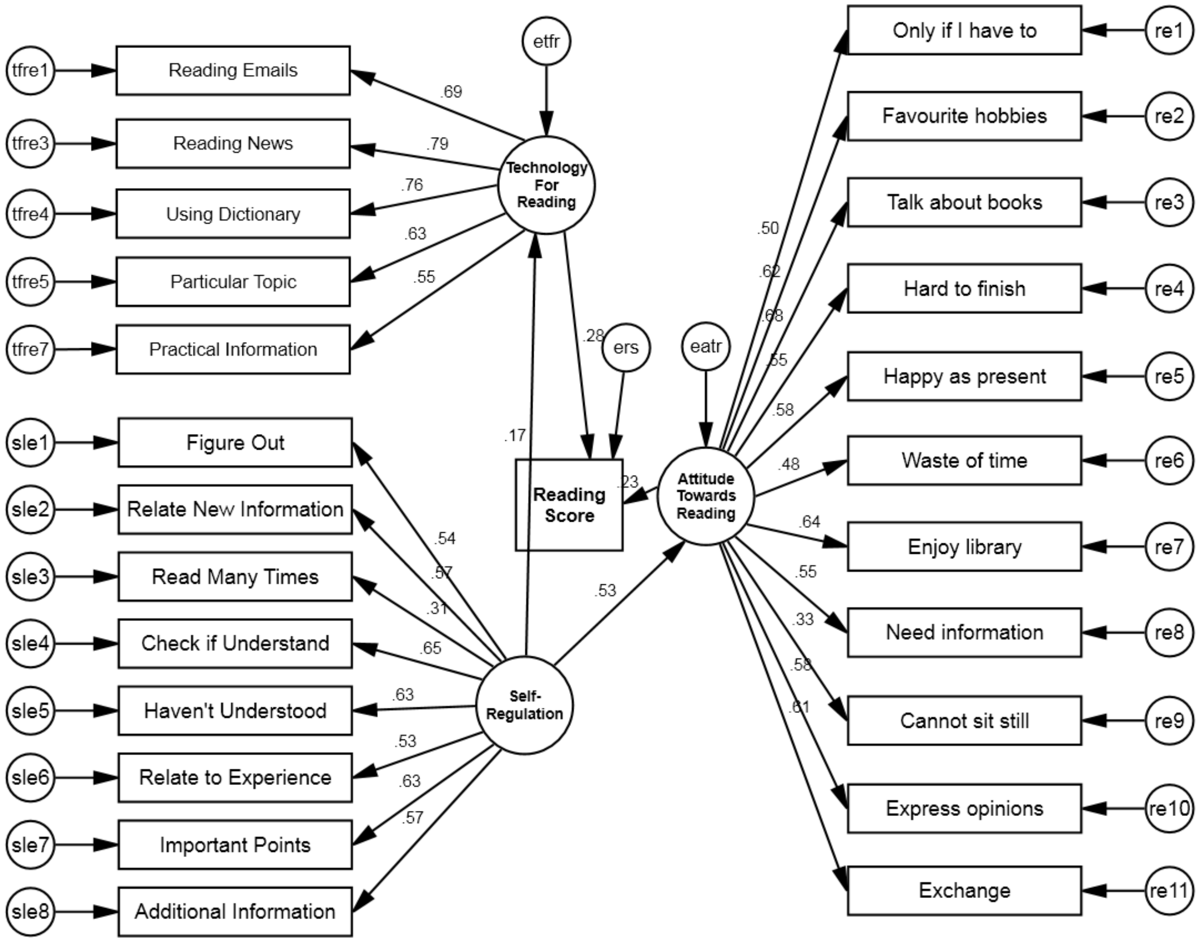

Figure 1: Path diagram for SEM Model 3

The final model was accepted to have a good fit in terms of goodness-of-fit criteria, including root mean square error of approximation (RMSEA), Tucker-Lewis Index (TLI), and comparative fit index (CFI). On the other hand, chi-square (χ^2) test values were significant that may not be expected from a good fit. However, $\chi 2$ is not adequate criterion for test of model fit by itself because it "is sensitive to sample size because as sample size increases (generally above 200), the χ^2 has a tendency to indicate a significant probability level" (Schumacker & Lomax, 2004, p. 92). Therefore, in terms of chi-square test, the value of CMIN/DF, which is the ratio of chi-square value to the degrees of freedom, can be considered to see the improvements among the models. In our case, this ratio was 2.83, 3.15, and 2.56 respectively. This also indicates that the final model was the best fit model. Table 2 gives a summary of the fit indices for each model.

Table 2. Summary of goodness of fit indices from three SEM models in the study

SEM Model	χ^2	df	CFI	TLI	RMSEA
Model 1	475.44	168	.89	.87	0.56
Model 1	1004.85	319	.87	.85	0.57
Model 3	691.20	270	.90	.89	0.48

The results from the final model (Model 3) indicated that there is a positive relationship between *Self-regulation* and other latent variables. *Self-regulation* predicted *Attitude towards Reading* better than *Technology for Reading*. As explained earlier, the path between *Self-regulation* and *Reading Score* was not statistically significant in Model 1. Therefore, this path was not included in Model 2 and Model 3. *Self-regulation* had an indirect effect on Reading Score through *Technology for Reading* and *Attitude towards Reading*. Similarly, there was a positive relationship between Reading Score and other latent variables (*Technology for Reading* and *Attitude towards Reading*) although the path coefficients from these latent variables to Reading Score were not very high. *Technology for Reading* and *Attitude towards Reading* had very similar path coefficients, meaning that these latent variables were able to predict Reading Score equally well.

Discussion

Both self-regulation and technology usage have been important parts of education and instruction. It is important to examine the impact of these factors on students' achievement. This study focused on the relationship between self-regulation, technology usage, and their impacts on students' reading score in an international standardized assessment, PISA. Structural equation modeling approach was used to create latent variables representing technology usage, self-regulation, and attitude towards reading. The observed variables for these latent variables were obtained from the PISA Main Survey that has survey items about technology usage, attitude towards reading, etc. for participating students.

The initial theory in this study was that there might be a significant direct relationship between technology usage and reading scores and also between self-regulation and reading scores in PISA. However, the results showed that there was not a significant direct relationship between reading scores and self-regulation. Instead, self-regulation had an indirect effect on reading scores through reading attitude and technology use for reading. There was a moderately strong relationship between technology usage, attitude towards reading, and reading scores. The results indicated that students tend to get higher reading scores if they are able to use technology for reading and they have a positive attitude towards reading.

Although the indirect relationship between self-regulation and reading scores was not anticipated from the beginning, there are several important implications of this finding. First, the results of this study imply that attitude towards reading can be improved by self-regulation activities. It can be explained to students that they would learn more by employing very simple strategies during their learning process. It is important to note that students use more self-regulation strategies as they believe in the benefits of self-regulation (Souvignier & Mokhlesgerami, 2006). Second, today's students are living with technology, and this study shows that technology usage may have a positive effect on reading scores. Furthermore, combining self-regulation with proper technologies could reveal better reading performance for students.

Apart from the relationship between self-regulation and technology usage, students need to be fostered to learn and use self-regulatory activities because the literature shows that self-regulation is associated with other important factors such as self-efficacy (Schunk, 1991). In terms of reading achievement, self-regulation activities can be used to comprehend more from readings. Because students may be knowledgeable about using self-regulation strategies, teachers could embed the same activities into the instruction and demonstrate students how to be a self-regulated learner. There are many methods to improve students' metacognitive skills in reading such as summarizing the text, taking notes, relating the texts, and self-monitoring. Primarily, teachers need to learn and practice these methods and then apply them in their classrooms to improve students' performance in reading.

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Appendix A. The PISA Main Survey questions used in this study

Q24. How much do you agree or disagree with these statements about reading?

	Strongly disagree	Disagree	Agree	Strongly agree
a) I read only if I have to	☐1	☐2	☐3	☐4
b) Reading is one of my favourite hobbies	☐1	☐2	☐3	☐4
c) I like talking about books with other people	☐1	☐2	☐3	☐4
d) I find it hard to finish books	☐1	☐2	☐3	☐4
e) I feel happy if I receive a book as a present	☐1	☐2	☐3	☐4
f) For me, reading is a waste of time	☐1	☐2	☐3	☐4
g) I enjoy going to a bookstore or a library	☐1	☐2	☐3	☐4
h) I read only to get information that I need	☐1	☐2	☐3	☐4
i) I cannot sit still and read for more than a few minutes	☐1	☐2	☐3	☐4
j) I like to express my opinions about books I have read	☐1	☐2	☐3	☐4
k) I like to exchange books with my friends	☐1	☐2	☐3	☐4

Q26. How often are you involved in the following reading activities?

	I don't know what it is	Never or almost never	Several times a month	Several times a week	Several times a day
a) Reading emails	☐1	☐2	☐3	☐4	☐5
b) <Chat on line> (e.g. <MSN®>)	☐1	☐2	☐3	☐4	☐5
c) Reading online news	☐1	☐2	☐3	☐4	☐5
d) Using an online dictionary or encyclopaedia (e.g. <Wikipedia®>)	☐1	☐2	☐3	☐4	☐5
e) Searching online information to learn about a particular topic	☐1	☐2	☐3	☐4	☐5
f) Taking part in online group discussions or forums	☐1	☐2	☐3	☐4	☐5
g) Searching for practical information online (e.g. schedules, events, tips, recipes)	☐1	☐2	☐3	☐4	☐5

Q27. When you are studying, how often do you do the following?

	Almost never	*Sometimes*	*Often*	*Almost always*
a) When I study, I try to memorize everything that is covered in the text.	☐1	☐2	☐3	☐4
b) When I study, I start by figuring out what exactly I need to learn.	☐1	☐2	☐3	☐4
c) When I study, I try to memorize as many details as possible.	☐1	☐2	☐3	☐4
d) When I study, I try to relate new information to prior knowledge acquired in other subjects.	☐1	☐2	☐3	☐4
e) When I study, I read the text so many times that I can recite it.	☐1	☐2	☐3	☐4
f) When I study, I check if I understand what I have read.	☐1	☐2	☐3	☐4
g) When I study, I read the text over and over again.	☐1	☐2	☐3	☐4
h) When I study, I figure out how the information might be useful outside school.	☐1	☐2	☐3	☐4
i) When I study, I try to figure out which concepts I still haven't really understood.	☐1	☐2	☐3	☐4
j) When I study, I try to understand the material better by relating it to my own experiences.	☐1	☐2	☐3	☐4
k) When I study, I make sure that I remember the most important points in the text.	☐1	☐2	☐3	☐4
l) When I study, I figure out how the text information fits in with what happens in real life.	☐1	☐2	☐3	☐4
m) When I study and I don't understand something, I look for additional information to clarify this.	☐1	☐2	☐3	☐4

APPLICATION OF POLYNOMIAL TREND IN FUNCTION OF DETERMINING TREND GROWTH OF CONTAINER TRAFFIC IN THE PORT OF KOPER[5]

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Abstract

The subject of this paper is the movement of container traffic in the port of Koper and consequently, the comparison was made with the container traffic in the port of Rijeka and Trieste in regard with the port of Koper. Container transport has a direct impact on the general prosperity of the area of Koper and Slovenia as a whole. It is, therefore, important to identify the factors influencing the container traffic in the Koper port and calculate the polynomial trend that approximates the movement of container traffic in the port of Koper, assuming that the container traffic will be moving the same way as in the previous period. From the proposed model with the processed data over the past twelve years via polynomial trend it is possible to predict the behaviour of container traffic in the next five years.

Keywords: Port of Koper; container traffic; polynomial trend; explained sum of squares and residual su m of squares

5

Introduction

In the EU port system, the ports of Trieste, Koper and Rijeka have been treated as a unique port system (multi-port gateway region) which are supposed to undertake a part of the traffic flows of a unique European TENT network in the unique European transport market in the near future. In addition, these ports compete with northern Europe ports (Antwerp, Rotterdam, Bremen, Hamburg) for Central Europe markets as one harbour region (north Adriatic). It's worth mentioning the Black Sea transport route and the Danube corridor which will also represent an influential factor in the central European markets in the future. The purpose and goal of this research is to predict the future movements of container traffic through the port of Koper via polynomial trend of degree k.

Using the previous dynamics of container traffic movement, the movement of container traffic will be estimated via trend-polynomial of degree k in the future. The results achieved may serve as guidelines for further capital investments into port container terminal in order to avoid terminal overcapacity. The paper presents the essential features influencing the attraction of container traffic in Koper traffic route.

The case study is to determine the relevant features of container traffic, quantify the elements of dependent variable Y and independent variable X, examine the movement of container traffic in the port of Koper, evaluate the movement of container traffic in the port of Koper.

In this case, the dependent variable Y is the number of TEU units in the port of Koper, while X represents the time (the value of the independent variable). In this paper container traffic has been analysed in the port of Koper by polynomial trend of degree k. A simple regression model was used and furthermore, regression parameters were evaluated using the least squares method, which consists in determining those estimates of parameters for which the residual sum of squares reaches a minimum.

Investments into the Koper port infrastructure and formation of inland container terminals

In response to the growing demand for port services, the port of Koper started a financially demanding infrastructure investment cycle in 2007. Capacities of container terminal were overloaded so it was decided to extend the shores of the container terminal. Investments into expansion of the quay I and introduction of post-Panamax container cranes provide leadership in the north Adriatic ports. Such equipment and sufficient depth allow the acceptance of large container ships with more than 7.000 TEUs. Ships with increasing capacities become regular visitors to the north Adriatic ports, and in addition, the ports without necessary infrastructure for their admission will not be competitive.

The port of Koper has a strategic goal to become a leading port and logistics centre for Central and Eastern Europe countries. Accordingly, modern logistics and distribution centres were founded in Sežana, Beltinci and Arad and they are located along the main European corridors and their intersections. Container terminals in Arad have been built in collaboration with two strategic partners, the Trade Trans Invest in the Slovak Republic and Hungarian railways MAV Cargo. The terminal is located on the strategic position of the European Corridor IV and is connected by block trains to the logistics centres in Sežana, which provides growth of container traffic in the port of Koper. The expansion of inland terminals in Slovenia as well as in the east of the continent provides a good basis for optimal management of new port infrastructure in combination with more intensive participation in rail freight business. The fact that the port of Koper is in the first strategic locations opens up the possibility of diverting flows of goods to the port of Koper. Competitive advantage that the port of Koper has realized by forming a network of inland terminals has been later supported by the state.

Despite the crisis, this continues to be containerized in the Mediterranean and the Adriatic, although less intense than in previous years. One can therefore expect that the competition among ports will become more intense. Adequate infrastructure and high service levels in such conditions represent a major competitive advantage. The port of Koper plans to build a brand new container terminal with a projected annual turnover of 1 million TEUs. A major step forward and increase of traffic in the port of Koper is the result of diverting the cargo (from North European ports) to logistic and distribution centres of large multinational companies located in Central Europe. The port of Koper has a leading part in the organization of efficient railway block-trains towards the destinations in Central Europe and thus provide an advantage in container traffic in relation to Trieste and Rijeka. These are the reasons where to seek an answer why Koper achieved an increase of turnover by 38% in 2010 compared to the year 2009, while Rijeka and Trieste remained at almost the same turnover.

Analysis of time series

The aim of the analysis of time series is to choose and evaluate the parameters of functions $f(X)$,i.e. $\hat{Y}$ which will be the best way to describe the relationship between the variables X and Y. Assuming the existence of dependent (regressand) variable Y and only one independent (regressor) variable X, it is a linear regression model whose general form is:

$$Y = f(X) + e \quad \text{or} \quad Y = \hat{Y} + e \tag{1}$$

Since the variable e expresses the residual or by the function *f(X)* unexplained effects arising from the statistical relation between variables X and Y, the best model will be the one that minimizes the value of the variable *e*.

Polynomial trend of degree k

Polynomial trend of degree k belongs to the additive models, and it is as follows:

$$Y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2 + \cdots + \beta_k x_i^k + e_i \quad i = 1,2,...,n \tag{2}$$

Y_i - i dependent (regressand, explained) variable, x_i - i independent (regressor, explanatory) variable, $\beta_0, \beta_1, \ldots, \beta_k$ - regression parameters (regression coefficients) e_i - stochastic variable that denotes the unsystematic effects on the dependent variable, n- sample size [1]. The system of equations in matrix notation is as [2] follows:

$$Y = X\beta + e \tag{3}$$ where:

$$Y = \begin{vmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{vmatrix}, X = \begin{vmatrix} 1 & x_1 & x_1^2 & x_1^k \\ 1 & x_2 & x_2^2 & x_2^k \\ \vdots & \vdots & \vdots & \vdots \\ 1 & x_n & x_n^2 & x_n^k \end{vmatrix}, \beta = \begin{vmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_k \end{vmatrix}, e = \begin{vmatrix} e_1 \\ e_2 \\ \vdots \\ e_n \end{vmatrix} \tag{4}$$

Hence Y is a vector of empirical values of the dependent variable, X is the matrix of regression variable value, β is the vector of unknown parameter values, e is the vector of unknown values of random variables e_i, and hence $E\lfloor e_i \rfloor = 0$ is for each i. Based on the sample it is to find the best possible estimate $\hat{\beta}_0, \hat{\beta}_1, ..., \hat{\beta}_k$, of the corresponding coefficients of the polynomial trend $\beta_0, \beta_1, \ldots, \beta_k$ and thus determine the polynomial trend in the sample:

$$\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_i + \hat{\beta}_2 x_i^2 + ... + \hat{\beta}_k x_i^k, \quad i = 1,2,...,n \tag{5}$$

where $\hat{Y}_i$ stands for the value Y which is located on the best adaptive regression spline, so it's called adaptive value of Y.

Polynomial trend of the basic set and the sample is usually different, because the assessed values $\hat{\beta}_0, \hat{\beta}_1, ..., \hat{\beta}_k$, differ from real parameter values $\beta_0, \beta_1, \ldots, \beta_k$. Vertical deviation (difference) between real value Y_i and adaptive value $\hat{Y}_i$ is called residual and is denoted as e_i [1]:

$$e_i = Y_i - \hat{Y}_i = Y_i - \left(\hat{\beta}_0 + \hat{\beta}_1 x_i + \hat{\beta}_2 x_i^2 + ... + \hat{\beta}_k x_i^k\right), \tag{6}$$

The parameters estimates $\hat{\beta}_0, \hat{\beta}_1, ..., \hat{\beta}_k$, of the required polynomials will be given by the least squares method, so, of all possible regression splines there will be selected the one with the smallest sum of squared residuals, i.e. find minimum expression [3]:

$$SQ = \sum_{i=1}^{n} e_i^2 = \sum_{i=1}^{n} \left(Y_i - \hat{Y}_i\right)^2 = n\hat{\beta}_0 + \hat{\beta}_1 \sum_{i=1}^{n} x_i + \cdots + \hat{\beta}_k \sum_{i=1}^{n} x_i^k = \sum_{i=1}^{n} y_i \ \hat{Y}_i \tag{7}$$

To get the mimumum expression (7), (k +1) ... partial derivative $\frac{\partial SQ}{\partial \hat{\beta}_0}, \frac{\partial SQ}{\partial \hat{\beta}_1} \frac{\partial SQ}{\partial \hat{\beta}_k}$ equals to zero, which leads to the system (k+1)- nonlinear equation, i.e. the system [2]:

$$n\hat{\beta}_0 + \hat{\beta}_1 \sum_{i=1}^{n} x_i + \cdots + \hat{\beta}_k \sum_{i=1}^{n} x_i^k = \sum_{i=1}^{n} y_i$$

$$\hat{\beta}_0 \sum_{i=1}^{n} x_i + \hat{\beta}_1 \sum_{i=1}^{n} x_i^2 + \cdots + \hat{\beta}_k \sum_{i=1}^{n} x_i^{k+1} = \sum_{i=1}^{n} x_i y_i \quad , \tag{8}$$

$$\hat{\beta}_0 \sum_{i=1}^{n} x_i^k + \hat{\beta}_1 \sum_{i=1}^{n} x_i^{k+1} + \cdots + \hat{\beta}_k \sum_{i=1}^{n} x_i^{2k} = \sum_{i=1}^{n} x_i^k y_i$$

or in matrix notation:

$$\left(X^T X\right) \bullet \hat{\beta} = X^T Y\,, \tag{9}$$

that is:

$$\hat{\beta} = \left(X^T X\right)^{-1} \bullet \left(X^T Y\right), \tag{10}$$

where:

$$\hat{\beta} = \begin{vmatrix} \hat{\beta}_0 \\ \hat{\beta}_1 \\ \vdots \\ \hat{\beta}_k \end{vmatrix} ;\, X^T X = \begin{vmatrix} n & \sum x_i & \cdots & \sum x_i^k \\ \sum x_i & \sum x_i^2 & \cdots & \sum x_i^{k+2} \\ \vdots & \vdots & \vdots & \vdots \\ \sum x_i^k & \sum x_i^{k+1} & \cdots & \sum x_i^{2k} \end{vmatrix} ;\, X^T Y = \begin{vmatrix} \sum y_i \\ \sum x_i y_i \\ \vdots \\ \sum x_i^k y_i \end{vmatrix} \tag{11}$$

Analysis of variance of regression is obtained in the following way:

$$ST = SP + SR \tag{12}$$

$$SP = \sum_{i=1}^{n} \left(\hat{Y}_i - \overline{Y}\right)^2 = \hat{\beta}^T \left(X^T Y\right) - n \bullet \overline{Y}^2 \tag{13}$$

$SP =$ sum of squares of explained part of deviation of the variable value $\hat{Y}_i$ from the arithmetic mean $\overline{Y}$,

where $\overline{Y} = \frac{1}{N} \sum_{i=1}^{n} Y_i$.

$$SR = \sum_{i=1}^{n} \left(Y_i - \hat{Y}\right)^2 = Y^T Y - \hat{\beta}^T \left(X^T Y\right) = \sum_{i=1}^{n} Y_i^2 - \hat{\beta}^T \left(X^T Y\right) \tag{14}$$

$SR =$ sum of residual part of deviation of the variable value Y_i from $\hat{Y}$.

$$ST = \sum_{i=1}^{n} \left(Y_i - \overline{Y}\right)^2 = \sum Y_i^2 - n\overline{Y}^2 \tag{15}$$

$ST =$ sum of squares of total deviations of the variable value Y_i from the arithmetic mean $\overline{Y}$.

The representativeness of regression is measured by the coefficient of determination, which is the ratio of explained sum of squares and total sum of squares deviation. It shows how much percent of the sum of squares deviation is explained by regression model, and is obtained like this:

$$R^2 = \frac{\sum_{i=1}^{n} \left(\hat{Y}_i - \overline{Y}\right)^2}{\sum_{i=1}^{n} \left(Y_i - \overline{Y}\right)^2} \tag{16}$$

The coefficient of determination ranges in the interval $0 \leq R^2 \leq 1$. The regression model will be more representative if R^2 is closer to the unit and vice versa. It's also necessary to point out that it's a point estimate of the real determination coefficient based on the sample. That is a biased estimate of the determination coefficient of the basic set, while for the unbiased estimate one should take into account the sample size or number of degrees of freedom. The resulting coefficient of determination, called the corrected coefficient of determination and represents an asymptotic unbiased estimate of real coefficient

of determination, which is obtained as follows [3]:

$$\overline{R}^2 = 1 - \frac{n - 1}{n - (k + 1)} \cdot \left(1 - R^2\right) \tag{17}$$

Lack of this coefficient stands in the fact that it can take even a negative value, depending on the size of the sample and determination coefficient estimate which is then meaningless.

If the sample size increases indefinitely, corrected coefficient of determination tends towards real coefficient of determination. Below there is analysed movement of container traffic in the port of Koper and furthermore approximation of the data given in Table 1 has been done so the movement of container traffic approximated generally by polynomial trend of degree k, i.e. formula (2).

Table 1. Container traffic in the ports of Rijeka, Trieste and Koper (in TEU)

Year	Port of Rijeka	Port of Koper	Port of Trieste	Total
1997	16474	66869	204318	287661
1998	14814	72826	174080	261720
1999	6866	78204	185163	270233
2000	8925	86679	206134	301738
2001	12711	100000	182379	295090
2002	15215	115000	163472	293687
2003	28205	120000	120768	268973
2004	60864	153347	131200	345411
2005	76258	179745	198319	454322
2006	94390	218970	220310	533670
2007	145040	305648	265863	716551
2008	168761	353880	335943	858584
2009	130740	343165	276957	750862
2010	137048	476731	281629	895408
Total	916311	2671064	2946535	6533910

Source: Port of Rijeka authority, Koper, Trieste

Polynomial trend of degree k was found in the example of container traffic in the port of Koper from 1997 to 2008 in the TEU (see table 2), and second-degree-polynomial was obtained.

Table 2. Calculated values of $\hat{Y}_i, i = 1,2,...,19$ for the port of Koper according to second-degree-polynomial trend in the period from 1997 to 2015

Year	x_i	y_i	$x_i\ y_i$	$x_i^2 y_i$	$\hat{y}_i$
1997	1	66869	66869	66869	80785
1998	2	72826	145652	291304	72835
1999	3	78204	234612	703836	71277
2000	4	86679	346716	1386864	76113
2001	5	100000	500000	2500000	87342
2002	6	115000	690000	4140000	104964
2003	7	120000	840000	5880000	128978
2004	8	153347	1226776	9814208	159386
2005	9	179745	1617705	14559345	196187
2006	10	218970	2189700	21897000	239382
2007	11	305648	3362128	36983408	288969
2008	12	353880	4246560	50958720	344949
2009	13				407322
2010	14				476089
2011	15				551248
2012	16				632801
2013	17				720747
2014	18				815085
2015	19				915817
Total		1851168	15466718	149181554	5454460

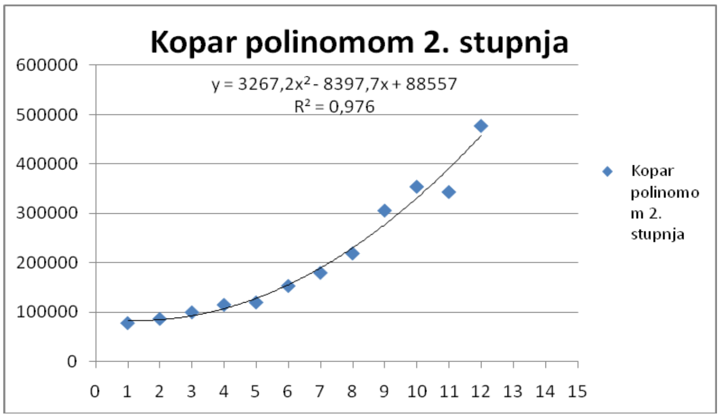

Fig. 1. Second-degree-polynomial trend for the port of Koper in the period from 1999 to 2010

For the port of Koper, second-degree-polynomial trend is optimal (see figure 1), where R^2=0.976. Thus, 97.6% of the total sum of deviation squares of the variable value Y from the arithmetic mean is explained by using second-degree-polynomial trend, while the remaining 2.4% of the sum of squares remained unexplained. Since the value of determination coefficient is very close to 1, it can be concluded that the second-degree-polynomial trend is very representative. As R^2 is a biased estimate of the coefficient of determination, corrected asymptotical unbiased coefficient of determination will be calculated and will be equal to:

$$\overline{R}^2 = 1 - \frac{n-1}{n-(k+1)} \cdot \left(1 - R^2\right) = 0{,}970667$$

The coefficient $\left(1 - R^2\right)$ is called the coefficient of alienation and represents a share of the sum of squared deviation, which is not explained by the model in total sum of squared deviations. In this case the coefficient of alienation is 0.029333.

The movement of container traffic in the north Adriatic ports

The following graph shows the movement of container traffic in the North Adriatic ports of Rijeka, Koper and Trieste from 1997 to 2010.

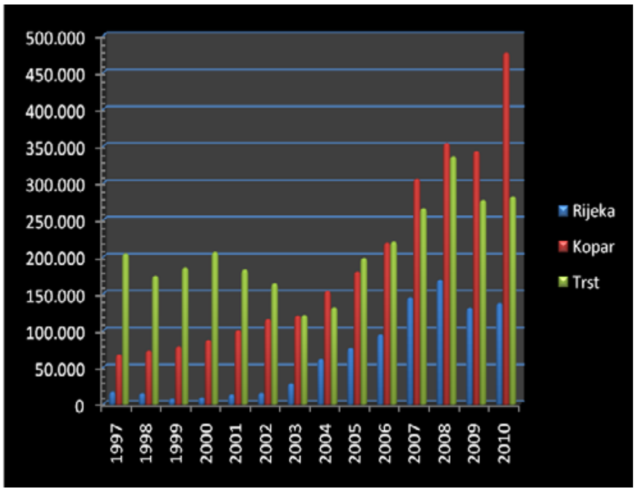

Fig. 2. The movement of container traffic in the ports of Trieste, Koper and Rijeka

Traffic at the container terminal in the Port of Koper recorded giant steps forward from 2003 until the recession year - 2009. The port of Trieste was continuously achieving a greater container traffic for years compared to the competing ports until 2004, when the competitive advantage was taken over by the neighboring port of Koper having reloaded more TEU units. But its leadership didn't last long, because in 2005, the port of Trieste assumed again a leadership position. In the period from 2004 to 2010 the largest overall increase in traffic was achieved by the port of Koper, then Trieste and finally Rijeka. In the period from 2000 to 2008 the container turnover in the Rijeka port increased from 8.925 TEUs to 168.761 TEUs and within the same period, its share on the North Adriatic transport route increased from 2.96% to 19.66%. The traffic in Koper port increased from 86.679 TEUs to 353.880 TEUs, and the proportion of the port of Koper in the North Adriatic port container turnover increased from 28.73% to 41.22%. Container turnover in the port of Trieste has increased from 206.134 TEUs to 335.943 TEUs, i.e. its share in container turnover of North Adriatic route decreased from 68.32% to 39.13%.

A noteworthy fact is that the port of Trieste was forefront in container traffic until 2004 when the port of Koper took over the leading position; however, in 2005 and 2006 the port of Trieste retook the lead and in 2007 the leadership was taken over by the port of Koper, which continued in 2010.

In comparison to 2009, Koper achieved an increase in turnover of 38% in 2010, while Rijeka and Trieste remained at almost the same traffic.

In 2010 the port of Koper achieved the container turnover of 476.731 TEU units, the port of Rijeka had a turnover of 137.048 TEU units, while the Port of Trieste made 281.629 TEU units. The port of Koper had the largest share of container traffic in the North Adriatic ports in 2010 which formed multi-port gateway region. Thus, the share of the port of Koper in the North Adriatic port container turnover is 53%, port Trieste makes 32% share and finally port Rijeka is with the lowest share of 15%.

Total container turnover for the ports of Rijeka, Koper and Trieste had a drop of 2.2% in 2001 with respect to year 2000, then a slight decline from 0.47% in 2002 with respect to 2001 and a significant decrease of 8.4% in 2003 with respect to 2002, an increase of 28.4% in 2004 with respect to 2003, growth of 31.5% in 2005 with respect to 2004, and finally, from 2005 until 2008 there was an increase ranging from 17% to 34%. However, there was a decline of 12.55% in 2009 with respect to 2008 and finally, increase of turnover to 19.25% in 2010 with respect to 2009. Average growth in total turnover for all three ports in the period from 1999 to 2010 was 12%.

Within the same period, the port of Koper had a turnover growth of 11%, 15%, 15%, 4%, 28%, 17%, 22%, 39%, 16%, one drop of 3% in 2009 with respect to 2008 and eventually, an increase of 40% in 2010 with respect to 2009.

Thus, the average growth of traffic in the port of Koper from 1999 to 2010 was 18% for each year.

Acknowledgements

The results presented in the paper have been derived from the scientific research project „New Technologies in Diagnosis and Control of Marine Propulsion Systems“ supported by the Ministry of Science, Education and Sports of the Republic of Croatia.

Conclusion

The increase of container traffic in the port of Koper can be attributed to a number of factors, including the revival of the economy in central Europe, increasing the storage and handling capacities at the terminal Koper. The establishment of new direct services with Far East, competitive logistics services on the hinterland markets (shorter transit time, lower costs in comparison with the ports of Northwest Europe, quality cargo handling, well-organized regular rail transport of containers). The port is also connected to a feeder service to major hub ports in the Mediterranean (Gioia Tauro, Malta, Piraeus, Haifa, Taranto).

In 2010 there was a record of the highest increase of traffic at the container terminal where 476.731 container units (TEU) were overloaded. The table in Annex 1 shows that the regression analysis using data from the container traffic in TEUs from 1997 to 2008, may well predict the movement of container traffic over the next five years. The Koper port was investing for years in building roads so it is now very well connected by road and rail routes, which greatly contributes to development and prolific port business. Confidence of business partners, competitiveness, good organization and effective performance of employees have undoubtfully contributed to better results. The results achieved in container transshipment have placed the port of Koper into a circle of the most important container ports of the Adriatic. Given the current trends and forecasts about the global economy further transshipment of containers is expected to rise. However, to gain optimal results there should be provided further investment into equipment and storage facilities. It has begun to rapidly grow the number of containers in the port of Koper since 2000. In the period from 2000 to 2008 the port of Koper's container traffic increased from 86.679 TEUs to 353.880 TEUs and in the same period, its share on the North Adriatic transport route increased from 28.73% to 41.22%. The total storage space at the terminal covers 180.000 m2, and the estimated annual capacity of cargo traffic is 700.000 TEUs. According to the defined model it is estimated that in 2013 container traffic would be expected to move at approximately 720.747 TEU units. Such conditions will require new investments in port infrastructure and storage facilities, which is closely related to the adoption of a new national spatial plan for the port of Koper.

The ports providing efficient and competitive services, and enjoy a favorable position will be the most successful in coping with the challenges and uncertainties brought by the global recession.

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APPLYING GAME-BASED LEARNING TO SENSORY INTEGRATION TRAINING OF AUTISTIC CHILDREN – A CASE STUDY OF WEB.CAM MOTION SENSOR GAME

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Abstract

This study used motion sensor games in game-based learning in sensory integration training for autistic children, and the research subjects were three elementary school children aged from 6 to 10. Web.cam cameras were connected to internet games to engage in motion sensor games. The subjects underwent physiological monitoring, researcher process observation (including sensory integration observation and process observation), interviews (with teachers and students), in order to understand the related research content of the usage process. Research results show that: (1) game-based learning focusing on Web.Cam motion sensor game has produced interest and positive evaluations from teachers and students in the sensory integration for special education; (2) in overall application, it is still necessary to accentuate the need for self-game design; (3) the effect of Web.Cam motion sensor game and game-based learning in sensory integration in special education was easily seen.

Keywords: game-based learning, motion sensor games, sensory integration training

Research Motives and Purposes

According to the census data by the Ministry of Interior in 2011 on the numbers of physical or mentally disabled people, there were 11,211 autistic patients in Taiwan, and autism was in second place (4,118 people) among 6-11 year old children with physical and mental disabilities. This shows that it is a disability category with many people. Since autistic patients have difficulty in interpersonal interaction, some people call them “star children.” At the current time, there is no one method that can fully cure autistic children. Current methods include drugs, educational therapy, art therapy, and associated new supportive methods of treatment. Among them, sensory integration training is a very important method of learning in educational therapy. Yu (2006) proposed that sensory integration training can make up for the shortcomings of brain function, enhance the coordination between senses and perceptions, improve the physical growth and development, and establish the foundation for abilities needed in later social life. This allows autistic patients to exercise and engage in limb training, elicit vestibular sensation, tactile senses, and stimulation to the individual, achieving the purpose of coordinated development of feelings and perceptions.

Furthermore, rapid development in human-machine interfaces has produced many new products such as touchscreens, voice-controlled systems, eyeball tracking systems, etc. Among them, motion sensor games, such as wii and kinect have also been developed, making human-machine interfaces highly popular. Thus, starting in 2002, the concept of game-based learning has constantly been discussed by experts and scholars; how to incorporate game characteristics to improve catering to learner needs has become an important part of this. However, its applications in special education should also be researched. In traditional training methods, even though many game methods are carried out by teachers in individual instruction, learners still cannot actively participate in learning, resulting in shortened learning time, lowered learning intentions, insufficient training obtained by learners, and poor levels of accommodation. In view of this, this study refers to past studies and designs a game-based learning instructional structure, using Web cam motion sensor technology to guide progression. Web cam online motion sensor games are used to carry out digital game-based learning (DGBL) instructional strategies, using entertaining and concrete game media design for the necessary sensory integration training for autistic patients should be a feasible issue worthy of exploration.

The research purposes of this study are1)To explore the influence of game-based learning instructional presentation method on student sensory integration training feedback. 2)To explore the influence of game-based learning instructional presentation method on teacher sensory integration training feedback.

Literature Review

Studies relating to autism and sensory integration

Autism is a developmental obstacle caused by abnormal brain function, which usually manifests before 3 years of age, often accompanied with mental disability, epilepsy, hyperactivity, reclusion, and acting out. Students with autism have three major obstacles in daily life: interpersonal relationship problems, language and expression problems, as well as behavioral problems (Wikipedia, 2012). Ornitz, Ritvo et al. at the UCLA pediatric psychiatry and pediatric neurology, began describing autism as a disorder in neurology, and refer to them as sensory integration disorder (Cheng, 1991). There are currently many studies on the education and treatment of autistic children, such as game treatment, art treatment, drug treatment, behavioral modification technology, CAI computer assisted instruction, sensory integration, and structural instruction (Special Education Knowledge Web, 2012). Since related studies have shown that the action and sensory integration problems of autistic children are summarized in the three factors: (1) difficulty in visual space; (2) difficulty in kinaesthetic sense; (3) difficulty in actions that require multisensory integration. Training of sensory integration uses suitable activity stimulation to elicit ideal behavioral performance. In environments with greater structure, autistic children would also have better learning performance.

Sensory integration is the organization and integration of different feelings transmitted by various nerve systems in the brain steam, allowing the different parts of the central nervous system to work together, so the individual can smoothly interact with the environment and feel a sense of satisfaction. Sensory integration training evaluates the neural needs of children, to guide them in training for suitable responses for stimulation. Training includes providing whole-body exercises that stimulate in vestibular system (gravity and motion), proprioception (muscles and feelings), and the sense of touch. The purpose is not to guide motor capabilities, but rather to improve how the brain processes sensory information and organization, as well as the ways for it to construct sensory data. The correct concept is “neural functions of brain functions.” “Sensory integration” training primarily seeks to enhance or improve the sensory integration ability of autistic children, in turn promote their learning and development. Motor training is most common in sensory integration training, including motor training with many physical action elements, which can give the senses suitable stimulation and promote vitality of the brain’s central nervous system. Sensory integration activity scholar Ayres (1972) pointed out that children’s sensory integration can proceed with vestibular senses, tactile senses, and proprioception, and proposed that changes in sensory input should be combined with motor exercise, use limb movement to train and develop sensory integration ability. Thus, sports games should integrate limb movement into game design, in order to naturally incorporate ways for children to move their bodies and achieve the objective of integrating sensory perception.

Research relating to game-based learning

Exploration of game-based learning can be traced back to well-known kindergarten scholar Friedrich Froebel, who asserted the importance of games and Froebel Gifts (Yang, 2010) for children’s learning. He proposed that games begin with happiness, and end with wisdom. Garris, Ashlers and Driskell (2002) used a digital game-based learning model to explain that when digital games are applied to learning, there is a process of learner input, process, and outcomes.

Research relating to motion sensor games

An exploration of motion sensor games shows that development of new technology has produced various new input tools that have replaced traditional human-machine interface tools (mouse, keyboard), such as wii, wii-fit, and kinect. The basis of related applications is constructed on the module of human-machine interaction. Jeng (2002) proposed human-centered interaction model theory, which divides the states of interactive events into three levels: cognitive space, physical space, and virtual space. Cognitive space originates in personal traits, experiences, and culture, in turn form physical space for interactive operations; in physical space, people use the control interface to control events, and in turn elicit interaction in virtual space; in virtual space, manipulation of events in physical space are used to compute and execute, combining with physical space to present the digital virtual interactive information for execution (Huang et al., 2010). This study uses the WebCam videoconferencing tool as the medium, with its technology similar to that of kinect, but is relative cheaper, matched with Sky game online game to conduct research relating to motion sensor games.

Research Procedures and Implementation

Research Method and Procedures

The research methods for this study are observation research and case study, and the analytical methods include analysis of physiological monitoring and interviews. At the beginning of the study, online Flash game resource http://webcamgames.sky.com/ is used to select games suited to the abilities and needs of subjects. The selection standards focus on four major directions, that the games are (1) competitive: enhance the attention and participation motivation of subjects; (2) extension of major muscle groups: training major muscle groups is effective; (3) has muscle endurance training: can focus on major muscle groups of subjects for repeated training in order to enhance muscle endurance; (4) difficulty should not be too high or too complex: although subjects are high-functioning autistic patients, the limb coordination is still insufficient, thus the training content should not be too fast or too complex. In the beginning of research, students are told that this is a game and they do not have to worry, then their blood pressure and heart beat are measured. This study then engages in testing and demonstration, explaining the connections between the camera, actions, and virtual space; then, the students undergo the experiment. Each time, three rounds of competition are conducted (about 10 minutes), and at the same time the researcher engages in observation and recording, attempting to engage in intervention testing to understand the conditions of concentration; after the game, blood pressure and heart beat are measured again to interview them about their feelings.

Research Subjects

This study is focused on three autistic students in special education classes in Pingtung County. Student A, symptoms are autism accompanied by ADHD, aged 8, height 140 cm, weight 38 kg; Student B, symptoms are autism accompanied by muscular dystrophy, aged 10, height 133 cm, weight 45 kg; Student C, symptoms are autism accompanied by mental disability, aged 8, height 134 cm, weight 35 kg. They have high-functioning learning abilities, and do not also have mental disability. The teachers are two female teachers with master's degrees, who have been working for 6 and 10 years.

Research Tools

Research experimental tool

This study uses Webcam as the experiment tool for motion sensor games, the necessary equipment is personal computer, including screen, mouse, mainframe, keyboard, internet system, one high-sensitivity WebCam, and speakers. Two meters squared of activity space is maintained in front of the equipment, with a total of 4m2 sensory space is used to avoid disturbing the research testing process.

After the related hardware and equipment are installed, the site http://webcamgames.sky.com/ is used to connect to the game to be used by the researcher, the swimming race game, and the difficulty level is set to easy. The interface is shown in Figure 1. The interface of this game is shown in (a), with the pool lane of the subject, and when the subject moves his hand there would be splashes; (b) shows the homepage of the game provider, which includes many types of motion sensor games conducted through the video cameras, such as ball-balancing game and jumping game.

(a) (b)

Figure 1 Motion sensor games interface

Research measurement tool

Mobile electronic blood pressure and heart beat monitor

This includes the mobile electronic blood pressure and heart beat monitor needed in measurement in this study. This mobile electronic blood pressure and heart beat monitor was manufactured by the Microlife company, and is a wristwatch-style electronic blood pressure monitor with the model number BP 3BE0-4. The precision is ±3mmHg.

Semi-structured interview record (for the feedback opinions)

The semi-structured interview record was designed by the researcher according to research needs, divided into the part for the teacher and the part for the student. The teacher portion is divided into three portions, which are background data, usage feedback, and addition of special explanations; considering student abilities, the student portion only has two parts, including usage intention and feelings, as well as special addition of explanations.

Data Analysis

Since there are few samples and there are major differences among the cases, this study uses participant observation to engage in research and data collection. Using the aforementioned data collection from research tools, sound recordings, and image data to organize and analyze the related data. The recording information is used for post-hoc research. This study also refers to Lin's (2007) four steps of data analysis flow in qualitative research, 1) reading and organizing; 2) description; 3) classifying; and 4) interpretation, using these for data analysis. In order to enhance validity, this study uses triangulation and the two classroom teachers (Lin and Hsu) to engage in simultaneous observation and recording for the same student. The researcher also focuses on the three sets of records for the same student to compare and analyze common and consistent opinions.

Results

Measurement of biological changes

This is used to measure the changes in heart beat and blood pressure when the subject undergoes 3 times for about 10 minutes of the Web.Cam motion sensor game, in order to understand whether this game can allow the subject to achieve a certain degree of activity, and to evaluate the level of exercise in this activity. The data analysis is as follows:

Table 1 Biological changes in the subjects before and after the game

Student	Test time	Heart beat (times/minute)	Blood pressure (systolic / diastolic)	Temperature
Student A	Before the game	90	119/77	36.7
	After the game	132(+42)	131(+22)/89(+12)	37.9(+1.2)
Student B	Before the game	83	108/68	35.6
	After the game	114(+31)	111(+3)/70(+2)	37.5(+1.9)
Student C	Before the game	92	112/71	36.4
	After the game	119(+27)	128(+16)/81(+10)	37.8(+1.4)

Table 1 shows that after the three subjects completed 10 minutes of motion sensor games in three instances, they showed in increase in heartbeat, blood pressure, and body temperature, showing that even though motion sensor games only exercise major muscles in the upper limbs, after multiple repetitions, the movement back and forth also caused clear increases in heartbeat of the subjects. It may be because of nervousness over the competition, body temperatures also rose. It is clear that the Web.Cam motion sensor game is effective in enhancing cardiovascular function.

Observation records

In the research process, the researcher makes observation records on the three subjects in terms of limb coordination, concentration focus time, tempo accommodation, game performance, as shown in Table 2.

Table 2 Observation records of subjects

Item / Student	Limb coordination	Race time	Tempo/ accommodation	Game performance
Student A	The whole body would shake from side to side, along with irregular shaking of the hands (at the same time, not alternately). Large range of large muscle movement, but there is a lack of coordination.	1.2m40s 2.3m01s 3.3m12s	1. Initially needs teacher assistance, motivating movement of major muscles, or there would be full-body twitching. 2. Excessive full-body movement, may come from hyperactivity in ADHD. 3. Can listen to the water splashes in the game along with the speed. Movement fastest among the three. 4. Coordination is somewhat fair among vision, hearing, and motion, and would speed up movement when falling behind.	1st 1st 1st
Student B	Limb coordination is best among the three, has most correct and accurate action consciousness. Rotation range is smaller, may be due to insufficient muscle endurance.	1.3m39s 2.4m02s 3.3m32s	1. Rotation range is relatively small and slow. 2. Listen to the water splash sounds in the game to adjust speed. 3. Insufficient muscle flexibility, rotation speed needs improvement. 4. Increase rotation when falling behind.	3rd 3rd 2nd
Student C	limb coordination is fair, unclear action consciousness, but has the ability to imitate, but the actions would sometimes change. Accurate rotation movement, has the most correct posture of the three. Rotation speed is still slower.	1.3m05s 2.2m42s 3.3m35s	1. Initially, needs teacher assistance to trigger major muscle rotation. 2. After teacher demonstration, can complete the action. 3. There is insufficient sensitivity to visual and audio stimulation, and the teacher has to stand-by to tell student to speed up.	2nd 1st 3rd

In the motion sensor game process, the subject can adjust the speed of rotating limbs through seeing whether he is ahead or behind, and can use the splashing sounds to adjust the rotation speed. Generally, in the early times of limb coordination, teachers need to carry out more demonstrations, so they can test-play, then carry out subsequent testing.

The sensory integration observation records of subjects are shown in Table 3. The determination refers to Huang et al.'s (2010) chart on poor proprioceptive sensation.

Table 3 Analysis of sensory integration observation of subject

Item / Subject	Initial difficulties in sensory integration	Improvement objective	Exhibition of sensory integration improvement or actions
Student A	Show many actions that provide oneself with major amounts of stimulation (poor proprioceptive sensation-body concept).	Lower excessive feedback for physical stimulation. Increase the precision of	Action was stopped in two instances, and rotation began after re-adjustment. Rotation range slightly decreased the

	Insufficient action precision (poor proprioceptive sensation -action planning ability).	integrating sound, sight, and, proprioceptive sensation.	distance between hands.
Student B	Poor muscle endurance (poor proprioceptive sensation -body concept). Slow tempo of action (poor proprioceptive sensation -action planning ability).	Strengthen muscle endurance Assist in improving action range and frequency.	Arm raised by about 2cm (visual estimation). Improved action range. Still easily tired
Student C	Inability to flexibly extend (poor proprioceptive sensation). Frequent stubborn unconformity to teacher decisions (poor proprioceptive sensation -action planning ability).	Assist in physical flexibility. Guide him in becoming more agreeable.	Likes motion sensor games, conforms to teacher opinions, relatively higher degree of agreement. Still insufficient physical extension flexibility, but acted precisely about twice.

Teacher and user feedback

Both classroom teachers and students participate at testing, the researcher interviews the subjects and their teachers. Since the students are not fully apt in expression, they express their thoughts through nodding, shaking their heads, or facial expressions. The interview records are shown in Table 4.

Table 4 Feedback interview on usage experiences for teachers and students

Identity	Feedback opinion	Note
Teacher Y	The class can deal with related hardware facilities. Students would certainly like the gaming method. It is hoped that training would still conform to functions. Teachers can use this game to understand student limb coordination. Generally speaking this is a quite good tool.	If the game can provide for teacher designs, it would be better.
Teacher Z	The equipment is cheap and easy to obtain. Can use this for physical training. Students like to play this way. Can see this as a positive reinforcement, and can be used for physical training. This is a game-assisted instruction that is worthy of promotion.	Hoping to include games involving balance and coordination, which can add full-body games

Table 4 Feedback interview on usage experiences for teachers and students(continue)

Identity	Feedback opinion	Note
Student A	Student expressed preference for this game. Student hopes to play a few more times. Students expressed that this was more fun than previous training. Student expressed having sore arms.	The student was eager to speak, and did not focus his attention. Even though he did not speak full sentences, the key vocabulary is still clear.
Student B	Student liked this game. Playing like this every day would be good. The game is not difficult Hands felt very sore. This is more fun than rehabilitation, would want to keep playing.	Student spoke words clearly, but sometimes the meaning was not clear.
Student C	Liked this game. Very sore hands (nod). Hoped to play every day (nod).	Student can mostly nod or shake head.

The results show that students and teachers expressed that they liked this type of game. Both teachers and students believe that it is a game and not a type of instruction, but all subjects expressed soreness in arm muscles, which shows that the muscles are being trained. This shows that in the game process, subjects have significant physical training. In interviews, teachers also stated that there is low demand for hardware and equipment for this type of game and can be widely used. However, if corresponding software can be developed it would be easier and better. On the whole, the combination of vision, hearing, and physical movement in sensory integration is effectives and receives affirmation.

Conclusion and Suggestion

In the overall research process, sensory integration training, training of student sensory connections, including vision, hearing, motor senses, and overall coordination of limbs all show the effects of change in the observation process. Teachers and students both responded about the efficacy. In terms of physical ability training, including changes in heartbeat, blood pressure, and body temperature, as well as upper arm soreness of subjects all show that it had an effect on extending muscles, and an effect was found for major muscle training and muscle endurance. The effect conforms to the results found by Huang et al. (2009) in multimedia motion sensor game applications. Chiang (2012) applied motion sensor games in elderly populations (similar to special education students), and also found an increase in hand-eye coordination. On the whole, teachers and students who underwent game-based learning carried out using Web.Cam motion sensor game for sensory integration in special education found it interesting and gave it positive evaluation.

However, since the special education field stresses catering to “individualized” needs of learners, and the subjects of special education have different types, degrees, and forms of disability, and there is a high degree of heterogeneity. If it is possible to allow teachers to have easier design media, it would allow the instructors to match “IEP” according to learner needs and make designs, incorporating the applications in life experiences; this would make the functions more effective and easily accepted. Simply put, overall application still accentuates the need for self-design of games, and this is a direction for future research.

The usage process also shows the effects of game-based learning. None of the subjects thought that they were undergoing physical training or rehabilitation courses; all believed they were playing, and did not reject the activity. The effects of lengthened learning (training) time and increased the time spent in concentration. This shows that GBL has a significant effect on learner motivation in instruction (Papastergiou, 2009; Rosas et al., 2003;Virvou, Katsionis, &Manos, 2005). Web.Cam motion sensor game can connect their physical actions to the virtual world, blurring the boundaries between the physical and the virtual, which can lower their need for abstract thinking ability, and in turn increase their level of participation. Studies relating to the enhancement of learning motivation also show that different degrees of learning motivation would elicit learning effects (Mizelle, Hart, & Carr,1993; Small & Gluck,1994). Chang (2008) found significant effects of applying motion sensor sports games in sensory integration training for autistic children. Generally speaking, the application effects of Web.Cam motion sensor game and game-based learning in sensory integration in special education is self-evident.

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APPLYING THE TECHNOLOGY ACCEPTANCE MODEL TO ONLINE LEARNING IN THE EGYPTIAN UNIVERSITIES

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Abstract

The purpose of the research is to identify the determinants of students' acceptance of online learning and to investigate how these determinants can shape students' intention to use online learning. A conceptual framework based on the Technology Acceptance Model (TAM) was modified. A questionnaire was developed and used to solicit information from the 153 undergraduate students who used online learning in DBMU. The results reveal that students' perception of ease of use, usefulness, attitudes towards online learning, and the social influence of students' referent group were identified as significant determinants of students' intention to practice online learning. The possibility of using the social influence of students' referent group, students' perceived ease of use, students' perceived usefulness and their attitudes towards online learning to predict their behavioral intention to use online learning was also confirmed.

Keywords: Online Learning, Technology Acceptance Model

Introduction

Rapid technological developments have increased society's dependence on information technology. One of technology variants is the online learning technologies, which is defined as "the use of the Internet to access learning materials; to interact with the content, instructor, and other learners; and to obtain support during the learning process, in order to acquire knowledge, to construct personal meaning, and to grow from the learning experience (Ally, 2004, P. 5)". Higher education institutions have increasingly embraced online learning world wide in order to realize different educational benefits such as: facilitating information exchange and collaborative learning, improving the quality of teaching and learning, improving access to education and training, realizing flexibility for time and place, responding to labor market conditions and to innovation technology itself, preparation for lifelong and self-paced learning while at the same time reducing costs and improving the overall cost-effectiveness of educational services (Keller & Cernerud, 2002; Liu, Liao & Chung Yuan, 2005; Shen, Laffey, Lin & Huang, 2006; Saadé & Kira, 2009; park, 2009). However, implementing a technology that is not willingly accepted and used by users exhaust resources and wastes time and money (Cowen, 2009). The user acceptance of a new information system, such as online learning, is considered the essential factor that determines the success or failure of this system (Davis, 1993). Hence, it is crucial for any university to know, before the implementation of online learning, if the shift to online learning technologies is what the students want and accept (Jung, Loria, Mostaghel & Saha, 2008; Yee, Luan, Ayub & Mahmud, 2009).

Due to the unique characteristics of online learning, Mansoura University and its branch in Damitta, as many Egyptian universities, continue to invest large amounts of financial resources and exert intensive efforts to implement online learning. Although these efforts resulted in quantitative growth of e-courses that become online available, the students are reluctant to practice online learning (ICTP, 2010). Therefore, the purpose of the research is to identify the determinants of students' acceptance of online learning and to investigate how these determinants can shape the students' intention to use online learning in DBMU. The research seeks to answer the following questions:

What are the determinants of students' acceptance to use online learning?
To what extent do these determinants exist among students of DBMU?
What are the relationships between these determinants?

What are the underlying influences of these determinants on students' intention to use online learning?

Significance

This research adds to the existing literature through identifying factors affecting students' behavioral intention to learn online, and through introducing a conceptual framework that examines the influence of each factor on students' behavioral intention to use online learning platform. Examining the relationships between these variables will provide those responsible for the management and development of online learning programs with important information about how students perceive and react to online learning so that they can enhance the effectiveness of online learning and create mechanisms for attracting students to adopt it.

Literature review

Determinants of students' acceptance of online learning

Research on e-learning involves several studies that investigated the influence of some students' attributes on their acceptance and usage of online technology. Students' preference for an online delivery system could be attributed to their perceived ease of use which would be evident from their competence in using internet and electronic communication, alongside their ability to engage in autonomous learning. The individuals' perception of the usefulness of online learning is an additional attribute that may increase their academic success in an online environment (Proffitt, 2008, p.18). Furthermore, the social influence of students' referent groups, student's attitude towards online learning are additional factors related to individuals' attributes and may influence their intention to learn online. (Bertea, 2009; Shen, Laffey, Lin & Huang, 2006) The users' actual usage of the technology is strongly influenced by their behavioral intention, which in turn is influenced by their prior experience with this technology (Sumak, Hericko, Pusnik & Polancic, 2011). The aforementioned attributes (students' perceptions of usefulness and ease of use, attitudes and social influence factors) could shape the determinants of students' acceptance and intention to use online learning. These determinants are relevant to the technology acceptance model (TAM).

TAM

TAM has gained considerable support in understanding and managing the process of new technology adoption (Chen, Chen, Lin & Yeh, 2007; Dillon & Morris, 1996; Masrom, 2007; Park, 2009). TAM was introduced by Davis (1989) to be used in predicting the user acceptance of any information technology system and to diagnose design problems before the users actually use this system through two factors: perceived usefulness (PU) and perceived ease of use (PEU) (Dillon & Morris, 1996; Chen, Chen, Lin & Yeh, 2007). According to Lee, Cho, Gay, Davidson and Ingraffea (2003), perceived usefulness is defined as "the degree to which a person believes that use of technology will produce better outcomes". This means if students perceive that the online learning system can help improve their performance, they are more likely to use online learning in their learning process (Yee, Luan, Ayub & Mahmud, 2009). PEU explains the user's perception of the amount of effort required to utilize the system or the extent to which a user believes that using a particular technology will be effortless (Alrafi, 2009). Within the current research, PEU is a student's perception about the degree of effort needed to learn online.

The core idea of TAM is that user's acceptance of technology is determined by his/her behavioral intention, which in turn is determined by his/her PU and PEU (Wu, 2009). Behavioral intention (BI) is used to express "the extent to which a student formulates conscious plans to use or not to use online learning related activities (Ramayah & Ignatius, 2005; Clement & Bush, 2011, and Li & Huang, 2009). BI is strongly related to the person's actual behavior; in other words: "if a person intends to do a behavior, then it is likely to be done". Also, TAM suggests that users formulate a positive attitude toward technology when they perceive it to be useful and easy to use (Lee, Cho, Gay, Davidson & Ingraffea, 2003). Based on TAM, higher levels of PU and PEU predict favourable attitudes which, in turn, predict intentions to use (Lucas, 1997). One's actual use of a technology system is influenced directly or indirectly by the user's behavioral intentions, attitude, perceived usefulness of the system, and perceived ease to use the system (Park, 2009, p.151).

TAM was updated many times to empirically verify particular assumptions. For instance, Venkatesh and Davis (1996) dropped the attitude construct from the original model, as they supposed it does not fully mediate the relationship between both perception constructs (i.e. perceived ease of use and perceived usefulness) and behavioral intent (Kim, ,Chun, , Song (2009). Similarly, Masrom (2007) dropped the actual use from the original model. On the other hand, Lee, Cheung and Chen (2005) included perceived enjoyment as an intrinsic motivator into TAM in order to examine the impact of perceived enjoyment on both students’ attitude and intention to use internet-based learning. However, only few researchers have tried to account for the influence of different referent groups on individuals' behavior (i.e. Park, 2009; Shen, Laffey, Lin & Huang, 2006).

Social influence and research framework

Shen, Laffey, Lin and Huang (2006) highlighted the social influence on students' attitudes and on their actual behavior within online learning environment. According to Kripanont (2007, p. 87), social influence (SI) is defined as "the degree to which an individual perceives that other important persons believe he/she should use the system".

The student's referent group plays an essential role in shaping his/her behavior. A referent group is defined as "a social group that is important to an individual and that, consequently, influences his/ her beliefs and behaviors (Mackie & Queller, 2000, p. 138)". The referent group of online students includes instructors, peers and/or other supporters (e.g., teaching assistants, mentors, and family members) (Shen, Laffey, Lin & Huang, 2006). The current research update TAM in order to include and examine the possible social influence of the students' referent group (namely: instructors/ mentors, peers, and family members) and other related constructs such as PU, PEU, ATT towards online learning on students' behavioral intention to use online learning. Figure 1 depicts the conceptual model of the current study.

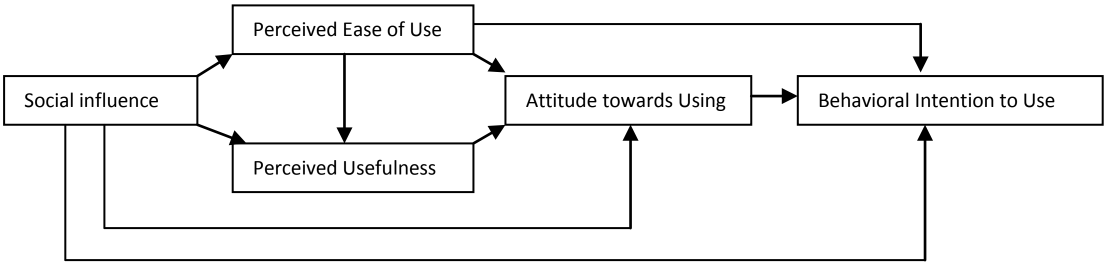

Figure 1 Conceptual model of the research

This conceptual model is a simple flow chart illustrating the hypothesized relationships between research constructs that constitute the key determinants of students' intention to practice online learning. These determinants are: social influence of referent groups, PU, PEU and attitudes towards online learning ATT.

Hypotheses

The results of previous studies, alongside the literature review, were employed to develop the following hypotheses:

H1: The social influence of the students' referent groups has positive relationships with students' PU, PEU, ATT, and their BI to learn online.

H2: The social influence of the students' referent groups, PE, PU and ATT are positive predictors for the students' intention to learn online.

H3: The social influence of students' referent groups is the strongest predictor for students' intention to learn online.

H4: students' PU and PEU are positive predictors for their attitudes towards online learning

H5: students' PEU positively influences their PU of online learning.

Method

Instrument

For the purpose of this study, a structured questionnaire was developed based on similar instruments as cited in literature (i.e. Kripanont, 2007; Jung, Loria, Mostaghel & Saha, 2008; Masrom, 2007). The final version of the questionnaire included 42 items to measure the five constructs of the research model; SI (five items), PEU (twelve items), PU (eight items), ATT towards online learning (eleven items), and BI to use online learning (six items). All items required seven-point Likert-style responses ranging from 1= "strongly disagree" to 7= "strongly agree".

Validity and Reliability

Content validity was established based on the opinion of two experts in the field of e-learning, besides piloting the questionnaire on a sample of 17 third year students of Damietta Faculty of Education. Feedback led to changing some items of the questionnaire, in addition to eliminating three items. The reliability of the questionnaire was measured for each construct using Cronbach's alphas. Reliability level was found to be above the recommended minimum standard of 0.60 for all five measures. The calculated Cronbach a were: PEU=0.69, PU=0.73, ATT= 0.61, BI= 0.73, SI=0.65.

Context and sampling

A central e-learning unit was established in DBMU in September 2009 in order to organize the process of managing and producing e-courses and uploading them on the web site of the university based on Moodle as a learning management system. By September 2009, there were 3 e-courses which became available online for the students of DBMU. One of these three courses is the "Instructional Technology 2" that targeted the students who were registered in the third year in Damietta faculty of Education within the academic year 2010/2011. As 640 students were found to be registered in the registration list, a purposive sampling method was used in the sample selection to ensure that only students who have previous experience (even short) with online learning in June 2010 participate in the study. Only 153 students out of 640 (24%) were selected because they used online learning in studying the e-course "Instructional Technology". There were 135 females (88.2%) and the mean age of all participants was 21.9 years.

Procedures

In June 2010, after the students finished their final exams, the survey was administered to the students of the research sample. The students were asked to respond to the questionnaire. 141 participants returned the instrument with a return rate of 92.16%, of which 20 were excluded as they were incomplete. The responses of the students on each item were coded from 1= "strongly disagree" to 7= "strongly agree". The negative items were reversely coded for the purpose of statistical analysis. The scores from the items on each construct were calculated so that each participant got a score on each construct.

Results and discussion

PU, PEU, BI and ATT towards online learning

Students' PU, PEU, ATT towards online learning, and their BI to use online learning, were identified as the determinants of individuals' acceptance and usage of online learning. Descriptive statistics were conducted to identify the status of these determinants between research participants. Table 1 summarizes the frequency of the participants' scores based on their responses on the four constructs of the questionnaire.

Table 1 descriptive statistics of participants' scores on the constructs of ATT, PU, PEU, and BI

	means	scores	Frequency	percentage
ATT	45.5	20-46	57	52.5%
		47-68	63	47.5%
PU	38.22	8-39	66	55%
		40-56	54	45%
PEU	40.15	17-41	62	51.6%
		42-65	58	48.4%
BI	22.19	6-23	72	60%
		24-40	48	40%

As depicted in Table 1, students' scores on the items that measure their attitudes towards online learning range from 20 to 68 with mean of 45.5. Students' who got scores from 20-46 were classified as having "negative" ATT whereas students who got scores more than 46 were classified as having "positive" ATT towards online learning. As the scores of 52.5% of participants ranged between20-46, it could be concluded that students of DBMU tend to have negative attitudes towards using online learning.

In respect to students' scores on the items measuring their PU, table 1 shows that students scores range from 8-56, with mean of 38.22. The range of students' scores from 8-39 was considered to reflect low level of students' PU, whereas the range of students' scores from 40-56 was considered to reflect their perception of usefulness. As the scores of 55% of the sample ranged from 8-39, therefore the students of DBMU could not be conceived as perceiving the usefulness of online learning.

Concerning the construct of PEU, students' scores range from 17-65, with mean of 40.15. Scores from 17-41 were classified as "not perceiving ease of use", however scores from 42-65 were classified as "perceiving" the ease of using online learning. Based on the results in table 1, 51.6% of research participants do not perceive the easiness of online learning which leads to the conclusion that the students of DBMU do not perceive online learning as easy in use.

Concerning participants' scores on the construct of students' BI, the scores range from 6-40 with mean of 22.19. Students who got scores from 6-23 were considered as not having BI to use online learning. However, students who got scores from 24-40 were considered as having intention to use online learning. As shown in table 1, 60% of the participants do not have BI to use online learning. Therefore the students of DBMU tend to be reluctant in using online learning.

PEU among students of DBMU may diminish their PU and their positive ATT towards using online learning, and in turn decline their intention to practice online learning. The following are the correlations between these constructs and the SI of students' referent group.

Relationships between different determinants of students' intention to learn online

Pearson's correlation was conducted to find out the relationships between the participants' scores on the measures of SI of students' referent groups, PU, PEU, ATT, and BI. Table 2 illustrates the correlations between SI, ATT, PU, PEU and BI.

Table 2 Correlations between SI, ATT, PU, PEU and BI

Variable	SI	ATT	PU	PEU	BI
SI	--	0.452**	0.369**	0.410**	0.551**
ATT	--	--	0.616**	0.502**	0.663**
PU	--	--	--	0.581**	0.625**
PEU	--	--	--	--	0.594**
BI	--	--	--	--	--
Mean	17.483	45.577	38.225	40.156	22.192
Std. deviation	6.872	9.739	10.456	11.634	8.805

***Note.* ** *p* < .01. n= 120**

Correlations presented in table 2 reveal positive and significant relationships between all research variables; SI and ATT (r=0.452, P<0.01), SI and PU (r=0.369, P<0.01), SI and PEU (r=0.410, P<0.01), SI and BI (r=0.551, P<0.01), PU and PEU (r=0.581, P<0.01), PU and BI (r=0.625, P<0.01), (r=0.452, P<0.01), ATT and PU (r=0.616, P<0.01), ATT and PEU (r=0.502, P<0.01), ATT and BI (r=0.663, P<0.01),. Therefore the first hypothesis, "Social influence of students' referent group has positive relationships with students' PU, PEU, ATT, and their BI to learn online", was supported. However, a high value of correlation was found between ATT and BI (r=0.66, P<0.01), which means the higher positive attitudes students have, the more behavioral intention to learn online they get. Similar conclusions could be inferred from the correlations between PU and BI (r=0.63, P<0.01) and between ATT and PU(r=0.62, P<0.01).

SI of students' referent group, PEU, PU, and ATT on students' BI to use online learning

Standard multiple regression analysis was conducted to explore the SI of students' referent groups, PE, PU, and ATT on students' BI to learn online. The dependent variable was the BI, whereas the independent variables were SI of students' referent groups, PEU, PU, and ATT. Table 3 depicts the results of multiple regressions for the influence of SI, PEU, PU, and ATT on students' BI.

Table 3 results of multiple regression analysis for the influence of SI, PE, PU, and ATT on students' BI

	R square	Adjusted R square	Standardized coefficient β	F	Sig.	Collinearity statistics Tolerance
SI	0.603	0.589	0.242	43.619	0.001	0.750
PEU			0.210		0.007	0.603
PU			0.221		0.008	0.521
ATT			0.312		0.000	0.548

As indicated in table 3, the social factors have significant influence on students' BI [F(4,115)= 43.619, β=0.242, p < 0.005]. The value of R square is 0.603 which indicates that the social influence of students' referent groups explain 60.3% (it's a quiet respectable result) of the variance in students' BI. Therefore, the SI of students' referent groups is a positive predictor to students' intention to learn online.

The result confirms the assumptions of Park (2009), and Shen, Laffey, Lin and Huang (2006) who underlined the SI on students' BI and on their actual behavior within online learning environment as well. This result, also, validate the research model which adapted Davis' original version of TAM to incorporate the influence of social factors to be employed in the area of online learning.

The influence of the social factors on BI could be attributed to the different effects for each category of students' referent groups and their contribution to students' BI. For example: The higher the online instructors actualize their roles in attracting students to learn online, deploying culture of online learning, building learning community, helping students work in groups, and keeping online discussions to realize productive interaction, the more influence on students' behavior they have. Likewise, students' intentional behavior to use online learning reflects, in several cases, their families' level of support to this kind of learning; families with higher income can afford to buy hardware, software, and can afford the cost of internet access, and therefore they are likely to be supportive for online learning than do families with lower income (Ibrahim, Silong & Samah, 2002).

Similar to the results of Chen, Chen, Lin, and Yeh (2007), the results in table 3 show positive influence of students' PEU on their BI [$F(4,115)= 43.619$, $\beta=0.210$, $p < 0.05$]. Based on the value of R square, PEU explains 60.3% of the variance in students' BI.

As for students' PU, the results in table 3 depict positive influence of PU on students' BI to learn online [$F(4,115)= 43.619$, $\beta=0.221$, $p < 0.05$]. The value of R square is 0.603 which indicates that PU explains 60.3% of the variance in students' BI. This result is concurrent with the findings of Bertrand and Bouchard (2008). Consequently, in accordance with the results of Li and Huang (2009), the current research suggests the possibility of using both PU and PEU to predict students' BI to use online learning.

Also, the results in table 3 reveal that students' ATT towards online learning have positive influence on their BI to learn online [$F(4,115)= 43.619$, $\beta=0.321$, $p < 0.0001$]. The value of R square (0.603) explains 60.3% of variance in students' BI. This result is consistent with the outcomes of Kim, Chun and Song (2009). So, the second hypothesis, "Social influence of students' referent groups, PE, PU, and ATT are positive predictors to students' intention to learn online", was supported.

Based on the values of standardized coefficient β in table 3, each of SI, PEU, PU, and ATT has significant contribution to students' BI. However, students' ATT makes the strongest contribution to students' BI ($\beta=.312$). Therefore, the third hypothesis, "Social influence of students' referent groups is the largest predictor to students' intention to learn online", was rejected.

The assumptions of Ramayah and Ignatius (2005), and Venkatesh and Davis (2000) who dropped the attitudes construct from TAM would be accepted in other contexts rather than online learning.

The influence of Students' PU and PEU on their ATT

To verify the fourth hypothesis, "students' PU and PEU are positive predictors to their ATT towards online learning", standard multiple regression analysis was conducted. The dependent variable was students' ATT towards online learning, while the independent variables were students' PEU and PU. Table 4 illustrates the results of multiple regressions for the influence of PEU and PU on students' ATT towards online learning.

Table 4 results of multiple regression analysis for the influence of students' PEU and PU on their ATT

	R square	Adjusted R square	Standardized coefficient β	F	Sig.	Collinearity statistics Tolerance
PEU	0.411	0.401	0.217	40.785	0.014	0.662
PU			0.490		0.000	0.662

As depicted in table 4, the value of R square is 0.411 which indicates that students' PEU and PU explain 41.1% (it's a quiet respectable result) of the variance in students' ATT. Therefore, both PEU and PU significantly influence students' ATT towards online leaning [$F(2,117)= 40.785$, $p < 0.05$]. So the fourth hypothesis was confirmed. These results emphasized the findings of Masrom (2007), and therefore students' PU and PEU could be used as a predictor for their attitudes towards online learning. However, based on the values of standardized coefficient β in table 4, PU has a stronger effect on students' ATT towards online learning than PEU did. Therefore, students' PU could be used as a strong predictor for their attitudes.

The influence of students' PEU on their PU

To investigate the influence of students' PEU on their PU of online learning standard multiple regression analysis was also conducted. The dependent variable was PU, whereas the independent variable was PEU. Table 5 demonstrates the results of multiple regressions for the influence of students' PEU on their PU.

Table 5 Multiple regression results for the influence of students' PEU on their PU

	R square	Adjusted R square	Standardized coefficient β	F	Sig.	Collinearity statistics Tolerance
PEU	0.338	0.332	0.581	60.209	0.000	1.000

As depicted in table 5, the value of R square is 0.338 which indicates that students' PEU explain 33.8% (it's a quiet respectable result) of the variance in students' PU. PEU has a significant influence on PU [$F(1,118)= 60.209$, $p < 0.0001$]. So, the fifth hypothesis, "Students' PEU is positively influences their PU of online learning", was supported.

Similar to the findings of Masrom (2007), students' PEU was found to influence positively their PU. Consistent with Ramayah, Suki and Ibrahim (2005), the possible explanation to such influence is that the more the student perceives the easiness of online learning, the more he/she perceives its usefulness.

Conclusion

The research was conducted to identify the determinants of students' intention to use online learning, to explore the availability of these determinants among students of DBMU, and to investigate relationships and influences of these determinants on students' intention to practice online learning. Based on literature review, SI of students' referent group, PU, PEU, and ATT towards online learning are the variables that were identified as key determinants of students' BI to learn online.

Based on the data that was collected from the research sample, the extent to which these determinants are available among students of DBMU was explored. It was found that students of DBMU tend to have negative attitudes towards using online learning, do not perceive online learning as easy to be used, do not perceive the usefulness of online learning, and they intend not to use online learning.

The reluctance of the students of DBMU to practice online learning could be attributed to insufficient skills that enable them to learn online, and the insufficient support they perceive from instructors, peers and families to adopt this innovation. These reasons may diminish students' perception of ease of use and their positive attitudes towards using online learning, and in turn decline their intention to practice online learning.

Based on the literature review, the research model was developed and employed to explore relationships between these determinants and their influence on students' behavioral intentions to use online learning. Consistent with Masrom (2007), Park (2009), and Ramayah, Suki, and Ibrahim, (2005) the research model excluded the individual actual usage from TAM in addition to replacing the external variables by social influence. The research results illustrate positive and significant relationships between students' behavioral intention to use online learning and each of social influence of students' referent group, students' attitudes towards online learning, and students' perception of both ease of use and usefulness of online learning. Also, the results confirm that each of SI and students' PU, PEU, and their ATT towards online learning influences students' behavioral intention to use online learning. Additionally, SI of students' referent group is found to be a significant predictor for both students' attitudes and their intention to use online learning.

Consistent with the results of Chen, Chen, Lin and Yeh (2007), PU and PEU were found to be significant predictors for students' behavioral intention to use online learning. Likewise, in agreement with the results of Baker-Eveleth and Stone (2008), students' PEU was found to be a positive predictor for both students' ATT and BI to use online learning. Moreover, the results are in accordance with Masrom (2007) in regard to the significant influence of PEU on the PU of the system. On the other hand, the students' ATT towards online learning was found to be a strong predictor for their behavioral intention to use online learning. These findings strongly support the appropriateness of using the research model to understand students' acceptance of online learning in DBMU based their perspectives.

Implications for Practice

The research model provides a useful framework for university administration needing to develop the infrastructure of online learning and assess students' readability for online learning. University administration and online should take these factors into consideration when planning to and/or assessing practice of online learning. The results of the research illustrate the importance of social factors related to the students' adoption of online learning. Therefore, deploying the culture of online learning among students community, assessing and developing students' readability to online learning, establishing computer labs equipped with sufficient facilities for online learning and making them available for all students of the university 24 hours /day, supplying students' houses with internet access for free of charge through the server of DBMU, planning and conducting events to deploy culture of online learning among students and their families can facilitate familiarity with online learning and encourage adoption of online learning. Furthermore, organizing training courses to promote students' perception of ease and usefulness of online learning could also enhance their positive attitudes and consequently their behavioral intention to practice online learning.

Limitations

Even though this research revealed meaningful findings for the learner related determinants affecting their intention to use online learning, several possible limitations should be mentioned: First, the purposive technique to select the research sample from only a small sector of students of DBMU, Second, the results of the research were based on data that was collected form students who have basic knowledge and insufficient experience of learning online. Theses limitations may impede the generalization of the findings to all population of DBMU.

Further research

It is suggested to replicate the current research using a larger sample, with longer experience to learn online. Additional research to study the influence of each category of students' referent group on their intention to learn online is needed. More research to study determinants related both design issues of online courses and students' behavioral intention to learn online are needed.

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APPLY DISCOVERY TEACHING MODEL TO INSTRUCT ENGINEERING DRAWING COURSE: SKETCH A REGULAR PENTAGON

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Abstract

The drawing method of a regular polygon has been explained in a variety of different methods in the relevant literatures. Most of the students against the plotting described procedure to complete the drawing step by step, but often without knowing the principle. It's important to develop a reasonable drawing scheme with simple geometry applied in the engineering drawing technology. A new model for regular pentagon (regular polygon, n=5) drawing will be developed with Discovery teaching method (as experimental group). The performance is better than Demonstrating method (as reference group) that students contrast the drawing procedure to finish a regular pentagon step by step. We chose the students of vocational high school provided with engineering background as a sample space. The pass probability for the experimental group with Discovery teaching method is p=.692 which is higher than the reference group p=.544. The golden rectangle is also applied to map the relationship of regular pentagon and developed an interest for engineering drawing.

Keywords: Discovery teaching method, engineering drawing, golden rectangle, regular pentagon, regular polygon

Introduction

Someone sketched a regular polygon as the mathematics research games. Some of them were maybe difficult enough for a vocational high school student, even university. The geometric appearance is a significant topic of engineering drawing course which teaches students to draw some regular polygons.

Nomenclature

A to *N*	apexes of regular pentagon
L	side length of regular pentagon
*L*1 to *L*4	relative length in a regular pentagon
N	sample space
R	radius of a circumscribed circle
a	relative length in a regular pentagon
b	relative length in a regular pentagon
n	number of sides for the regular polygon, event number
r	radius of an inscribed circle
Theta	inner angle of polygon

Students are always taught to follow the drawing procedure and finish a regular polygon without knowing the principle in Demonstrating method. We expand a new teaching model abided by Discovery teaching method which was been developed by Jerome S. Bruner. We will also investigate that the relationship of golden

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ratio is matched in a regular pentagon. Therefore, it is based on the geometric drawing skill to employ a no-scale ruler and compass only to sketch a regular pentagon. The golden rectangle can be involved into a regular pentagon.

Roark (1954) had derived the relation between the side length, radius of an inscribed circle and radius of a circumscribed circle. Richmond (1893) had drawn an accurate regular pentagon but no calculating formula included. The drawing procedure was developed to sketch a correct regular pentagon (Madachy, 1979 and Pappas, 1989a). Pappas (1989b) also found the golden rectangle principle. Livio (2002) had sketched a logarithmic spiral from the golden rectangle and called it as a golden spiral. They contributed to the sketching method of regular pentagon and golden rectangle, but the syllogism was seldom introduced in the literatures. There was not any study that used Discovery teaching method to teach students how to finish a regular pentagon drawing. We will derive a simple teaching model to apply in the engineering drawing technology field in this research.

The Study for Drawing a Regular Pentagon

Let's see Demonstrating method for drawing a regular pentagon. There are three models to sketch a regular pentagon. The length of one side, radius of a circumscribed circle or radius of an inscribed circle is given that makes the specific regular pentagon separately.

Model 1: Draw a Specific Regular Pentagon from the Given Length of One Side

The 1st case of drawing a specific regular pentagon is from the given length of one side. Sketch it in Figure 1 and list the procedure below.

Lengthen $\overline{AB}$ and make a vertical line $\overline{BD}$ which is perpendicular to $\overline{AB}$, then $\overline{BD} = \overline{AB}$.

Find the mid-point *C* of $\overline{AB}$, then put the centre of circle at point *C* and use the length of $\overline{CD}$ as a radius to make an arc which intersects line AB at point *E*.

Set point *A* as the centre of circle and make an arc with a radius of $\overline{AE}$ which intersects arc AD at point *F*. The arc intersects the perpendicular divided line of AB at point *G*.

Use the length of GF as the radius, then set point *G* and *A* as the centre of circle to draw two arcs which intersects each other at point *H*.

Connect five vertexes and finish the drawing of regular pentagon *ABFGH*.

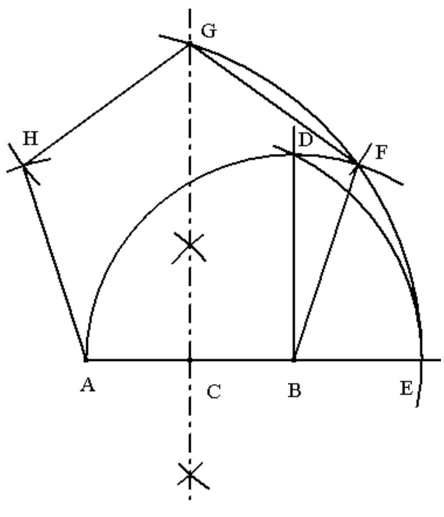

Fig. 1. Specific regular pentagon from the given length of one side

Model 2: Draw a Specific Regular Pentagon from the Given Radius of a Circumscribed Circle

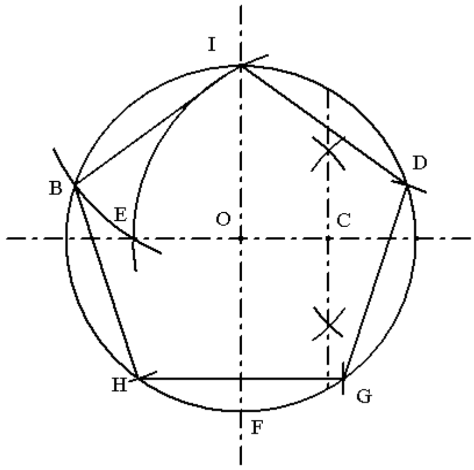

Fig. 2. Specific regular pentagon from the given circumscribed circle

The 2nd case of drawing a specific regular pentagon is from the given radius of a circumscribed circle. Now, sketch it in Figure 2 and illustrate the steps below.
Get two diameters which meet at right angles and make a perpendicular divided line of radius to get the mid-point *C*.
Set point *C* as the centre of circle and make an arc with a radius of $\overline{CI}$ which intersects the diameter at point *E* (where point *I* is one the quarter position).
Set point *I* as the centre of circle and make an arc with a radius of $\overline{IE}$ which intersects circle at point *B*. Therefore, we can get the length of one side of regular pentagon as $\overline{IB}$.
Finally, use the same length of $\overline{IB}$ to get five apexes in order and finish the regular pentagon *IBHGD*.

Model 3: Draw an Approximate Regular Pentagon from the Given Radius of an Inscribed Circle

The 3rd case of drawing a specific regular pentagon by the given radius of an inscribed circle is not found in the literatures. The efficiency method for dividing an angle to five parts has not been expanded. So, sketch an approximate but not a precious regular pentagon in Figure 3 and list the steps below.
Use a pin compass (a small wheel inside can be used to adjust tiny distance) and separate to five parts (4 divided points, S1~S4) for the right angle.
Get two parts of divided angle as degree 36 and intersects the tangent line which passes the quarter position of Q4 at point *A* and *B*.
It's based on $\overline{AB}$ as the length of one side to sketch the other sides in order. We can get the approximated regular pentagon *ABCDE*.

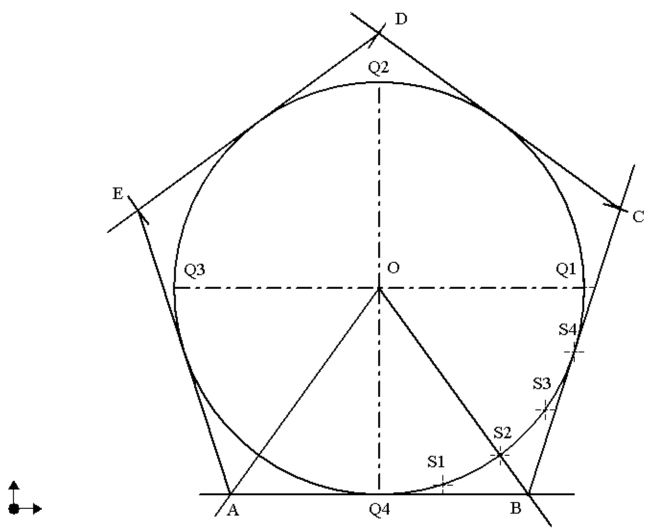

Fig. 3. Approximate regular pentagon from the given inscribed circle

Use Discovery Teaching Method to Guide Students Sketching a Regular Pentagon

We use Discovery teaching method to guide students drawing a regular pentagon and solving the teaching problem without knowing the geometry of regular polygon. They are also derived three models of sketching a regular pentagon like Demonstrating method. However, we develop the models that the length of one side, radius of a circumscribed circle or radius of an inscribed circle is given respectively. The teaching scheme will be focused on the derivation to guide students and make the right graph.

Model 1: Draw a Specific Regular Pentagon from the Given Length of One Side

Because each interior angle of a regular pentagon is 108^o, we start it from the trigonometric function of $\cos 18^o$ and $\sin 18^o$ which is derived by 5 times angle formula of cosine function.
Refer to Figure 1 and express the length of diagonal line AG below. L is the length of side $\overline{AB}$.

$$\cos 90^o = 16\cos^5 18^o - 20\cos^3 18^o + 5\cos 18^o \tag{1}$$

$$\cos 18^o = \sqrt{\frac{5+\sqrt{5}}{8}} \tag{2}$$

$$\sin 18^o = \frac{\sqrt{5}-1}{4} \tag{3}$$

Refer to Figure 1 and express the length of diagonal line $\overline{AG}$ below. L is the length of side $\overline{AB}$.

$$\sin\angle AGC = \sin 18^o = \frac{\overline{AC}}{\overline{AG}} = \frac{L/2}{\overline{AG}} \tag{4}$$

$$\overline{AG} = (\frac{1+\sqrt{5}}{2})L \tag{5}$$

It is based on Pythagorean Theorem to derive the reduction of $\sqrt{1^2+2^2} = \sqrt{5}$ that 1 and 2 are the length of two sides and $\sqrt{5}$ is the length of hypotenuse. It could be added with the original length of 1 and divided to two parts which length is $(1+\sqrt{5})/2$. In Figure 4, following are the steps we develop by Discovery teaching method.
The known length of one side AB is L. Lengthen AB to point D and let it satisfy $BD = AB$.
Make a perpendicular divided line of AD, let BC equals twice of AB. So it satisfies $AC = \sqrt{5}L$.
Point A is set as the centre of circle and the length of AB is radius. It's used to draw an arc which intersects $\overrightarrow{CA}$ at point E. ($\overline{AE} = \overline{AB} = L$, $\overline{CE} = (1+\sqrt{5})L$).
Make a perpendicular divided line of CE and get the mid-point H. The length of diagonal line is same as $\overline{CH} = (1+\sqrt{5})L/2$.
Set $IJ = L$ as the given length of one side for the regular pentagon and make a perpendicular divided line of $\overline{IJ}$.
Point I is set as the centre of circle and the length of CH is radius. Make an arc and intersect the perpendicular divided line of IJ at point K which is an apex of regular pentagon. The length of diagonal line is $\overline{IK} = \overline{CH} = (1+\sqrt{5})L/2$.
Set point J as the centre of circle and the length of $\overline{CH}$ (length of diagonal line) is radius. And set point I as the centre of circle and the length of IJ is radius, too. Make two arcs and intersect the other at point L. The length of diagonal line is also $\overline{JL} = \overline{CH} = (1+\sqrt{5})L/2$.
Same as the 7th step, we set the centre of circle at point I and the length of diagonal line $\overline{CH}$ as radius. Two arcs meet at point M.
Connect the apexes of $IJMKL$ which is the regular pentagon.

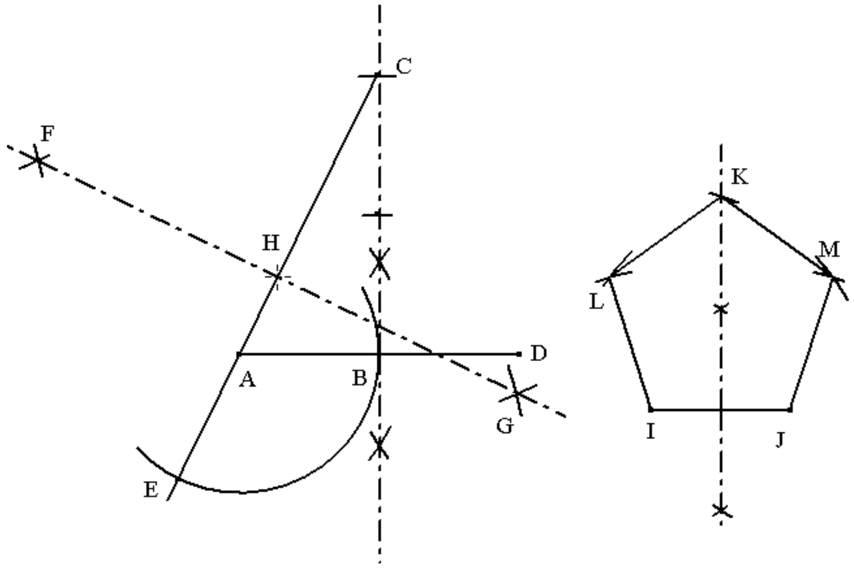

Fig. 4. Regular pentagon drawing from the given length of one side for discovery teaching method

Model 2: Draw a Specific Regular Pentagon from the Given Radius of a Circumscribed Circle

Refer to the circumscribed regular pentagon in Figure 2 and got $\angle BFI = 36^o$. The formula will be derived below. We can involve eq. (2) and eq. (3) into the following equations.

$$\because \cos\angle BFI = \cos 36^o = \frac{\overline{BF}}{\overline{IF}}$$

$$\cos 36^o = \cos^2 18^o - \sin^2 18^o = \frac{1+\sqrt{5}}{4} \qquad (6)$$

$$\therefore \quad \frac{1+\sqrt{5}}{4} = \frac{\overline{BF}}{2R}$$

We can get the following result.

$$\overline{BF} = \frac{(1+\sqrt{5})}{2}R \qquad (7)$$

The length of R is radius of circumscribed circle. It is also based on Pythagorean Theorem to derive the length of BF from eq. (7). Beginning steps are similar to Figure 4 which the other sketching procedure listed below.

Draw a circle with the radius of $\overline{AB}$ (equal R in the left picture), and let the length of $\overline{OI}$ equal R in the right one.
The relationship of $\overline{CH} = (1+\sqrt{5})R/2$ is similar to Figure 4. Use point I (centre of circle) to portray two arcs intersect the circle at point J and K which are two apexes.
Set CH as the length of regular pentagon, point J as the centre of circle and $\overline{JN}$ as the radius to portray an arc. The arc intersects the circle at point L.
Point K is set as the centre of circle and the length of $\overline{JN}$ is radius. It's used to draw an arc which intersects the circle at point E.
Connect apexes of *LMKNJ* and get an accurate regular pentagon.

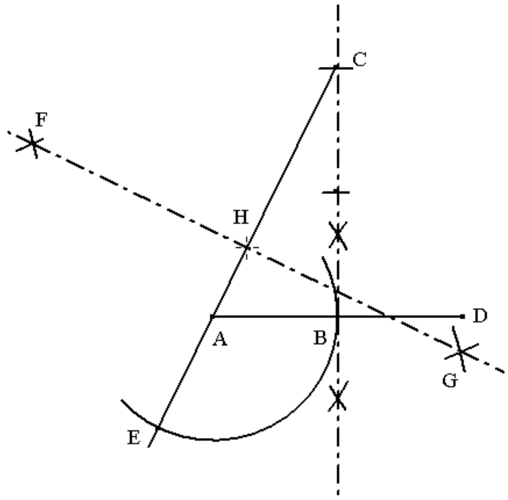

Fig. 5. Regular pentagon drawing from the given circumscribed circle for discovery teaching method

Model 3: Draw an Accurate Regular Pentagon from the Given Radius of an Inscribed Circle

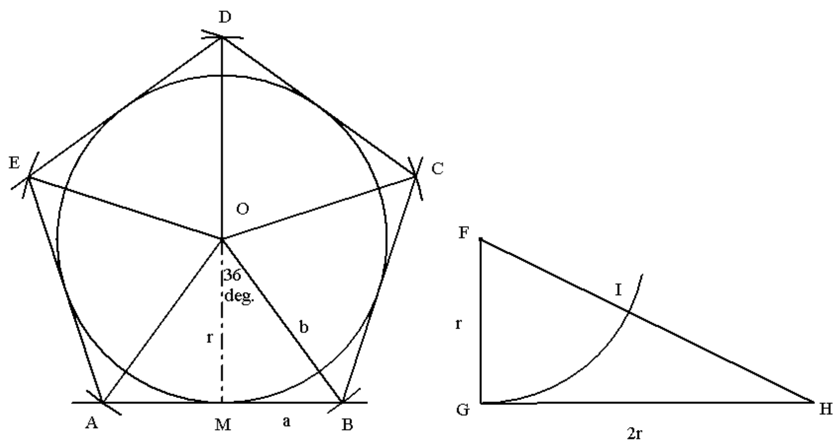

Fig. 6. Accurate regular pentagon drawing from the given inscribed circle from discovery teaching method

We will analyze this model from a half central angle $\angle MOB = 36^o$ in Figure 6. Derive the length of *a* and *b* below by trigonometric functions. It is an accurate drawing which is different from Figure 3.

$$\because \cos 36^o = \frac{1+\sqrt{5}}{4} \qquad \tan 36^o = \frac{\overline{MB}}{\overline{OM}} \tag{8}$$

$$\therefore a = \sqrt{5-2\sqrt{5}}r \qquad b = (\sqrt{5}-1)r \tag{9}$$

Because the length of *b* is easier to develop than *a* for Pythagorean Theorem in Figure 6. It is also derived the reduction of $\sqrt{1^2+2^2} = \sqrt{5}$ initially. We will guide students to sketch it by relationship of *b* and the radius of inscribed circle. Contrast Figure 6 and design the drawing procedure as following.
Draw a tangent line $\overline{AB}$ for circle *O*. The tangent point is *M*, and the radius $\overline{OM}$ equals *r*.
Make a line segment $\overline{FG}$ on the right side of Figure 6 which is equal to the radius $\overline{OM}$.
Draw a segment $\overline{GH}$ which is perpendicular to $\overline{FG}$. The length of $\overline{GH}$ is 2*r*.
Connect point *F* and *H*, and the length of $\overline{FH}$ is $\sqrt{5}r$.

Set point F as the centre and $\overline{FG}$ as the radius of circle to make an arc which intersects $\overline{FH}$ at point *I*. We can find the formula $\overline{IH} = (\sqrt{5}-1)r$ is same with the value *b* in eq. (9).___
Back to the left side of Figure 6, point *O* is set as the centre and IH is the radius of circle which intersects the tangent line at point *A* and *B*. The two apexes of regular pentagon are also decided, and the length of one side is confirmed.
Refer to the length of one side in previous step; draw the apexes as point *C*, *D* and *E* in order.
We connect point *ABCDE* and get an accurate regular pentagon.

Golden Rectangle Found in a Regular Pentagon

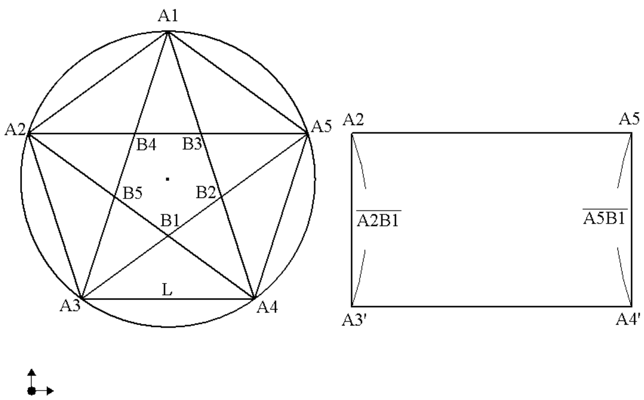

Fig. 7. The golden rectangle (golden ratio) is closely related to the length of a regular pentagon

There is a certain ratio of $(1+\sqrt{5})/2$ in eq. (5) and eq. (7). We can say that it is really a magic ratio because its reciprocal is $(-1+\sqrt{5})/2$. It shows that the ratio is closely related to the length of a regular pentagon. The illustration is found in Figure 7.

The major length of the regular pentagons ($A_1A_2A_3A_4A_5$ and $B_1B_2B_3B_4B_5$ in Figure 7) shows as below. The length of segment $\overline{A_3A_4}$ in Figure 7 is the reference length which equals *L*.

$$
\begin{aligned}
L_1 &= \overline{B_3B_4} = \frac{3-\sqrt{5}}{2}L \approx 0.382L \\
L_2 &= \overline{A_2B_4} = \overline{B_3A_5} = \frac{-1+\sqrt{5}}{2}L \approx 0.618L \\
L_3 &= \overline{A_2B_3} = \overline{B_4A_5} = \overline{A_3A_4} = \overline{A_2B_1} = \overline{A_5B_1} = L \\
L_4 &= \overline{A_2A_5} = \frac{1+\sqrt{5}}{2}L \approx 1.618L
\end{aligned}
\tag{10}
$$

The comparison between each length is listed below.

$$
\begin{aligned}
L_1 + L_2 &= L_3 \\
L_2 + L_3 &= L_4
\end{aligned}
\tag{11}
$$

Use two expressions of $\overline{A_2A_5} = 1.618L$ and $\overline{A_2B_1} = \overline{A_5B_1} = L$ to make a figure of golden rectangle showed as the right one in Figure 7.

Results and Conclusions

Results

We select grade one students for engineering background of National Suao Marine & Fisheries Vocational High School in Taiwan. There are seventy-six students separated two parts of experimental group with Discovery teaching method and reference group with Demonstrating method. All of students must be taught how to make a perpendicular divided line and know the geometry of a regular pentagon in class. In order to satisfy the essential requirements in trigonometric functions, the class of teaching sine and cosine function is arranged for the students of experimental group to ensure that they have ability to calculate the simple size of a regular pentagon enough.

The test is designed as two stages to go on. In the first stage, show them the drawing procedure to sketch three models of regular pentagon step by step for reference group. But, teach them the geometry of regular pentagon and guide to finish the drawing by Discovery teaching method for experimental group. It is essential to confirm that everyone could sketch all types of drawing by these two different teaching models. In order to avoid affected the test results due to desired psychology, the 2nd stage test isn't notified to all students. The 2nd stage test is held two weeks later. We don't offer any drawing procedure to all students. Let the students of reference and experimental groups to sketch three types of regular pentagon which are drawn before. All of the auxiliary line should be retained to check the correctness. We don't limit the drawing time to sketch them. It was estimated whether they pass just for the correct drawing steps or not. The results are listed in Table 1.

Table 1. Results for demonstrating and Discovery teaching methods (sample space, *N*=38)

Drawing Model	Fig.1	Fig.2	Fig.3	Average	Fig.4	Fig.5	Fig.6	Average
Pass Member (*n*)	23	22	17	20.7	28	29	22	26.3
Pass Probability (*p*)	.605	.579	.447	.544	.737	.763	.579	.692

Conclusions

Figure 1, 2 and 3 (refer to Demonstrating method) are corresponding Figure 4, 5 and 6 (refer to Discovery teaching method) developed from the same model of regular pentagon. The conclusions from Table 1 are listed below.

The pass probabilities for Figure 1 and Figure 2 are higher than Figure 3, we infer the cause about not familiar with using the graphic instrument of pin compass for model 3 in demonstrating model. Figure 3 and Figure 6 are the most difficult one in drawing a regular pentagon, so they get lower probability.

The pass probability for Discovery teaching method is higher than for Traditional one. It can be illustrated that Discovery teaching method applied in engineering drawing was good.

Because the pass probability for Figure 6 isn't high enough, we analyze that geometry of trigonometric functions is difficult for some students.

The pass probability just derived out the geometry of regular pentagon correctly is p=.763 in experimental group. It indicates 1/4 students could not calculate the geometry from trigonometric functions. But it had high average probability (p=.907) for the students who can derive out the geometry of regular pentagon correctly. It shows students will almost pass when they could deduce the geometry.

The teaching model can also be used to the other engineering geometric appearance of some regular polygons (for example, regular heptagon (n=7)…etc.) for future.

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ASSESSMENT OF STUDENT PERCEPTIONS OF E-FEEDBACK

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Abstract

Increasingly students are in need of faster, individual, more informative feedback on their work. Further, class sizes are increasing and students may be geographically dispersed, perhaps with only a virtual presence. Thus the importance of providing effective e-feedback is and will become ever more important.
Therefore there are many pertinent questions requiring answers:- What are the key factors that students perceive as important in the assessment process? How should feedback processes be designed and what are the critical factors that students want? Can interactive feedback be provided? Has the model of student behaviour changed from desiring to excel to that of merely meeting requirements and passing a series of hurdles?
A small scale e-survey was carried out with a sample of postgraduates and second and third year undergraduates immediately following completion of a semester of study where e-feedback was provided to students individually. The reactions of students were analysed and conclusions for future development have been drawn.

Student Feedback, Electronic Feedback, Student perception, e-feedback

Main text

Introduction

This paper assesses a trial programme of providing electronic feedback via e-mail to second and third year undergraduates and postgraduates.

Discussion

Feedback is a necessary part of students' learning experience, however inadequate feedback and inadequate feedback systems can cause significant amounts of dissonance. Effective feedback can be reinforcing, motivating and a force for improvement (Hyland, 2003). Three general criteria for effective feedback have been posited (Taras 2002); a) knowledge of standards b) the necessity of comparing standards to students' submitted work c) student initiated action to close any gaps identified. Poor feedback has been characterised by being either; ambiguous; negative; late; or where criteria have lacked certainty (Huxham 2007). Attempts to improve the speed of feedback by providing model answers only provide a partial solution; students still require personalised feedback Huxham 2007).
It has been commented that students are increasingly perceiving themselves to be customers (Weaver 2006) . This is significant given a backdrop of an increasing student fee environment from which it could be expected that students will increasingly become more discerning clients perhaps expecting a higher standard of service than has hitherto been provided.
Findings discussed in the literature (Wojtas 1998), (Weaver 2006) indicate that some students' sole concern iss to achieve a pass mark rather than to obtain feedback. Another issue which has been explored is the often commented problem of students not understanding feedback provided either because the language is couched in "expert terms" or that it is negative and error focused which results in a failure to use it (Lea and Street 1998). (Zacharias 2007).

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The authority position of teachers based on knowledge that teachers control grades and a cultural belief that teachers other source of knowledge (Zacharias 2007) concludes that there is a requirement for feedback to be directive, but can cause dissonance where feedback contradicts students ideas. Indeed it has been posited that too much feedback could result in students being depressed; less feedback might be perceived as more motivating since fewer "mistakes" had been identified (Zacharias 2007) and large amounts may be overwhelming (Brockbank & Mc Gill, 1998).

Links between developed feedback strategies which ally teaching with learning and assessment (Biggs, 1999) and frequent student comments on the lateness of feedback and its appropriateness are clear issues identified in previous work. This is particularly important in a university context where there is an operational dilemma between providing comprehensive feedback and increasing student numbers with decreasing cycle times (Falchikov a 1995). This is further compounded by issues of assessment frequency and timeline where assignment deadlines are in advance of receipt of feedback; in effect rendering the value of the feedback provided to be useless. (Hartley and Charlesworth 2000).

Feedback – a systems viewpoint – the background to the study

A framework quartet for identifying the characteristics of feedback has been suggested to be:-a) performance – gap Information; b) positive feedback; c) feedback clarity and d) fairness (Lizio and Wilson 2008). This has been used to inform the feedback system which is the subject of evaluation in this paper. The crucial steps involved in this system are firstly to clearly define the assignment in the course Handbook together with a two-dimensional assessment grid which identifies assessment criteria against benchmark levels of performance. Then the assignment and method of assessment is discussed in class with students. This pre-forms students' expectations and prepares them for feedback which benchmarks the "performance gap" assessment against the pre-defined criteria. This uses the exact phrases in the grid to calibrate the level of attainment of a students work. In addition positive feedback is provided in the form of a free text narrative which has two objectives: a) to provide positive reinforcement and encouragement as a motivator to mitigate the effects of perhaps less motivating performance benchmarking (Lizzio et al 2003) and b) developmental comments which are essential to point out areas where students can improve their performance. Clarity; this has been interpreted in two ways a) mechanical clarity; feedback needs to be provided in type. This research confirms that students have issues in reading handwritten comments. Also providing handwritten comments implies the return of manuscripts to students, a process which is beset with numerous logistical problems and students' reaction to the availability of marked scripts was also assessed. b) writing feedback comments in clear uncomplicated sentences, deliberately avoiding academic language (Chanock 2000) and providing feedback at an assignment specific and generic level which a student my find useful in further work (Lizzio and Wilson 2008).

Finally the issue of fairness has been addressed from a metasystem point of view. This is especially important with large cohorts and multiple markers. By using a marking system which identifies marks by criteria , by marker and by student it is possible to audit the marking process and determine dispersion by and between markers thus providing an objective basis for moderation. This process is explained to students and contributes to the perceived level of fairness of the evaluation process (Whitington et al 2004). It has been observed (Cohen and Cavalcanti, 1987) that there is an inverse relationship between the quantity of comments that the student will receive and their grade. An attempt to offset this is provided by the standard evaluations contained within the marking grid, however it is more or less inevitable that students who require more guidance should receive more constructive comments.

Another dimension which has not been fully developed is the cultural background of the student receiving feedback. Students who have been taught didactically frequently have "feedback dissonance". This emanates from a mismatch of expectations. " I have worked hard and have included much information" which decoded is "I have produced a long descriptive piece of work with little critical evaluation". The expectation from the student's point of view is that this discussion and remonstration with the tutor will hold sway resulting in a negotiated higher grade. The process of cultural adaptation appears to be a long one and has a latency stretching well into the duration of a yearlong course with potentially demotivating results and thus questions relating to the motivation of students in receipt of feedback were investigated.

The issue of how feedback is actually delivered to students is a topic which merits investigation. The increasing reliance on Virtual Learning Environments (VLE's) such as BREO provide interesting opportunities for improving the feedback process with e-feedback and also provide a check on questions of academic concern. Feedback systems based on VLE's provide a effective mechanism for commenting on work, but to date lack the systems dimensions which permit for conducting quality audits of grade distribution by marker, hence the probing of student attitude on consistency and fairness. There is relatively little literature currently available on e-feedback and it appears that developments are fragmented and designed to meet specific local needs with a few exceptions which have been made generally available, for example the "Electronic Feedback marking assistant" developed at Liverpool John Moores University (Denton 2001). Previous studies have demonstrated that students perceive that electronic feedback is of greater value than handwritten comments (Denton et al 2008) and that "electronic statement banks" assist tutors and students to explicitly consider assessment criteria (Case, 2007). In addition it is claimed that rapid provision of feedback by e-mail which shortens the feedback cycle improves student performance (Denton 2001) and is considered to be fairer by students as it is based on a structured scheme which clearly identifies the marking scheme (Denton et al 2008)

Students may not be concerned as to who has marked their work as long as the perception is that it has been marked fairly (Crisp 2007). Indeed, with the casualisation of the academic labour force required to provide additional capacity to teach and assess large cohorts and with the increasing provision of distance learning, written feedback may be the only mechanism available (Crisp 2007) which opens the secondary issue of how can a university provide follow up guidance for students who have had their work marked by a non-permanent member of staff and who require further support and explanation of the feedback comments provided.

The study concept and objectives

The study was carried out to assess student reactions to feedback in general and to the provision of electronic feedback as part of a closed loop system which used benchmark performance levels identified in the unit Handbook to set student expectations and identify the marking criteria which were then applied in the feedback provided to students in addition to specific comments designed to improve student work quality. The rationale behind the study was to try and ascertain student assessment of process with a view of being able to determine the relative importance of the feedback "service" provided

Objectives of the study were to obtain an assessment of the relative importance of the mechanism of feedback, relating to the nature of the feedback and student's motivation to retrieve evaluate and reflect on feedback received. The questionnaire was administered to second and third year undergraduates and to postgraduates studying for a master's degree. Students were invited to comment using a 10 point scale which addressed: importance of feedback factors, agreements to attitudinal statements on the nature of feedback provided and likelihood of students taking action arising from receipt of feedback. The questionnaire is appended as Appendix 1

An online questionnaire was posted on the VLE to three student cohorts each studying different units all of which had been subject to the same standards of course design and feedback where criteria based feedback had been provided for assignments by email. The units were taken by second year and third year undergraduates and a group of postgraduates.

Results

70 completed responses were received from students and were evaluated as follows.

Ranking of factors.

A weighted average score was computed since the scales use are a 10 point Likert scale, the values can be broadly interpreted as a percentage importance, agreement or likelihood of action. The rankings are ordered by average score.

		Score	**Importance Ranking**
First Rank	Q2d	9.3	Feedback gives me guidance on how to improve my work
Second Rank	Q2b	8.8	Feedback is emailed to me
	Q2c	8.7	Feedback relates to marking criteria in the unit handbook
	Q2a	8.5	Feedback arrives within 3 weeks
	Q2g	8.4	Assignments are marked fairly
	Q2h	8. 4	Grading is consistent across units
	Q2i	8.4	I understand why my work gets the given grade
Third rank	Q2f	7.0	I just get my grade

		Score	**Agreement Ranking**
First Rank	Q3c	8.8	I want detailed comments on my work showing exactly where I need to focus

	Q3m	8.6	My aim is to get an "A" for my assignments
	Q3f	8.5	I find comments on my work useful
Second Rank	Q3d	7.7	I usually understand the comments that are given
	Q3g	7.4	I receive feedback promptly
	Q3h	7.4	I agree with the comments that are made
	Q3i	7.4	The quality of feedback varies greatly between units
	Q3j	7. 2	The quality of feedback varies widely between assignments on a unit
	Q3k	7.2	I want to just pass an assignment without working too hard
Third rank	Q3a	5.6	I find it difficult to read handwritten comments.
	Q3b	5.9	All i want to see is my grade
	Q3l	3.8	I work hard to achieve the best grade possible

		Score	**Actions Ranking**
First Rank	Q4f	9.4	I will try to use the comments received in future assignments
	Q4c	9.3	I will read feedback/comments sent to me by email
Second Rank	Q4b	8.9	I will read feedback/comments on BREO/Turnitin
	Q4d	8.9	I will understand the comments made on my work
	Q4e	8.7	I will reflect on the comments made on my work
Third rank	Q4a	6.9	I will retrieve marked hardcopy assignments

Interpretation of findings
Multiple correlation analysis was carried out on the dataset and 5 pairs of cross correlations stood out as being very significant compared to other weaker correlations as shown in Table 1.

Table 1. Significant relationships

Comment Pairs	Chi - squared	DF	Cramers v	Significant at
I understand why my work gets the given grade + Assignments are marked fairly	154.67	48	0.60	1% level
I work hard to achieve the best grade possible + I find comments on my work useful	150.22	49	0.55	1% level
I understand why my work gets the given grade + Feedback gives me guidance on how to improve my work	101.39	25	0.54	1% level
I find comments on my work useful + I want detailed comments on my work showing exactly where I need to focus	128.19	49	0.52	1% level
Grading is consistent across units				10% level

	41.98	30	0.35
+ Feedback gives me guidance on how to improve my work			

In addition, factor analysis was carried out using the entire dataset as illustrated in the table 2 below. Three factors which explain approximately 39% of variation have been identified. These may be interpreted as follows:- Factor 1; proactive characteristics, students requiring detailed information which they intend to reflect on and use in the future . Factor 2; passive characteristics; students appear passively engaged and will use rather than seek out feedback. Factor 3; dissociated characteristics; students appear to regard feedback as a source of information which confirms passing of assignments rather than containing any elements of active learning.

Table 2. Factor analysis results

	Factor 1		Factor 2		Factor 3	
Eigenvalue		4.94		3.36		3.12
Proportion		17%		11.60%		10.80%
Factor Loadings	I will reflect on the comments made on my work	0.71	I understand why my work gets the given grade	0.68	I just get my grade	0.67
	I find comments on my work useful	0.69	Feedback gives me guidance on how to improve my work	0.55	I usually understand the comments that are given	0.6
	I will try to use the comments received in future assignments	0.6	I will retrieve marked hardcopy assignments	0.51	I receive feedback promptly	0.59
	I will read feedback/comments on BREO/Turnitin	0.55	I can discuss my results with my teacher	0.47	I want to just pass an assignment without working too hard	0.51
	I will read feedback/comments sent to me by email	0.55	Grading is consistent accross units	0.46	All i want to see is my grade	0.48
	I want detailed comments on my work showing exactly where I need to focus	0.55	I find it difficult to read handwritten comments.	0.34	I agree with thecomments that are made	0.45
	I can discuss my results with my teacher	0.54	I receive feedback promptly	0.33	I prefer overall comments on the standard I have achieve	0.4
	Feedback relates to marking criteria in the unit handbook	0.51	I just get my grade	0.28	The quality of feedback varies greatly between units	0.28
	I work hard to achieve the best grade possible	0.5	I want detailed comments on my work showing exactly where I need to focus	0.25	Please identify which unit you are currently enrolled on	0.27
	My aim is to get an "A" for my assignments	0.48	Feedback relates to marking criteria in the unit handbook	0.16	I find comments on my work useful	0.23
	I usually understand the comments that are given	0.43	Feedback is emailed to me	0.16	I find it difficult to read handwritten comments.	0.19
	I receive feedback promptly	0.43	Feedback arrives within 3 weeks	0.13	I can discuss my results with my teacher	0.12

Conclusions

This study demonstrates that there is a segmentation of feedback required by students. Active and eager students want detailed informative feedback, which will be avidly consumed, internalised and acted upon. Paradoxically, it is this group of students which is generally “short changed” in that feedback for good work is generally laudatory and confirmatory rather than challenging. The middle segment – passively engaged students - will be dutiful in using feedback, but appear to lack the same drive and determination as active learners to apply feedback. Finally the lower segment, which typically will receive the most detailed feedback (hopefully couched in a constructive vein) is the least likely to either require detailed feedback or to apply this in future work. Might this indicate a consumerist solution? If it is believed that feedback is a valuable commodity and also that the perceived value varies by the attitudes of student segment, then possibly a solution to the paradox identified above is to provide differing feedback service levels governed by payment of a feedback fee. This “fee” need not necessarily be monetary, but might be defined by “feedback tokens”. It might be imagined that a student who is concerned with a particular course or assignment might recognise their vulnerability and would therefore assign a greater value to information that for an assessment where the student was confident of their ability. Clearly such a system would be difficult but not impossible to implement, but would have significant benefits to students and would also be extremely efficient in allocating scarce marking resources to achieve the most productive outcomes for students.

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Appendix The Questionnaire

We are always striving to improve the quality of our teaching and making feedback we provide to students as helpful as possible. Please could you take a few moments to answer the following questions on this subject. The survey is completely confidential and your responses will be used to help us direct and improve how we provide feedback to you.

1. Please identify which unit you are currently enrolled on
   - ☐ Fundamentals of e Business BSS003-6
   - ☐ New Advances in Business BSS007-3
   - ☐ Applied Integrated Business BSS003-2
   - ☐ Other
2. Please can you rate the importance to you of the following statements on a 10 point scale, where 10 is the most important and 1 is the least important

	10 most important	9	8	7	6	5	4	3	2	1 least important
Feedback arrives within 3 weeks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Feedback is emailed to me	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Feedback relates to marking criteria in the unit handbook	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Feedback gives me guidance on how to improve my work	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I can discuss my results with my teacher	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I just get my grade	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Assignments are marked fairly	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Grading is consistent accoss units	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I understand why my work gets the given grade	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. Thinking about the range of feedback you have receieved this semester, please indicate the extent to which you either agree or disagree with the following statements where !0 is you totally agree and 1 is you totally disagree

	10 totally agree	9	8	7	6	5	4	3	2	1 Totally disagree
I find it difficult to read handwritten comments...	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
All i want to see is my grade	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I want detailed comments on my work showing exactly where I need to focus	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I usually understand the comments that are given	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I prefer overall comments on the standard I have achieved	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I find comments on my work useful	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I receive feedback promptly	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I agree with thecomments that are made	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

The quality of feedback varies greatly between units	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
The quality of feedback varies widely between assignments on a unit	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I want to just pass an assignment without working too hard	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I work hard to achieve the best grade possible	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
May aim is to get an "A" for my assignments	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

4. Please can you identify how likely you are to do the following, where 10 is totally likely and 1 is totally unlikely

	10 Totally likely	9	8	7	6	5	4	3	2	1Totally unlikely
I will retrieve marked hardcoppy assignments	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I will read feedback/comments on BREO/Turnitin	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I will read feedback/comments sent to me by email	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I will understand the comments made on my work	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I will reflect on the comments made on my work	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
I will try to use the comments received in future assignments	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

5. Finally do you have any comments on either the way you receive feedback or the type of feedback that you receive?

____
____
____

Thank you for sparing the time to complete this questionnaire. Your help is greatly appreciated

ASSISTING PRIMARY SCHOOL CHILDREN TO PROGRESS THROUGH THEIR VAN HIELE'S LEVELS OF GEOMETRY THINKING USING GOOGLE SKETCHUP

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Abstract

This research aims to study the effectiveness of newly-developed learning modules built to assist Malaysian primary students to progress through the first three levels of widely accepted van Hiele's model of geometry thinking. The first part of the paper reviews the background of study focusing on the problems encountered by Malaysian mathematics teachers to practice this model in the classroom using Geometer's Sketchpad. It also includes brief essential information about the learning modules which was built using Google SketchUp. The second part describes methodology adopted in the research which involved quantitative approach of a pre versus post quasi-experimental design ran on a group of forty Year 6 primary school children in Malaysia. The results of comparative single-group mean analysis of the test scores suggest that the learning modules were potential in assisting students to progress through the respective van Hiele's levels of geometry thinking, with all of them demonstrated progression of at least within level.

Keywords: Improving classroom teaching; teaching/learning strategies; interactive learning environments

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Introduction

Geometry is one of the fields that are formally introduced in the Malaysian mathematics school curriculum right from the early primary education. Its emphasis increases as students progress to secondary education, where about forty percent of the sixty topics in the five-year secondary mathematics curriculum comprise of Geometry content (Malaysian Ministry of Education, 2007). A deep conceptual understanding and the ability to visualize geometrical properties at the elementary level are most needed for the students to progress to the higher level learning of Geometry.

Background of Problems

When it comes to the learning of Geometry at schools, many mathematics educators associate the development of thinking with a famous learning model called van Hiele's model of geometry thinking which was first proposed by Dina van Hiele-Geldof and Pierre van Hiele. They identify five differentiated levels of thinking that a student must progress sequentially from one level of thinking to the next without skipping any level. These are Level 0 or L0 (Recognition), Level 1 or L1 (Analysis), Level 2 or L2 (Informal Deduction), Level 3 or L3 (Deduction) and Level 4 or L4 (Rigor). The progression from level to level is more dependent on the content and method of instruction (van Hiele, 1986). Since then, the model has been creating a growing interest among researchers worldwide including Malaysia to investigate the nature and extent of students' level of thinking in learning Geometry (Usiskin, 1982; Wu & Ma, 2005; Ding & Jones, 2006; Saifulnizan, 2007; Noraini, 2007). The van Hiele's model of geometry thinking, which was first introduced more than three decades ago, remains applicable until now and still gaining popularity among mathematics educators.

In recent years, the technology-related applications have been widely developed and used to assist learners to learn mathematics more meaningfully and effectively. GSP in particular, offers advantages in assisting learners to draw and visualize in both 2D and 3D dynamic construction. There are numerous studies which revealed that, when properly used, the GSP could help learners improve the progression of their van Hiele's levels of geometry thinking and thus improved the learning of Geometry (see for example Saifulnizan, 2007; Noraini, 2007).

In Malaysia, all secondary schools were supplied with GSP (in limited number) by the Ministry of Education with intention to assist both teachers to teach and students to learn Geometry and Geometry-related subjects more effectively in the classroom lessons. Every year, a substantial number of resource mathematics teachers were trained to use this van Hiele-based dynamic software in order to produce effective teaching and learning, especially in Geometry. However, the GSP-assisted learning in the classrooms has not been practiced widely mainly due to the limited availability among students to practice outside the classroom. The problem was worsened by the lack of expertise to use among teachers as well as the lacking of clear ready-to-use learning modules associated with each of the related geometry topic (Azlina & Lok, 2009). The use of GSP in the primary school classrooms has been much rarer as the supply of GSP was limited to secondary schools only whilst the number of primary school mathematics teachers who received training to practice GSP-assisted learning was much lesser. Based on a close scrutiny on the GSP, series of discussions with fellow mathematics educators and our own teaching experiences in mathematics, the researchers feel that the complexity to use GSP among young learners at primary schools may have aggravated the problems.

Speaking about of the use of computer software in teaching and learning of geometry learning, the Google Sketchup (GSU) software seems to offer several advantages as compared with GSP. First, it is an easy and intuitive to use for learning purposes especially on Geometry. Second, the standard version is downloadable from Google free of charge for students to use it on their own computers. Third, it carries features that help learners to motivate themselves to clear up spatial problems by creating corresponding virtual models by themselves. The virtual models should help students to understand that all drawings are representations of spatial problems which have to be solved by spatial thinking (Leopold, 2008). Younger students can easily create the 2D and 3D objects, since only a few simple tools are required. Older students who are learning about equations of curves can also take advantage of GSU's text tool, to see whether their curves follow the correct paths.

However, as far as the van Hiele's model of geometry learning is concerned, GSU possesses a drawback as it is designed for architectural applications rather than pedagogical. Thus, it is equipped with much less pedagogically oriented instructions as compared with GSP. Nevertheless, with its built-in features, the researchers strongly believe that GSU can be utilized to provide an alternative learning tool especially for the young learners to accomplish effective learning of Shapes and Spaces especially by following the levels and learning phases prescribed by van Hiele's model of geometry thinking.

Having accepted the important roles of van Hiele's model of thinking in Malaysian mathematics learning, of Geometry, the pedagogical problems related to the GSP-assisted learning in Malaysian context mentioned above have triggered the researchers to investigate the following question - *Beside GSP, can we build a pedagogically oriented, free access and relatively simple to use computer-based learning tool that would assist primary school children to progress through van Hiele's level of thinking in the learning of Geometry?*

Background Information of the Study

The full study was conducted in two stages. First, it involved the design and development of newly-developed learning modules built using Google SketchUp. For simplicity, these learning modules are called GSU-based Learning Modules. These learning modules were built to assist Malaysian primary students to progress through the first three levels of van Hiele's geometry thinking. In the second stage, the newly-developed GSU-based Learning Modules were tried out to a sample of the targeted group. A quantitative investigation was then conducted to study how well did these learning modules assist the learners to progress through the first three levels of van Hiele's geometry thinking, especially in the learning of Shapes and Space in Malaysian mathematics curriculum.

The main focus of this paper is to reports the study conducted in the second stage. Brief descriptions pertaining to the first stage are included in the following section to provide readers with a clear background of the whole study.

About the Newly-Developed GSU-based Learning Modules

The newly-developed GSU-based Learning Modules consisted of carefully crafted learning activities designed to assist primary school children to progress through the first three levels of van Hiele's geometry thinking, namely L0, L1and L2. It was designed and developed in accordance of procedures prescribed by ADDIE model concentrating on the learning of geometry topics of Shapes and Spaces. It consisted of three sub-modules, namely Module 1 (Triangles), Module 2 (Squares and Cubes) and Module 3 (Rectangles and Cuboids). Each of these modules incorporated relevant content and learning activities designed to be executed with the help of visualization-oriented features available in the GSU. For each module, students would have to execute specific tasks in specific order aiming to assist them to attaining the respective level-to-level progression of the van Hiele's levels of geometry thinking. The restriction of emphasis to the first three van Hiele's levels was mainly due to established research findings conducted elsewhere which revealed that the first three levels played much more important role in producing better conceptual understanding of elementary Geometry of Year 6 (Knight, 2006). As experienced mathematics teachers, the researchers strongly believe that it would be extremely important for learners of this age group to acquire these first three levels of thinking if they were to succeed in the learning of higher level of Geometry.

Each of the GSU-based Learning Modules was designed and developed based on the levels and learning phases described by the van Hiele's model of geometry thinking concentrating on learning properties as emphasized by Crowley (1987), namely,

Students must proceed through the levels in order.

Students move through the levels without skipping any level. Their progress from level to level is more dependent on the content and method of instruction than on age.

For learning to occur, instruction must occur at the level of the student. If instruction is delivered at a higher level than the learner, the student will have difficulty following the thought processes used.

The learning activities incorporated in the GSU-based Learning Modules were designed and developed by following closely the van Hiele's school of thought that students pass through numerous levels of geometry thinking as they progress from merely recognizing geometry shapes to being able to construct a formal geometry proof (van Hiele, 1999; Clements, 2004).

The GSU-based Learning Modules carried a special importance of geometrical structures on learning mathematics, i.e. specific visualization-oriented learning activities via the utilization of special features offered by the GSU. These visualization-oriented activities formed an important component of building concrete or at least semi-concrete of our mental representation of a concept (Konyalioglu, Ipek, & Isik, 2003). They involved several types of geometrical representations of diagrams, pictures and shapes for visualization of the abstract concepts in Geometry. In particular, these visualization-oriented activities focused on assisting learners to:

- recognize shapes
- make associations about shapes and developing visual thinking by means of presenting illustrations

from a variety of positions.

- establish geometry concepts through activities involving analyzing shapes through geometric manipulations which were made simpler by the use of GSU.
- develop informal deductive thinking using problem-solving conditions which guide them in discovering issues and eventually stimulate geometry thinking.

The full details of the design and development of the GSU-based Learning Modules are explained in Tan (2011).

About The Study

Objectives of Study

This study aims to investigate the effectiveness of the GSU-based Learning Modules in assisting primary school students to progress through the first three van Hiele's levels of geometry thinking in the learning of Shapes and Spaces.

Methodology

This small-scale study adopted a pre and post quasi-experimental design using a single group of subjects. No control group was used in this study as the researchers were only interested to see the progression of van Hiele's levels of geometry thinking 'within the subjects under study'. As such, this study performed no comparative investigation between groups of students who used the GSU-based Learning Modules and those who did not. The effectiveness of GSU-based Learning Modules was evaluated via the investigation on the progression of geometry thinking made by the subjects after the use of these learning modules. The data of the study were gathered and analyzed using simple quantitative approach.

Sample

The study was conducted to forty Year 6 students from a primary school at which one of the researchers was teaching. They were identified and selected using specially adapted test called Wu's Geometry Test (or simply WGT) created by Wu et al. (2005a). The sample comprised of three categories of students, each represented a particular cohort of students with specific van Hiele's levels of geometry thinking of below BL0, L0 and L1 respectively. The number of students for each cohort were 4, 9,and 27 respectively. These numbers were based mainly on 'what were available' and no stratification method has been applied in the sampling method.

Instrument

In short, the adapted version of WGT consisted of three sub-tests (namely Test 1, Test 2 and Test 3), each to measure students' van Hiele's levels of geometry thinking associated with each of the respective three GSU-based learning sub-modules described earlier. The adaptation involved only the exclusion of items from the original version of WGT (Wu et al., 2005a) which were not covered by the Malaysian primary mathematics curriculum. Each sub-test consisted of 25 items and it has been designed to measure the student's van Hiele's levels of geometry thinking as to whether his or her level of thinking was at BL0, L0, L1 or L2.The full details of the test items and the validation process adopted in the adaptation are explained in Tan (2011). It must be noted that the same WGT was used to measure the students' van Hiele's levels of geometry thinking before (pre) and after (post) the use of GSU-based Learning Modules.

The Fieldwork

Once selected using the (pre) WGT, each of the school children was asked to undergo a series of learning sessions on Shapes and Spaces, this time with the assistance of the newly-developed GSU-based Learning Modules. Each of the learning sessions took one hour and was conducted in the evening (i.e. after the normal morning classes). It ran four times a week for three consecutive weeks.

During the learning session, each student was asked to perform self-instructed learning activities prescribed in the respective module at their own preferential learning speed in specific sequences starting from Module 1 and then followed by Module 2 and Module 3. It must be noted that during the whole learning sessions, the teacher did not perform the teaching of Shapes and Spaces at all. Instead his role was to provide instructions to students 'what to do' as well as to provide minimal help to clarify the learning activities to be performed. These help were given only as necessary.

The students' van Hiele's levels of thinking were measured again using the (post) WGT upon the completion of the whole intervention program at the end of third week.

Test Scoring and Data Analysis

The adapted version of WGT preserved the scoring principle set by Usiskin (1982) in measuring the van Hiele's levels of geometry thinking, i.e. for each learning module,

a. Ones are considered to have attained a particular van Hiele's level of geometry thinking if they manage to answer correctly at least 60% of the total items designated for each particular level associated with the respective module, and
b. One's van Hiele's level of geometry thinking is defined as the highest level attained by him/her.

Simple comparative analyses of WGT scores were performed to investigate the increases (or decreases) of post-test scores versus the pre-test scores for both the over-all and individual cases of the students.

No inferential analysis of means (ANOVA or alike) was performed due to the small size of sample as well as the possibility that the sampling criteria used in the study might not meet the assumptions required by inferential statistics.

The Findings and Discussions

Two layers of analyses were performed in the full study, first based on the whole GSU-based Learning Modules followed by analysis on each of the three sub-modules. Due to close consistency of findings throughout the sub-modules as well limitation of the size of article, this paper focuses only on the first.

Using the procedures and conventions described earlier, the WGT scores gathered before and after the use of GSU-based Learning Modules were analyzed and summarized in Table 1. The information clearly suggested that before the intervention, all students were found to have achieved van Hiele's levels of geometry thinking of L1 or below with four of them felt within BL0 which indicated that they did not even attain the threshold score of L0. This situation might be considered as 'relatively unsatisfactory' if they were to meet the van Hiele's requirements to learn Geometry effectively as it indicatedmost students only operated on the lower thinking levels of recognition and analysis during the learning of Shapes and Spaces. If the test scores could be taken as an indication of their level of understanding in Shapes and Spaces, it might then be concluded that their understanding was rather low as reflected by the low mean scores of less than 56%.

These information, coupled with summary of essential information related to the progression of van Hiele's levels of geometry thinking after the use of GSU-based Learning Modules (Table 2) seemed to insinuate significant changes of scenarios. These information showed that all of the students have managed to progress at least within the level (i.e. a situation where individual showed increase of test scores within a particular level but did not reach a level-by-level progression as defined by Usiskin's criteria). Among them, more than half have managed to perform between levels progression. Again, if the test scores could be taken as an indication of their level of understanding in Shapes and Spaces, there were quite marked improvement of understanding made by the students as reflected by the increase of means from less than 56% to around 70%. These findings appeared to indicate that the newly developed GSU-based Learning Modules possessed high potential to assist students to progress through the respective van Hiele's levels of geometry thinking.

The progression of van Hiele's levels of geometry thinking was investigated further by plotting a graph to scrutinize the progression made by each subject under study (Figure 1). This plot appeared to suggest that:
The use of the GSU-based Learning Modules has managed to assist majority of the students to progress through their van Hiele's level of geometry thinking.
With little exception, the progression occurred in the manner as described by van Hiele, that, the progressions of levels of thinking were sequential where learners passed through the levels in order as their understanding increased.

Information elucidated in Figure 1 and Table 3 showed that there were four students who did not seem to 'follow' the van Hiele's rule of progression of levels of geometry thinking' (referred to as 'jump phenomenon') where they have progressed through van Hiele's levels of geometry thinking without following strictly the sequential order. In particular, three students demonstrated a progression from BL0 to L1 whilst one of them progressed through from L0 to L2. It was unclear if these non-sequential progressions indicated a 'break of rules' of the van Hiele's model of geometry thinking but the researchers feel that these might have not been the case if the progression were measured twice or more during the whole of the intervention period. Having said that, these jump phenomenon appeared to suggest the potential of the newly designed GSU-based Learning Modules in assisting weak learners to learn Shapes and Spaces in the Malaysian primary mathematics of Geometry.

It must be noted that the above claims made about the effectiveness of the newly-developed GSU-based Learning Modules may be refutable as the experimental design employed in this study may have permitted other factors such as test retention and repeated learning to have contributed to the progression of the van Hiele's levels of geometry thinking. However, it must also be stressed again that the students received no 'second time or additional teaching lessons of Shapes and Spaces' during the whole experimental sessions. Viewed from the design and development of the GSU-based Learning Modules, these were designed and developed using thorough principles focusing on the van Hiele's model of geometry thinking. In particular, a great emphasis were given on the visualization-based learning activities and hands-on explorations to develop geometry thinking that would actively engage the students in the learning processes and enhance students' conceptual understanding of geometry concepts. Thus, any progressions of the van Hiele's levels of thinking occurred are thought to be likely resulted by the active engagement of students in the learning processes.

As mentioned earlier, similar analyses on each of the GSU-based Learning Modules were performed in the study. With very little exceptions, these analyses revealed a more or less consistent pattern of findings throughout all modules. The details of such findings are reported in Tan (2011).

Conclusion

As noted earlier, the dynamic graphical GSU software is neither built on van Hiele's model of thinking nor specifically aimed to be used to assist learners to learn Geometry more effectively. Bearing in mind of the limitations and possible refutation mentioned above, this study seem provides evidences that, when incorporated with carefully designed learning activities, GSU can be used to assist primary school children to progress through the van Hiele's levels of geometry thinking. It is hoped that this would lead to the full development of a practical computer-assisted learning alternative that eventually assists primary school children to learn Geometry more meaningfully and effectively.

Limitations and Future Studies

The results of this research should be interpreted with the precautions and arguments mentioned in the earlier section in mind, that some additional factors such as test retention, repeated learning, etc. might have contributed to the findings. The researchers are currently undertaking a series of qualitative studies to investigate these threats and will be reporting the results once full analysis are available.

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Appendix

Table 1: The Number and Percentages of Students According to the van Hiele's Levels of Geometry Thinking among Students Before and After the Use of the Whole GSU-based Learning Modules (n=40)

van Hiele's Levels of Geometry Thinking	Number of Students	
	Pre	**Post**
BL0	4 (10.0%)	0 (0%)
L0	9 (22.5%)	1 (2.5%)
L1	27 (67.5%)	28 (70.0%)
L2	0 (0%)	11 (27.5%)
Mean WGT Score	55.9%	70.3%

Note: Numbers in brackets show the percentage of students for each category.

Table 2: Break-down of Number and Percentages of Students for Each Category of Progression of van Hiele's Levels of Geometry Thinking Before and After the Use of the Whole GSU-based Learning Modules (n=40)

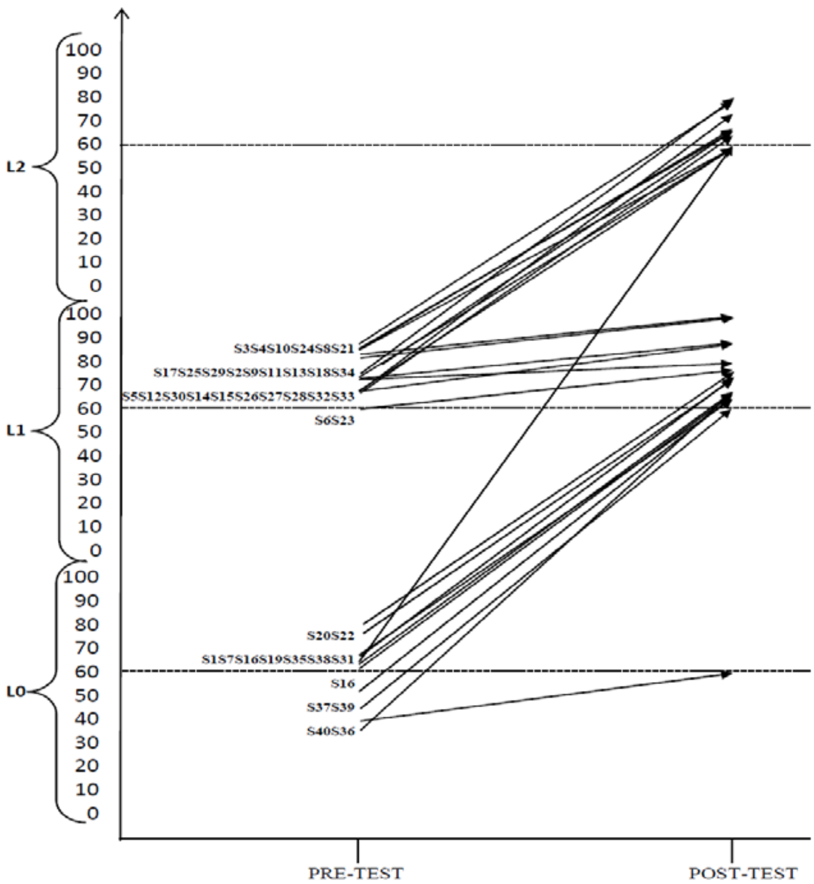
Category of Progression of van Hiele's Levels of Thinking	The Progression of van Hiele's Levels of Thinking Involved			Jump Phenomena		Total
Between Levels	**BL0 to L0**	**L0 to L1**	**L1 to L2**	**BL0 to L1**	**L0 to L2**	
	1 (2.5%)	8(20.0%)	10(25.0%)	3 (7.5%)	1(2.5%)	23 (57.5%)
Within Level	**L0**	**L1**	**L2**			
	0 (0%)	17 (42.5%)	0 (0%)			17 (42.5%)
No Progression at all	**L0**	**L1**	**L2**			
	0 (0%)	0 (0%)	0 (0%)			0 (0%)

Notes: a. Numbers in brackets show the percentage of students for each category.
Within Level progression is a situation where individual shows increase of WGT scores within a particular level but does not reach the threshold of the immediate next level of geometry thinking

Table 3: Details of WGT Scores of Each Individual Who Demonstrated Jump Phenomenon (threshold score = 60%)

Student	WGT Scores (in percentage)						The Jump Phenomenon	
	Level L0		Level L1		Level L2			
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
S36	36	60	32	64	24	40	BL0	L1
S37	52	76	44	64	8	32	BL0	L1
S39	44	72	24	60	28	44	BL0	L1
S31	64	68	56	80	36	60	L0	L2

Figure 1: Plot of Individual van Hiele's Levels of Geometry Thinking Before and After the Use of the Whole GSU-based Learning Modules (n=40)



Notes: a. *Dotted line represents the threshold score of 60% of the WGT for the respective level of geometry thinking*

Si denotes the i^th Student (i = 1,2,3,……..,40)

A COMPUTERIZED ADAPTIVE TESTING SYSTEM FOR UNDERGRADUATE LEVEL CHINESE READING PROFICIENCY

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Abstract

In recent years, there has been a dramatic proliferation of research concerned with Computerized Adaptive Testing (CAT). Some paper and pencil tests have been transformed to computerized based tests such as Graduate Record Examinations (GRE) program. In Taiwan, Chinese reading ability is a required literacy for undergraduate students. Students have to pass the Chinese reading literacy exam before graduation. This study tried to construct an item response theory based item bank for undergraduate level Chinese reading proficiency test and develop the corresponding CAT system. This Chinese reading proficiency test also provides sub-domain scores of Chinese reading proficiency. Remedial instructions are provided based these sub-domains after the computerized testing. Another contribution is that by applying this IRT-based Chinese reading proficiency test, the students' performances of different departments or universities can be evaluated and compared.

Keywords: Undergraduate Level Chinese Reading Proficiency Test, Computerized Adaptive Testing, subscale

Introduction

Over the past decade, Computerized Adaptive Testing (CAT) has achieved great popularity. Adaptive tests possess several benefits over traditional paper-and-pencil tests. These include increased measurement precision, reduced testing time, standardized instructions, and flexible scheduling of examinees. Most adaptive tests use item selection and scoring algorithms based on Item Response Theory (IRT). These techniques used in operational adaptive testing rely on the assumption of unidimensionality. Adaptive testing using unidimensional item response models for item selection and ability estimation is called unidimensional adaptive testing. However, Unidimensional item response models are not always appropriate for real tests. Such as Programme for International Student Assessment (PISA) include additional requirements stemming from complex theoretical underpinnings that cannot be tackled optimally with a unidimensional approach.

Tests with multiple components are common in large-scale assessments. A review of many new forms of assessment and the associated scoring protocols, such as those represented in cognitive tasks, performance tasks, clinical skills assessments, writing assessments, and oral presentations. The components usually consist of subsets of items that measure specific content or process attributes beyond an overall ability. Although the overall ability estimate is useful for important decisions, the subscale ability estimates complement the overall ability estimate by providing better diagnosis of examinees' strengths and weaknesses, and can also help assess and inform teachers' instructional practice. To make valid inferences about a student's attributes from the student's responses to items in the subtest domains, reliable subscores should be obtained.

With advances in the computing power of personal computers, CAT has gradually achieved popularity. For instance, CAT has been implemented in large-scale testing programs such as the Graduate Record Examinations. Those CAT system are build for language learning. In Taiwan, Chinese class is an general education for undergraduate students. During different semester, Teachers have to create a test to examine the students' performance. Since the Chinese class is a general education, and teachers have to build a test during different semester and in different college to assess student's performance. But there is no item bank was build. Teachers have to produce an test in each semester over and over. In this study, try to construct a standardized item bank of undergraduate level Chinese reading proficiency test and build the CAT system. Providing the system to the college in the middle of Taiwan. Teachers can create an test through the item bank by giving their curriculum plan. After students test on the CAT system, teachers can get the pattern from students and compare the ability

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from different class, semester or collage. The CAT system also provide the subscale score, this information can be used by teachers to judge a student's strengths and weaknesses with respect to particular objectives. Students also can learning by themselves through the remedy learning interfaces.

Chinese Proficiency Test and Computer-based testing

Chinese Proficiency Test has become popular in recent years. Such as, United Kingdom language school has included learning Chinese as a foreign language (CFL) in its foreign language learning curriculum. National Security Language Initiative (NSLI) of the United States has identified Chinese language an important national security strategic language. Currently, Test of Chinese as a Foreign Language (TOCFL), Hanyu Shuiping Kaoshi (HSK), Test of Practical Chinese (C. Test), Scholastic Assessment Test (SAT) subject test in Chinese with listening, and Advanced Placement (AP) Chinese language and culture are often used to assess Chinese proficiency (SC-TOP, 2011; HSK, 2011; C. Test, 2011; College Board, 2011a; College Board, 2011b).

The majority of the tests mention before are administered by the traditional paper and pencil tests (PPT) format. With the popularity of computer devices and the development of information technology, computerized tests have become a current trend in testing. Computer-based testing (CBT) has been developing quickly since then as new question formats, alternative models of measurement, improvements in test administration, immediate feedback to test takers, more efficient information gathering (Akdemir & Oguz, 2008; Mills, 2002; Wise & Plake, 1990), and development of new methods of assessment such as simple adaptations of multiple-choice items to more innovative item types (Jodoin, 2003). So far, only AP Chinese Language and Culture and TOCFL have developed their own Chinese language computerized assessment systems (College Board, 2011a). AP exams are used for placement purposes to determine collage students current language level in the United States. In 2003, the College Board launched an AP Chinese Language and Culture course and exam based on the national standards for foreign language teaching and examination formulated by the American Council on the Teaching of Foreign Languages (ACTFL). The purpose of the exam is to evaluate learners Chinese language communication skills in the real life (College Board, 2011a). However, those proficiency tests are build for "non-native Chinese" learners. In this study, we build an undergraduate level Chinese reading proficiency test. This test was build for "native Chinese" college students.

Computerized Adaptive Testing

Figure 1 shows the structure of an adaptive test as a flowchart in this study. The three major steps (starting, continuing, and stopping) were followed the flowchart. The steps were (Wainer, 2000):

a. Starting

The general principle of selecting the next item based on previous response is not helpful when there are no previous responses. Although an examinee's proficiency cannot be estimated from responses to previously administered items when testing begins, the mean of the population of examinees is a reasonable initial guess.

b. Continuing

The next item will be selected by the item selection strategy based on this examinee's temporarily ability, the expected a posteriori (EAP) estimation method is applied for the participant's ability calibration and estimation. In this study item selection strategy is based on the maximum information method. The item selection procedure is the process of selecting an item from the item bank to be administered to the examinee, and that information will be provided as a guideline in the CAT system to indicate which items should or should not be chosen during a test. This procedure will go all the way through and stop as soon as it met the test termination criteria.

c. Stopping

After each item is administered and scored, an interim estimate of the examinee's ability is calculated and used by the item selection procedure to select the next item. An adaptive test can be terminated when a target measurement precision has been attained, when a preselected number of items has been given, or when a predetermined amount of time has elapsed. Any of these rules may be used in its pure form, or a mixture of them can be used.

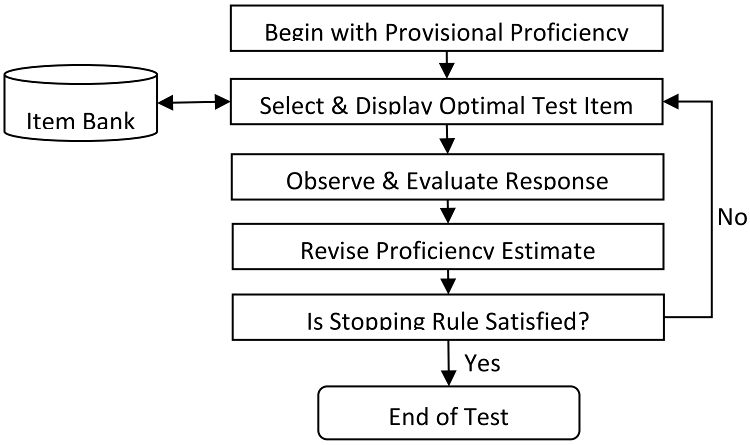

Fig 1. The Procedure of Computerized Adaptive Testing

Item Bank Development and the Effectiveness of CAT Process

This research will develop a Item bank of Undergraduate Level Chinese Reading Proficiency Test. Figure 2 shows the item bank development flowchart in this study.

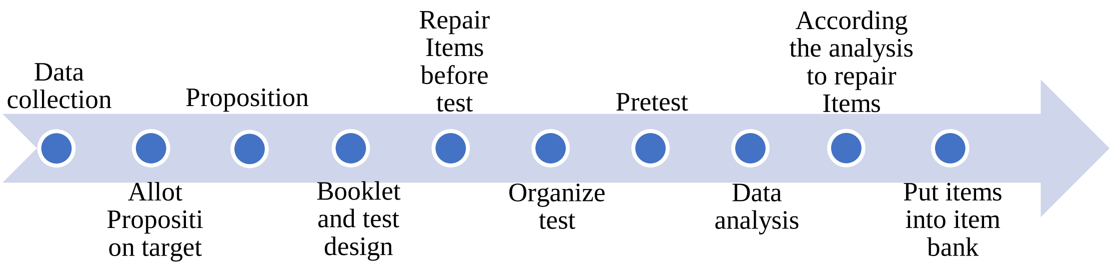

Figure 2. Item bank development flowchart

The framework of Undergraduate Level Chinese Reading Proficiency Test incorporates an overall ability dimension underlying all test items and several ability dimensions specific for each subtest. Overall scale express a unified Chinese ability, and were clustered into measures of four Chinese competency goals. The framework are show as Table 1

Table 1. The framework of Chinese for Freshman Proficiency Test

Overall Scale	Subscale
Chinese Ability	Vocabulary and Grammar (i.e., Character, Pronunciation, Word meaning and Grammar)
	Literary Knowledge (i.e., Classical literature and Modern literature)
	Literature Appreciation
	Culture Knowledge (i.e., Culture inheritance and Life accomplishments)

To develop a Undergraduate Level Chinese Reading Proficiency Test system to assess Chinese ability (overall ability), vocabulary and grammar, literary knowledge, literature appreciation and culture knowledge (subscales) were constructed by fifteen instructors of language and literacy education department. There were 480 items in the item bank. There were around 6,000 empirical data collected from several colleges in Taiwan from 2009 to 2011. The participants in this study were selected from the population of freshman enrolled in the colleges in the middle of Taiwan.

In this study, using simulation data to evaluate the performances of ability estimates in CAT process. The evaluation method is applied the simulate data into CAT process mentioned in Figure 1 to simulate CAT process. At each iteration, CAT assumes one item is draw from item bank and administered to the participant.

In Figure 3, the vertical axis indicates the RMSE of EAP estimation method and the horizontal axis represents the number of administered items. Figure 3 shows that there is a significant difference in RMSE decline as the accumulation of items examinees participated in increased. The RMSE are always less than 1 and the RMSEs are less than 0.6 when the exam items completed reached 8. This result is similar to the study conducted by Chen (2006), Wang and Vispoel (1998).

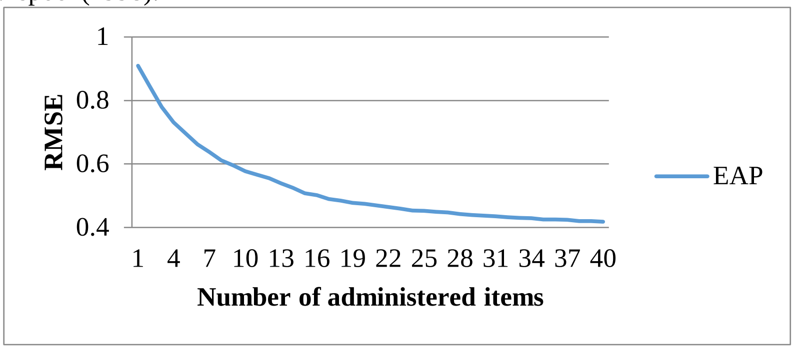

Figure 3. The Performances of ability estimation in CAT

Test Selection Interface: Figure 4 indicates the test selection interface. Each examinee have an account and password which enable them to enter into the system and start the test. Each examinee is required to preselect the scope of testing after entering into the system.

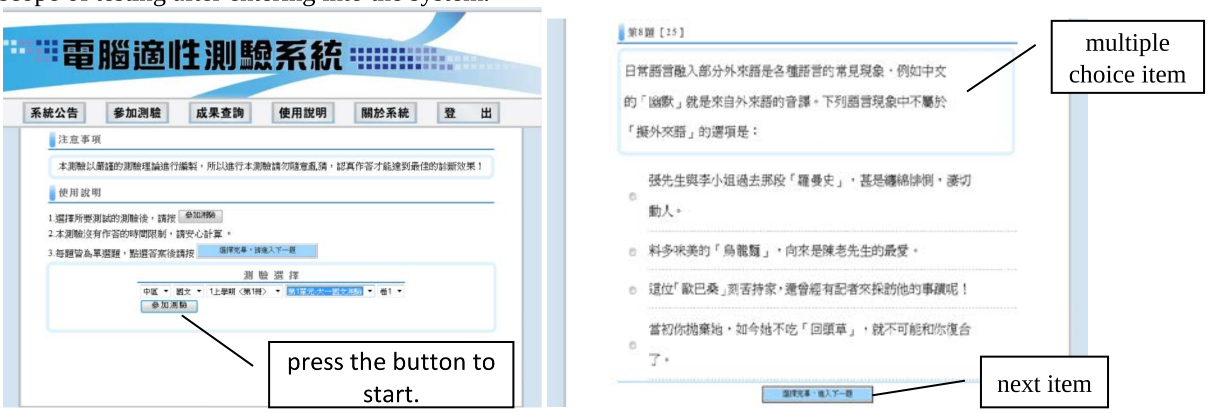

Figure 4. Test Interface

Report Interfaces: When a student completes the test, the computer screen will show an individual assessment report of their own test results. The left portion of the report includes the student’s basic information, the score and percentile of this test. The right half includes the student’s learning records, test dates, test times and the scores. Additionally, the report also lists details of subscale score.

Figure 5. Report Interface

Remedy Learning Interfaces: Student can according to the subscale score report to choose which index to learn. Click on the index can given student learning information. Student can improve the weakness by themselves.

Figure 6. Remedy Learning Interface

Test History Interfaces: Every test the student take will be record. Student can look up their own test history. Also can get their report in each test.

Figure 7. Test History Interface

The Reports of Different Test Groups

Performance from different department

Through the undergraduate level Chinese reading proficiency test, we could saw the difference from different department. We also could saw the different performance in semester. Figure 8 shows the performance from different department in different semester. The results showed that the performance of department A and R were under average. School could provide extra remedy course for them.

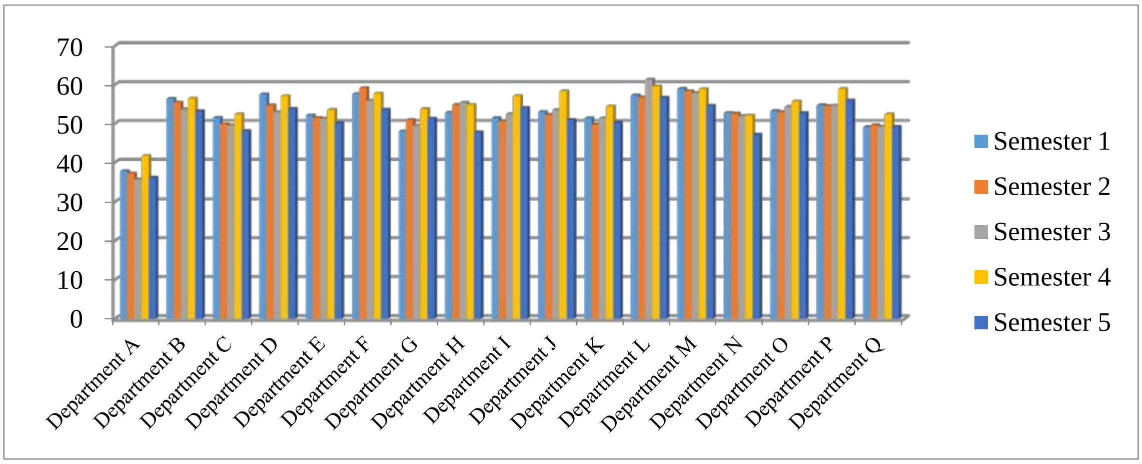

Figure 8 Performance from different department

Performance from different semester

After the test we could tell the difference from different semester. Through the result could adjust the teaching direction from different semester. Figure 8 shows the performance from different college.

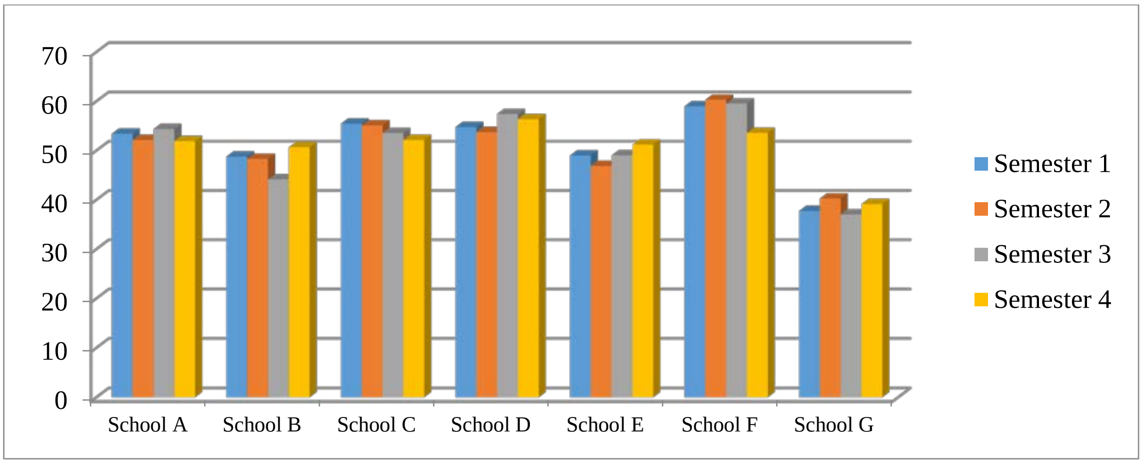

Figure 9 Performance from different semester

Performance from different college

Through the undergraduate level Chinese reading proficiency test, we could saw the difference from different college. We also could saw the different performance in each assessment framework. The result shows that the weakness and advantage from different college. Figure 10 shows the performance from different college.

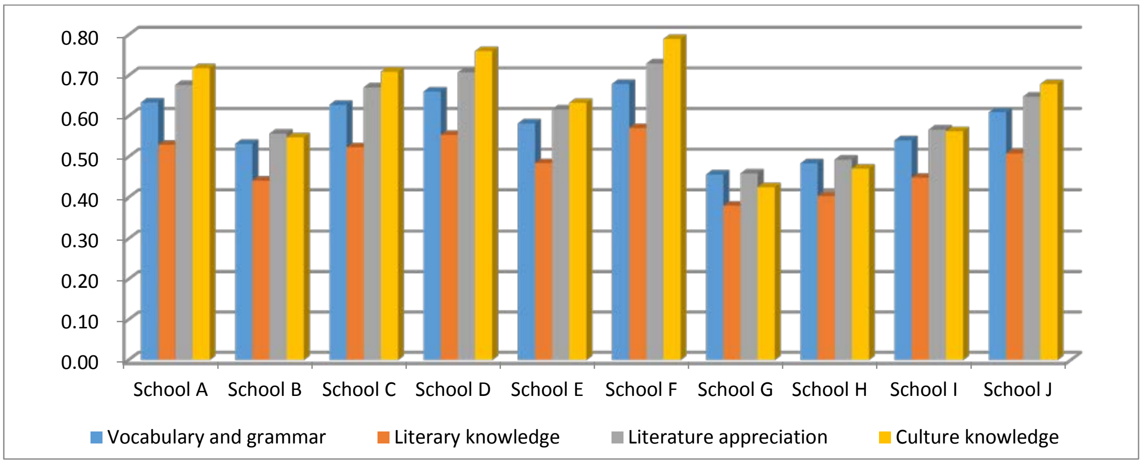

Figure 10 Performance from different college

Conclusion

This study conducted computer-based undergraduate level Chinese reading proficiency test. The participants in this study were undergraduate students in the middle of Taiwan. The data analysis showed that the computerized CPT possess good reliability and validity.

The CAT system developed in this study included a testing interface and a management interface. For the testing interface, examinees participated in testing after login to the interface. The result will also be presented to the examinee as soon as the items are competed. The management interface contains the function of item bank editing. This function also includes test assignment, item bank creation or modification, and item editing in the item bank. In addition, there are different features in the CAT system that are available to the user in accordance to his or her requirement. For example, the user can select different testing formats.

After test on CAT system, students and teacher could get the overall score and subscale score. The overall score could be used in important decisions such as did students pass this subject. Subscale score identifies examinees' relative strengths and weakness, and can also help assess and inform teachers' instructional practice. Using the remedy learning system to practice their weakness after school by themselves.

This directions in future research are as follows:

This CAT system was developed for multiple-choice items. However, in order to fully utilize computers in the test, this CAT system can be amended to fit more diverse and comprehensive items and to make the exam closer to real scenarios.

This study can also focus on adding new functions to the CAT system such as the an initial item setup method, item selection strategy, and exposure rate control, in the near future.

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A DEVELOPMENT OF TRAINING MODEL BASED ON CONSTRUCTIVISM THEORY FOR TEACHERS UNDER THE JURISDICTION OF THE BASIC EDUCATION COMMISSION

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Abstract

This research explored the training model based on constructivism theory for teachers under the jurisdiction of the Basic Education Commission. This model showed the instructional design including the conditions and approaches to be implemented for teaching. The study aimed to: 1) develop instructional design model which consisted of methodological groundwork studies and all literature review for creating the training model based on constructivism theory for teachers; 2) evaluate the appropriateness of the training model; 3) find out the efficiency of training module based on the model using the 85/85 criterion; and 4) explore satisfaction of teachers in training module based on constructivism theory.

Focus group discussions were conducted with eight participants who were experts in constructivism theory and media practice. Data gathered were then certified by five purposively chosen methodological experts in constructivism theory and instructional design. The data were analyzed using means and standard deviation. The level of appropriateness of the training module were also tested for actual implementation to 30 teachers.
The results of this research indicated that the development of training model based on constructivism theory for teachers under the jurisdiction of the Basic Education Commission could be explained using the 5C Model diagram. In this model, five components were analyzed – condition, conflict, catalyst, consideration, and construction. The model integrated the knowledge and learning activities within the management process. In addition, the research results showed that the training module based on constructivism theory for teachers had an efficiency of *(E1/E2) 85.0/85.55* and high level of learner satisfaction.

Keywords: Constructivism Theory, Training Model, 5C Model

INTRODUCTION

Education reforms in Thailand aim to improve the level of education of Thai people. The National Education Act of Thailand, B.E. 1999 was implemented based on the principle that all students have the ability to learn and develop themselves. The experience of the teacher can be enhanced by learning from the training activities. The objectives of teacher trainings have to match with their competencies. Training is a method of learning how to work efficiently (Wichit, 2001). Constructivism has come to dominate both thought and process in education (Fensham, 1992; Matthews, 1998, 2000). The essential functions of the mind consist of understanding and investigating. In other words, building up intellectual structures has constructed reality (Piaget, 1971, p.27). In this paper, an effort has been made to examine the main features of the constructivist epistemology and how learning in training affected the teachers. The main purpose of this study is to research and develop a training model based constructivism theory for teachers under the jurisdiction of the Basic Education Commission.

The Research Methods

First Phase : Studying the training model based on constructivism theory for teachers**.**

Analyzing the elements of constructivism theory.
Analyzing the elements of training theory.
Analyzing the needs of teachers.
Integrating the elements of training and constructivism theory.

Second Phase: Developing the training model based on constructivism theory for teachers and assessment tools.

1. Developing the training model based on constructivism theory for teachers**.**
2. Developing the assessment tools that include the achievement test.
3. Developing the satisfaction questionnaire for teachers.

Third Phase: Developing and evaluating the training module based on constructivism theory for teachers**.**

1. Research design using the One Group Pre-test Post-test Design.
2. Population and samples:

2.1 The population included the teachers under the jurisdiction of the Basic Education Commission Training Course on The Production Media Multimedia, 2010 academic year at Faculty of Education, Chandrakasem Rajabhat University, Thailand.

2.2 Eight participants who were experts in constructivism theory and media practice were included in the focus group discussion. Five respondents were purposively chosen to certify the training model. Thirty teachers were included in the implementation and testing of the training module.

3. Research tools:

3.1 The training model based constructivism theory for teachers.

3.2 The assessment tools (exercise, manual guide, practice, media for training and paper test).

4. Data analysis: Descriptive statistics (means and standard deviation).

FINDINGS

The 5C training model based on constructivism theory for teachers was appropriated with the five experts' consensus (with IOC = 1.0).

Process step: comprise that the elements of Training Base on Constructivism Theory for Teachers are include the Constructivism activities – C_1 : Condition (Objective, Ice break, Stimulate) is driven by BAR (Before Action Review); C_2,: Conflict (Conditioning, Learning by doing, scaffolding) is driven by AAR (After Action Review); C_3 : Catalyst (Internal motivation, External motivation) is driven by Reflex; C_4 : Consideration (Self-Reviewing, Peer-Reviewing) is driven by Bench mark; C_5 : Construction (Present, Discussion) is driven by Best Practice in the 5C model (Figure 1).

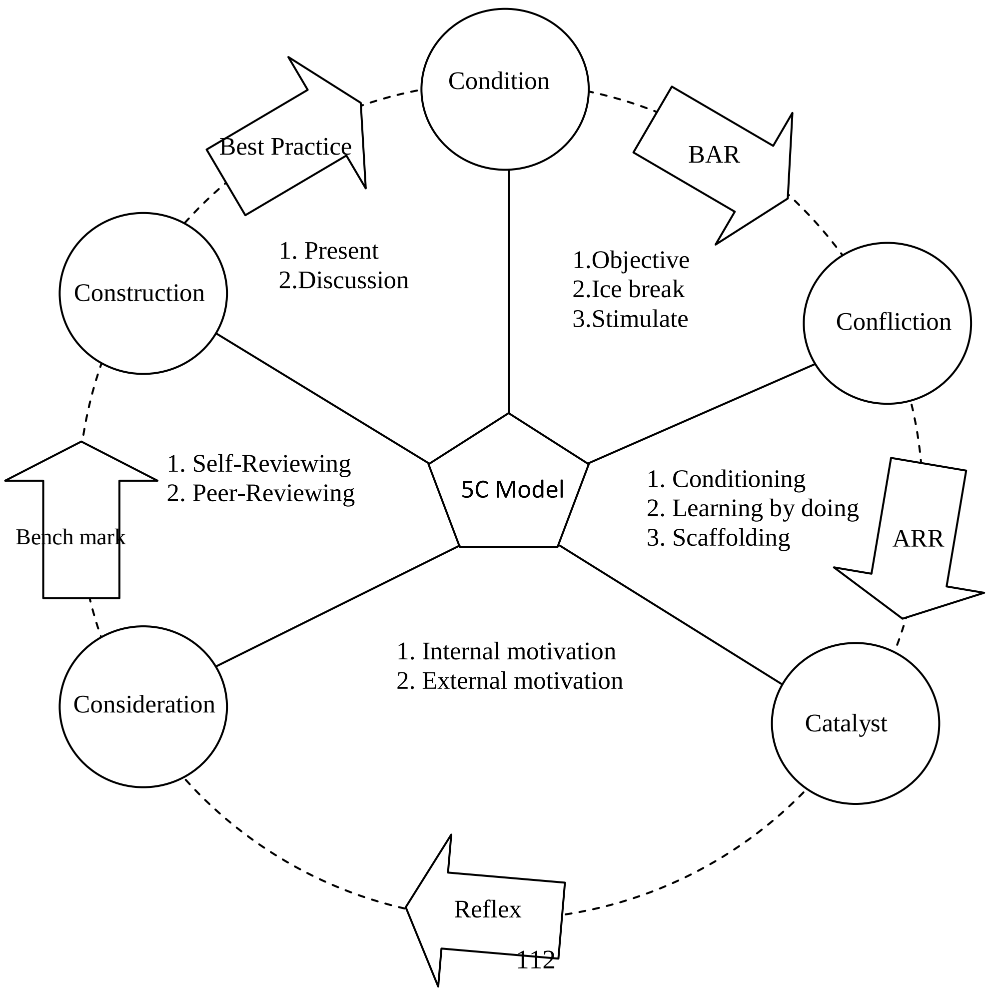

Figure1 : The Training Base on Constructivism Theory for Teachers process – 5C model

3. The efficiency of the Training Base on Constructivism Theory for Teachers process – 5C model was appropriated with the volunteer participants' competency *(E1 / E2 = 85.0 /85.55)* that accord with the efficiency criteria of based learning (85/ 85 Standard) (Whattananarong, 2004) (Table 2).

Table 1: The efficiency of knowledge of Training Base on Constructivism Theory for Teachers process

Volunteer Participants (n=30)	**Formative efficiency evaluation: E1 score = (30)**	**Summative efficiency evaluation: E2 score = (30)**
1	26	26
2	28	28
3	24	24
4	23	23
5	25	25
6	26	26
7	24	24
8	26	26
9	25	25
10	28	28
11	25	25
12	26	26
13	24	24
14	23	23
15	26	26
16	27	27
17	25	25
18	26	25
19	28	27
20	25	26
21	26	24
22	24	26
23	27	29
24	24	26
25	25	28
26	26	25
27	26	26
28	27	24
29	26	27
30	24	27
ΣX	765	770
Efficiency	*85.0*	*85.55*

4. The efficiency of knowledge model Training Base on Constructivism Theory for Teachers process. at the 0.05 level of significance

Table 2. Difference of the mean score from between the training process and the scores from the post-test

Activity	**n**	$\overline{X}$	**S.D.**	**t**	**p**
between trainings	30	25.50	5.54	4.40	.000
after the training (post-test)	30	25.66	5.66	4.45	

p < .05

The level of satisfaction of the training module based on constructivism theory for teachers

Table 3: Level of satisfaction of the training module based on constructivism theory for teachers

Title	$\overline{X}$	S.D.
satisfaction	3.98	0.45 \

CONCLUSIONS

The research found out that the training model based on constructivism theory for teachers under the jurisdiction of the Basic Education Commission and the 5C Model (condition, conflict, catalyst , consideration, and construction) were effective in the design and implementation of instructional systems, especially in training module. The 5C Model has1) The condition use BAR (befor Action Review) in the first step teacher to know objective activity ice beark and stimulate after training. 2) conflict is to action by ARR(After Action review).teacher take conditioning Learning by doing and scarf fording. 3) catalyst is to motivation is reflex internal motivation and external motivation.4) consideration is step the thinking beanch mark self-reviewing and pree-reviewing.5) construction to be new Knowles drive by best practices present,discussion,evaluation.

Constructivism continues to be the dominant research program in education, and it continues to generate new research and insights Finally, Training based on constructivism theory learning technologies have the potential to transform the professional development of teachers; penetrate cultural, discipline, and other barriers; bring educators together to learn, share successes and challenges; present and transfer learning

ACKNOWLEDGEMENT
This research was funded by the Graduate school, Kasetsart University, Thailand.

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A MULTI-FACTOR FUZZY INFERENCE AND CONCEPT MAP APPROACH FOR DEVELOPING DIAGNOSTIC AND ADAPTIVE REMEDIAL LEARNING SYSTEMS

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Abstract

This paper proposes a method for evaluating learning achievement and providing personalized feedback of remedial suggestion and instruction for learners. It functions as a combination of three particular processes. The first is based on learners' test results to calculate the values of four diagnostic factors - accuracy rate, test difficulty, confidence level, and length of answer time. The second is to employ fuzzy theory to infer learning achievement of learners. The third provides personalized feedback for learners based on concept map with cognitive taxonomy. Experimental results reveal that the proposed method can help learners to learn more effectively and efficiently.

Keywords: Learning diagnosis; Fuzzy inference; Adaptive feedback; Concept map; Taxonomy of cognitive objectives

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Introduction

To evaluate learning achievement of learners is an important research topic of adaptive learning systems. Providing students with evaluation reports regarding their test/examination as sufficiently as possible and with the unavoidable error as small as possible is the chief aim of education institutions (Biswas, 1995). In recent years, researchers have proposed various approaches for developing adaptive learning systems based on the personal features or learning problems of learners (Hsu et al. 1998; Chen and Lin 2001; Hwang et al. 2008; Bai and Chen 2008a; Bai and Chen 2008b; Bai and Chen 2008c; Chen and Bai 2009; Lee et al. 2009; Lazarinis et al. 2010). Chen and Bai (2009) presented a method considering the learning degrees and accuracy rates for diagnosing the learning barriers, it can overcome the drawbacks of the method presented by Lee et al. (2009), and can more reasonably diagnose the learning barriers for adaptive learning. However, in their study there are simply two factors taken in consideration for identifying the learning barriers of learners. In addition to the learning degrees and accuracy rates, some researches argued that in order to evaluate more accurately learning achievement, educators must consider multiple criteria, such as the test difficulty, lucky guesses, and length of answer time (Petr 2000; Hameed 2011).

In Petr's method, students were instructed to "Indicate your confidence rating for each answer by circling a number from -5 (very confident it is wrong) to 5 (very confident it is correct)."A confidence score that measured how well the students evaluated the correctness or incorrectness of their answers can reflect the probability a student gives the right answer due to lucky guess or not. Besides, the shorter time spent to answer a hard question correctly implies a stronger knowledge of the concept (Agarwal et al. 2006; Hameed 2011) Hence, this study not only employs the accuracy rates, but also considers the test difficulty, lucky guesses, and length of answer time in the processing of learning achievement diagnosis, attempting to make the diagnosis more completely.

Since Zadeh (1965) proposed the concept of fuzzy set theory, it has been widely used in solving problems in various fields. Some methods have been reported for applying the fuzzy set theory in educational grading systems. According to the previous studies, the fuzzy set theory is proven to be an efficient and effective method to handle the uncertain and vague terms in an assessment environment (Biswas, 1995, Ma & Zhou, 2000, Wang & Chen, 2008, Saleh & Kim, 2009). Since the information of evaluating learning achievement is usually rather imprecise, uncertain and subjective, we consider fuzzy logic technique is suitable for dealing with these kinds of vague situations. Therefore, in this paper the proposed system applies fuzzy set theory to provide expert-like reasoning ability which can infer the learning achievement for providing adaptive learning feedback to learners.

Novak (1998) proposed Concept Map to organize or represent the knowledge as a network consisting of nodes (points/vertices) as concepts and links (arcs/edges) as the relations among concepts. It has been proposed and applied in various domains. For example, Hwang (2003) proposed a conceptual map model which provides learning suggestions by analyzing the subject materials and test results. Tseng et al. (2007) proposed a Two-Phase Concept Map Construction (TP-CMC) approach to automatically construct the concept map by learners' historical test records. Although concept map has shown its effectiveness in helping learners to find out their learning problem, it still lacks some information. In the existing concept map, it only provides the information about the concept and their relationships, while the cognitive objective of each concept cannot be exhibited. Instead of showing that the learner will 'understand the concept', a more precise statement is that the learner will 'summarize the main rules from the instructions to the concept' (Mayer 2002). Research and theory in Cognitive Science have shown that human cognition can be analyzed into Remember, Understand, Apply, Analyze, Evaluate, and Create in the order of complexity (Anderson et al. 2001). By using the taxonomy of cognitive objectives, educators can create a student-centered learning environment that fosters a range of thinking skills, from the recall of factual information to the development of critical thinking and problem solving skills (Gronlund 2004). Therefore, it is meaningful to incorporate cognitive objectives with concept map. After evaluating the learning achievement, the diagnosis report of learning barriers should be provided according to the concept map with cognitive objectives to offer more information than the traditional one.

The purpose of this study is illustrated as follows. First, multiple factors are taken into consideration to provide more flexible and complete diagnosis. Next, we explore fuzzy logic as human thinking and judgment for assessing learners' learning achievement. Finally, according to the diagnosis, the adaptive feedback of remedial suggestion and instruction are provided to learners. The rest of this paper is divided into four sections. Section 2 describes the mechanism for diagnosing learner's learning achievement and the adaptive feedback for learners. Section 3 introduces the implementation of the proposed method. Section 4 presents an experiment to evaluate the performance of the proposed method. Finally, the conclusions are drawn in Section 5.

Methodology

The proposed learning diagnosis mechanism uses multi-factor fuzzy inference and concept map to evaluate learners' learning achievement and generate adaptive feedback and remedial instruction for learners. First, the diagnostic factors are illustrated in Section 2.1. Second, using fuzzy inference to diagnose learning achievement is stated in Section 2.2. Finally, the personalized feedback of remedial suggestion and instruction based on concept map with cognitive taxonomy is depicted in Section 2.3.

Diagnostic factors

As stated above, four diagnostic factors are considered in this study for determining learning achievement: accuracy rate of concept, test difficulty, confidence level (for measuring the lucky guess), and length of answer time. There are three sources utilized to acquire the data of diagnostic factors: testing information assigned by instructors, testing results derived from learners, and relationships among concepts. When selecting a question for testing, the general principle to follow is to ensure the question should be related to a specific concept so that a correct answer implies the possession of knowledge of that concept (Agarwal et al. 2006). Based on the principle, this study assigns a specific concept to each question as shown in Table 1, where $Q_tC_i = 1$ represents 'relevant' and $Q_tC_i = 0$ represents 'irrelevant', $1 \leq t \leq m$, and $1 \leq i \leq p$. Besides, in order to identify how strongly a correct answer implies concept mastery. Each question Q_t should be related to a difficult degree D_t as shown in Table 2, where $0 \leq D_t \leq 1$ and $1 \leq t \leq m$. After the initial setting of questions, the instructor performs a test to record the answers of the learners. The relationship R_{tj} between question Q_t and learner S_j is shown in Table 3, where $R_{tj} = 1$ indicates that learner S_j answered question Q_t correctly; $R_{tj} = 0$ indicates that learner S_j failed to answer question Q_t correctly, $1 \leq t \leq m$, and $1 \leq j \leq n$.

Table 1. Associations between questions and concepts

Questions	Concepts				
	C_1	C_2	C_3	…	C_p
Q_1	Q_1C_1	Q_1C_2	Q_1C_3	…	Q_1C_p
Q_2	Q_2C_1	Q_2C_2	Q_2C_3	…	Q_2C_p
…	…	…	…	…	…
Q_m	Q_mC_1	Q_mC_2	Q_mC_3	…	Q_mC_p

Table 2. Difficulty degree of each question

Questions	Q_1	Q_2	Q_3	…	Q_m
Difficulty Degree	D_1	D_2	D_3	…	D_m

Table 3. Associations between learner's answers and questions

Questions	Learners				
	S_1	S_2	S_3	…	S_n
Q_1	R_{11}	R_{12}	R_{13}	…	R_{1n}
Q_2	R_{21}	R_{22}	R_{23}	…	R_{2n}
…	…	…	…	…	…
Q_m	R_{m1}	R_{m2}	R_{m3}	…	R_{mn}

Regarding the accuracy rate, from the conceptual relationships in test questions shown in Table 1 and the answer record of learners shown in Table 3, the accuracy rate ac_{ij} of the learner S_j with respect to the concept C_i can be calculated by Formula (1) which is the same as used by (Chen and Bai 2009):

$$ac_{ij} = \frac{\sum_{t=1}^{m}(R_{tj} \times Q_tC_i)}{\sum_{t=1}^{m} Q_tC_i} \times 100\% \tag{1}$$

where R_{tj} denotes the record of the learner S_j with respect to the question Q_t, Q_tC_i denotes the relationships of the concept C_i in the question Q_t, $1 \leq j \leq n$, $1 \leq t \leq m$, and $1 \leq i \leq p$.

Regarding the test difficulty, from the conceptual relationships in test questions shown in Table 1 and the difficulty degree of each question shown in Table 2, the average difficulty degree D_{ij} of concept C_i answered correctly by learner S_j can be calculated by Formula (2):

$$D_{ij} = \frac{\sum_{t=1}^{m}(R_{tj} \times Q_tC_i \times D_t)}{\sum_{t=1}^{m} Q_tC_i} \times 100\% \tag{2}$$

where R_{tj} denotes the record of the learner S_j with respect to the question Q_t, Q_tC_i denotes the relationships of the concept C_i in the question Q_t, and D_t denotes the difficulty degree of each question, $1 \leq j \leq n$, $1 \leq t \leq m$, and $1 \leq i \leq p$.

Table 4. Relationships between concepts

Concept	Concepts				
	C_1	C_2	C_3	$\cdots$	C_p
C_1	W_{11}	W_{12}	W_{13}	$\cdots$	W_{1p}
C_2	W_{21}	W_{22}	W_{23}	$\cdots$	W_{2p}
$\cdots$	$\cdots$	$\cdots$	$\cdots$	$\cdots$	$\cdots$
C_p	W_{p1}	W_{p2}	W_{p3}	$\cdots$	W_{pp}

In the adaptive learning environment, the Concept Map can be used to demonstrate how the learning status of a concept can possibly be influenced by the learning status of other concepts (Tseng et al. 2007). In addition, there exist the prerequisite relationships among concepts, so each concept needs to be learned in a dedicated order (Hwang 2003). Regarding the lucky guess influence, we use the prerequisite relationships among concepts to calculate the confidence level of each concept for learners. Confidence level can be defined as the degree that the learner has understood the concept, and it can be used to judge the probability that the learner correctly answered the questions related to a concept due to lucky guesses. Table 4 shows the relationships among concepts, where W_{xy} indicates the prerequisite relationship between the concept C_x and concept C_y, and C_x is the prior knowledge of C_y where $0 \leq W_{xy} \leq 1$. Let C_x be the prior knowledge of C_y, and C_y be the prior knowledge of C_z. If a learner S_j correctly answered the questions with respect to the concept C_y or C_z, then the confidence level of the learner S_j with respect to concept C_y will be increased. If a learner S_j wrongly answered the questions with respect to the concept C_x, then the confidence level of the learner S_j with respect to concept C_y will be decreased. And the increased and decreased value is proportional to the prerequisite relationship between two concepts and the difficulty degree of each question. Hence, the confidence level of the learner S_j with respect to each concept can be calculated by Formula (3)

$$CL_{ij} = \frac{\sum_{k=1}^{p}\sum_{t=1}^{m} Q_tC_k \times W_{ik} \times D_t \times R_{tj} + \sum_{t=1}^{m}\left(\sum_{k=1}^{i-1} Q_tC_k \times W_{ki} \times D_t \times (R_{tj}-1) + \sum_{k=1}^{i+1} Q_tC_k \times W_{ki} \times D_t \times (R_{tj}-1)\right)}{\sum_{k=1}^{p}\sum_{t=1}^{m} Q_tC_k \times W_{ik} \times D_t} \times 100\% \qquad (3)$$

where CL_{ij} denotes the confidence level of the learner S_j with respect to concept C_i, W_{ki} denotes the prerequisite relationship between the concept C_k and concept C_i , R_{tj} denotes the record of the learner S_j with respect to the question Q_t, Q_tC_i denotes the relationships of the concept C_i in the question Q_t, and D_t denotes the difficulty degree of each question Q_t, $1 \leq j \leq n$, $1 \leq t \leq m$, and $1 \leq i, k \leq p$.

Diagnosis based on fuzzy inference

To usefully deal with imprecise information and obtain more precise estimation of the learning achievement of learners, the technique of fuzzy inference is employed. The process is detailed as follows. The input variables of fuzzy inference mechanism are accuracy rate, test difficulty, confidence level and length of answer time. Among these input variables, the accuracy rate, test difficulty and confidence level can be calculated by Formula (1)-(3), while the length of answer time is the total time spending to solve the test by a learner. To present the linguistic variables of input and output for the fuzzy inference mechanism, five trapezoidal membership functions are defined by experts as shown in Fig. 1. The trapezoidal membership function is defined as Formula (4) (Lee and Wang 2008). Then, the fuzzy inference mechanism performs membership functions to compute the membership degrees for each fuzzy input variable.

$$FS(x\colon p1, p2, p3, p4) = \begin{cases} 0, & x < p1 \\ (x-p1)/(p2-p1), & p1 \leq x \leq p2 \\ 1, & p2 \leq x \leq p3 \\ (p4-x)/(p4-p3), & p3 \leq x \leq p4 \\ 0, & x > p4 \end{cases} \qquad (4)$$

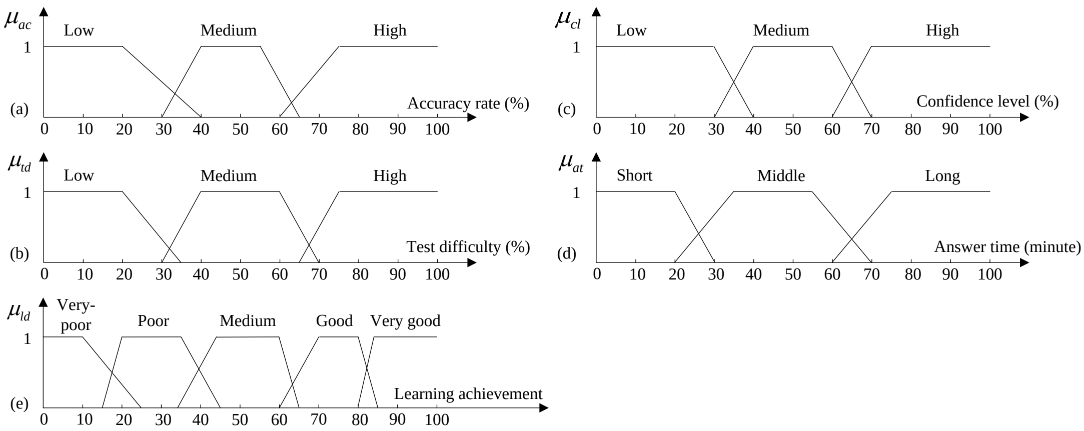


Fig. 1.
The membership functions for fuzzy variables (a) Accuracy rate; (b) Test difficulty; (c) Confidence level; (d) Answer time; (e) Learning achievement

Table 5. Part of the constructed fuzzy rules

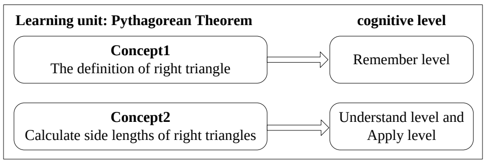
Rule no.	Input fuzzy variables				Output fuzzy variables
	Accuracy rate	test difficulty	confidence level	answer time	learning achievement
R1	Low	Low	Low	Short	Very Poor
R2	Low	Low	Low	Middle	Very Poor
R3	Low	Low	Low	Long	Very Poor
…	…	…	…	…	…
R80	High	High	High	Middle	Very Good
R81	High	High	High	Long	Very Good

Furthermore, this study employs 81 fuzzy rules corresponding to all possible combinations of input terms. The ideas behind the construction of the fuzzy rules are stated as follows. The better the learning achievement is (1) the higher the accuracy rate, test difficulty, and confidence level are; as well as (2) the faster the answer time is. Hence, the experts constructed the fuzzy rules according to these criteria and Table 5 lists part of the constructed fuzzy rules. The Mamdani's minimum implication (Zimmermann 1987) is then used to integrate triggered rules with the same consequences. Finally, the defuzzification method of center of gravity is used to acquire the crisp value to represent learner's learning achievement.

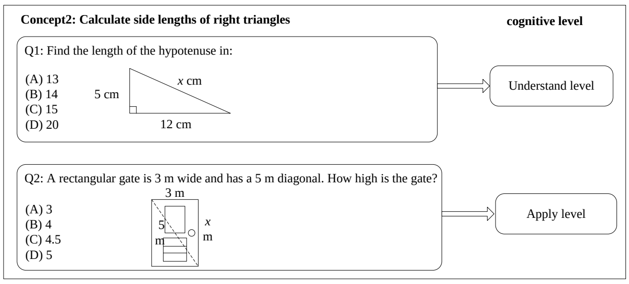
Personalized feedback based on concept map with cognitive taxonomy

In order to help learners learn more effectively and efficiently, a well learning diagnosis system should not only diagnose the learning achievement and barriers, but also provide personalized feedback of remedial suggestion and instruction.

Concept Map has been widely adopted for assessing learning barriers of each concept, thus this study provides the diagnosis of each concept for learners. Additionally, research and theory in cognitive science have shown that human cognition can be analyzed into Remember, Understand, Apply, Analyze, Evaluate, and Create in the order of complexity. In order to provide learners with more learning information, in this study each concept is related to one or more particular cognitive levels, as shown in Fig. 2(a). Besides, each question is also related to a specific cognitive level, as show in Fig. 2(b). Different question types may be suitable for judging different cognitive levels, such as True-False, Multiple-Choice and Matching are suitable for judging the Remember level, Understand level, and Apply level. Essay is suitable for judging the Analyze level, Evaluate level, and Create level. When a learner fails in some concept, it indicated that there is a learning barrier for this learner, and the learner can remedy this concept by enhancing the particular cognitive level of this concept. Hence, the suggestions provided by this study for learners are not only to understand the learning achievement of each concept, but also to help them understand their cognitive level about each concept and constructive process of knowledge acquisition.



(a)



(b)

Fig. 2. Example of concepts and questions related to specific cognitive levels (a) Concepts related to specific cognitive levels; (b) Questions related to specific cognitive levels

To verify the validity of the proposed learning achievement diagnosis mechanism and effectiveness of the personalized feedback of remedial suggestion and instruction, this study also includes the development and evaluation of a diagnostic and adaptive remedial learning system with the adaptive remedial learning materials for learners.

System development

Based on the proposed approach, a web-based Intelligent Diagnosis and Adaptive Remedial (IDAR) learning system has been implemented using PHP and MySQL. IDAR comprises two major modules, one is for the fuzzy-based diagnosis to evaluate learner's learning achievement, and the other is for the adaptive feedback of remedial suggestion and instruction. The architecture of IDAR is depicted in Fig. 3.

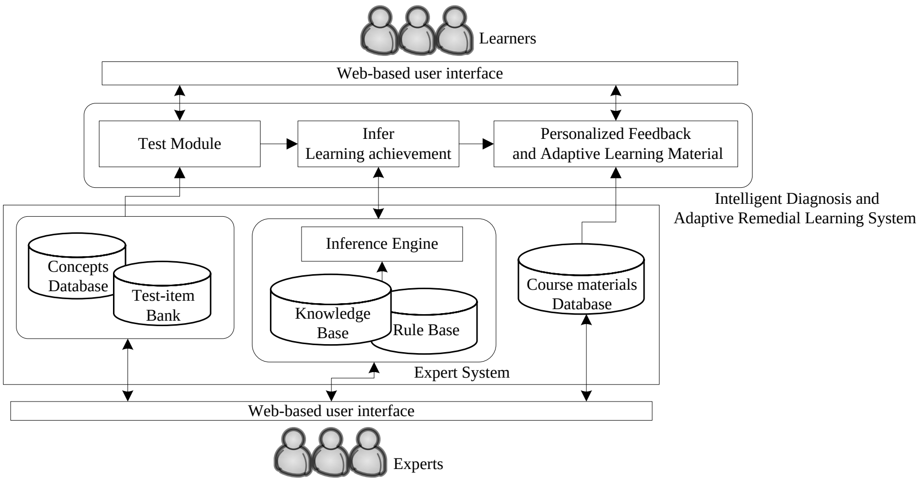
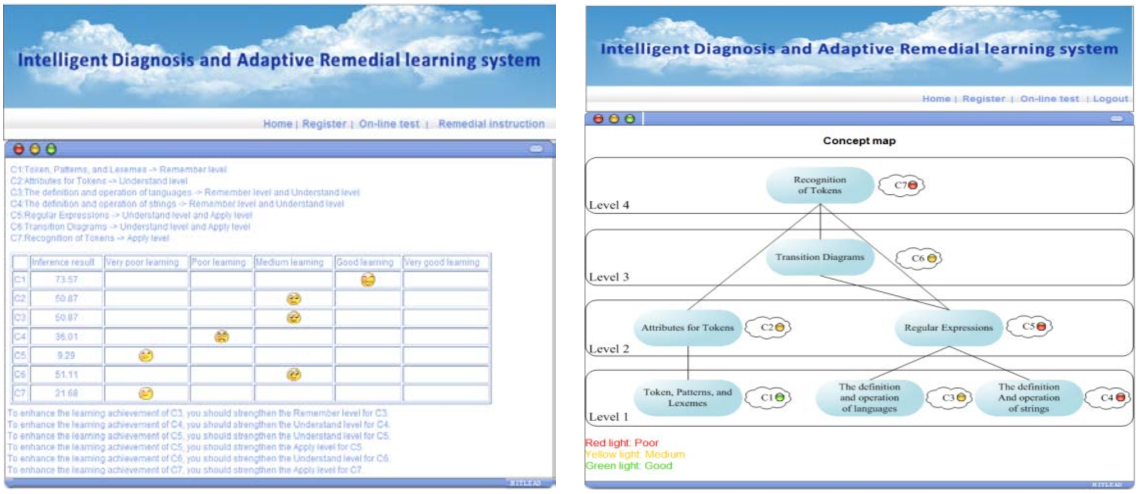


Fig. 3. The architecture of the intelligent diagnosis and adaptive remedial learning system

In the beginning, the experts design testing items and determine the difficulty level of each test item and their relationships between concept and test item, which are stored in the test item bank. In this study, the test item types contain True-False and Multiple-Choice which is suitable for judging the Remember level, Understand level, and Apply level. Besides, the relationship between two concepts is determined by the experts and stored in the concept database. After the learner finish the test, the inference engine uses predefined knowledge base and rule base to infer the learner's learning achievement based on their test results. An example of inference result and the inferior cognitive levels of each concept are provided to the learners as shown in Fig. 4(a).



(a) (b)

Fig. 4. Example of system interface (a) inference result and personalized feedback; (b) personalized remedial instruction

Moreover, this system offers a personalized remedial learning environment for learners to strengthen their understanding of each concept. Fig. 4(b) shows an example of concept map which is a clickable image map. When learners click on one of the concept node, they're directed to the page which presents adaptive learning materials according to their diagnostic results. And the learners of Fig. 4(b) should learn the concepts from level 1 to level 4.

Evaluation and analysis

Experiment design

We conducted an experiment involving fifty-two students enrolled in a course of compiler construction at a

university in Taiwan. The students were grouped into a control group and an experimental group according to their average quiz score of the course, so that their compiler background knowledge were more or less balanced.
Control group: In this group, 25 students used the system diagnosing learning barriers based on the accuracy rate of each concept and providing personalized learning guidance for them. The learning materials which students studied are textbook and their notes.
Experimental group: In this group, 27 students used the IDAR system diagnosing learning achievement based on fuzzy theory and providing personalized suggestions and adaptive learning materials for them.

Analysis of pre-test and post-test

First, all of the students took a pre-test to evaluate whether they had the same knowledge level with regard to learning compiler. Then, according to the learning suggestions, all of the students strengthen their understanding of each concept. After finishing the remedial learning activity, all of the students took a post-test. In the following, an independent-samples t-test was adopted to analyze the experiment results as shown in Table 6, it is obvious that there is no significant ($p > 0.05$) difference between Experimental group and Control group in the pre-test, but significant ($p < 0.05$) difference between Experimental group and Control group in the post-test.

Table 6. The independent-samples t-Test results of the pre-test and post-test results

Tests	Group	N	Mean	S.D.	T	P
Pre-test	Experimental	27	22.74	7.27	-1.129	0.264
	Control	25	24.92	6.58		
Post-test	Experimental	27	33.88	9.78	2.013	0.049*
	Control	25	29.0	7.46		

**p*<.05.

Table 7. The paired t-Test results of learning improvement for the two groups

Group	Tests	N	Mean	S.D.	T	P
Experimental	Pre-test	27	22.74	7.27	-4.681	0.000**
	Post-test	27	33.88	9.78		
Control	Pre-test	25	24.92	6.58	-2.303	0.030*
	Post-test	25	29.0	7.46		

**p*<.05. ***p*<.001.

A paired t-test was then used to analyze the learning improvement for these groups, as shown in Table 7, and the results reveal that both of these two systems could help students to improve their learning performance. However, Table 6 reveals that the IDAR system is more useful than the other one in improving the learning achievement of learners.

Conclusions

This study proposed a novel approach relying on fuzzy inference and concept map, which can diagnose learner's learning achievement and provide adaptive remedial suggestion and instruction. To obtain more accurate diagnostic results, the proposed method considers accuracy rate, test difficulty, confidence level (for measuring the lucky guess), and length of answer time as the diagnostic factors. Besides, by incorporating cognitive objectives with concept map, more complete learning suggestions can be provided to each learner. An experiment has been conducted to evaluate the efficacy of the novel approach. The experimental results show that the proposed method can significantly help learners improve their learning performance. It implies that the proposed method is effective in evaluating and improving learners' learning achievement.

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A NEW APPROACH TO EVALUATION OF UNIVERSITY TEACHING CONSIDERING HETEROGENEITY OF STUDENTS' PREFERENCES

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Abstract

Students' evaluations of teaching are increasingly used by universities to evaluate teaching performance. However, these evaluations are controversial mainly due to fact that students value various aspects of excellent teaching differently. Therefore, in this paper we propose a new approach to student evaluation of university teaching based on data from conjoint analysis. Conjoint analysis is a multivariate technique used to analyze the structure of individuals' preference. In particular, our approach accounts for different importance students attach to various aspects of teaching. Moreover, it accounts explicitly for heterogeneity arising from student preferences, and incorporates it to form comprehensive teaching evaluation score. We have conducted survey and confirmed applicability and efficiency of the proposed approach.

Keywords: Student evaluation of teaching; conjoint analysis; students' preferences; criteria importance; heterogeneity; overall rating.

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Introduction

Students' evaluations of educational effectiveness are widely used to evaluate teaching effectiveness and educational quality in many countries across the world. These evaluations are important as feedback to students, teachers, departments, university administrators, governmental policymakers, and researchers. Hence, it is not surprising that substantive and methodological studies in this area have resulted in a huge research literature. The vast majority of these researches are based on the traditional approach to students' evaluations of teaching (SET), in which students in a specific course taught by a specific teacher evaluate the teaching effectiveness of their teacher, typically near the end of the term (Marsh et al. 2011). Ratings by all students within the course are aggregated to form course-average ratings that are used as feedback to teachers to improve their effectiveness; the ratings are sometimes also used for personnel decisions by administrators, coursework selection by students, and research (Marsh 2007).

In higher education, there is a long history of research and much debate into the appropriate use of SETs (Marsh 2007; Marsh and Roche 2000; McKeachie 1997). One major shortcoming of current procedures is that it is uncertain if the survey items of SET questionnaires properly represent the underlying constructs for which they were developed. Marsh (2007) suggested that effective teaching is a hypothetical construct for which there is not a single indicator and the validity of the dimensions of student evaluations should be demonstrated through a construct validation. Both, researchers and practitioners (Abrami and d'Apollonia 1991; Cashin and Downey 1992; Marsh and Roche 1993) agree that teaching is a complex activity with multiple interrelated components (e.g., clarity, interaction, organization, enthusiasm, feedback). Hence, it should not be surprising that SETs, like the teaching they are intended to represent, are also multidimensional. Particularly formative/diagnostic feedback intended to be useful for improving teaching should reflect this multidimensionality. For example, a teacher can be organized but lack enthusiasm or he can be always available for students but lack clarity.

There are many ways of evaluating educational activity and therefore the teaching staff. Berk (2005), in a recent review, describes up to 12 varieties of evaluation. Most evaluations are represented by a Likert-format scale consisting of items that have been designed to assess some aspect of teaching. Responses to these items are then averaged to produce a mean teaching performance score (Witte and Rogge 2011). This average is then used as an index of teaching effectiveness and used for formative and/or summative evaluation. A somewhat similar approach consists of summing the ratings and expressing them as a percentage to the maximal attainable overall rating (Liaw and Goh 2003). A third way is asking students to rate the overall performance of the teacher on one single scale (Davies et al. 2007; Ellis et al. 2003).

However, some questions arise to be answered. First, whether all the aspects of teaching are equally important for students and whether students' attitudes are homogeneous, i.e. what is the structure of their preferences toward different aspects of teaching? Second, if there is heterogeneity of preferences, in which way and to what extent it influences the overall evaluation of teacher as well as his rank. Did averaged scores hide the real situation?

An appropriate approach to elicit students' preferences is conjoint analysis, a multivariate technique used to understand how an individual's preferences are developed. It originated in mathematical psychology (Luce and Tukey 1964), and was first introduced in marketing research to evaluate consumer preferences for hypothetical products and services (Green and Rao 1971). Nowadays, it is widely used for designing optimal products and product lines (Kuzmanovic and Martic 2012), to understand the preferences in various markets including retail (Kuzmanovic and Obradovic 2010), transportation (Hensher 2001), telecommunication (Kim 2004; Kim et al. 2008). It is also used in the health care field for eliciting patients' and community's preferences for health services (Kuzmanovic et al. 2012; Ryan and Ferrar 2000).

However, only a few studies have used the conjoint analysis within the education industry. Soutar and Turner (2002) used conjoint analysis and cluster analysis to suggest a better university education system for students. Hur and Pak (2007) attempted to identify the preferred subjects for an after-school computer education course in elementary schools by means of conjoint analysis. Sohn and Ju (2010) used conjoint analysis to assign the weights of those four components to effectively recruit the science high school students who have a high quality. Kim, Son, and Sohn (2009) used conjoint analysis to determine the most influential attributes of English Medium Instruction (EMI) classes, and to develop a customized EMI class system for university students whose mother tongue is not English.

In this paper we propose a new approach to student evaluation of teaching which takes into account the students' preferences for various aspects of teaching, as well as possible heterogeneity of their preferences. Using illustrative example we will confirm efficiency of proposed approach in practice. The approach is expected to serve as a practical guideline that, subject to possible modifications in the future, may become an essential tool used by universities for their continuous improvement programs.

The paper is organized as follows. Section 2 addresses some basic concepts of conjoint analysis, including the procedure for determining the criteria importance. The proposed methodological framework of student evaluation of teaching based on conjoint data is also given in this section. The proposed approach to evaluation of teaching is tested through the illustrative example given in Section 3. Section 4 provides the concluding remarks that summarize the most important contributions of the paper.

Theoretical framework

Conjoint analysis

Conjoint analysis, sometimes called ‘trade-off analysis’, reveals how people make complex judgments. The technique assumes that complex decisions involve not only one factor or criterion, but rather several factors ‘considered jointly’. It is based on the simple premise that consumers evaluate the value of a product or service by combining the separate utilities provided by each product attribute.

Conjoint experiments involve individuals being asked to express their preferences for various experimentally designed, real or hypothetical alternatives. These hypothetical alternatives are descriptions of potential real-world alternatives, in terms of their most relevant features or attributes (both quantitative and qualitative). Lists of attributes describing single alternatives are called profiles or concepts. Typically, the set of relevant attributes is generated by expert opinions, reviewing the research literature and performing pilot research with techniques such as focus groups, factor listings, or repertory grids. Two or more fixed values, or “levels”, are defined for each attribute, and these are then combined to create different profiles. The experimental procedure involves profiles being presented to respondents who are asked to express their preferences by rating or ranking these profiles.

Having collected the information on individual preference, the responses need to be analyzed. The simplest and most commonly used utility model is the linear additive model. This model assumes that the overall utility derived from any combination of attributes of a given good or service is obtained from the sum of the separate part-worths of the attributes. Thus, respondent *i*’s predicted conjoint utility for profile *j* can be specified as follows:

$$U_{ij} = \sum_{k=1}^{K} \sum_{l=1}^{L_k} \beta_{ikl} x_{jkl} + \varepsilon_{ij}, \; i = 1,...,I, \;\; j = 1,...,J, \qquad (1)$$

where I is the number of respondents; J is the number of profiles; K is the number of attributes; L_k is the number of levels of attribute *k*. β_{ikl} is respondent *i*’s utility with respect to level *l* of attribute *k*. x_{jkl} is such a (0,1) variable that it equals 1 if profile *j* has attribute *k* at level *l*, otherwise it equals 0. ε_{ij} is a stochastic error term.

The parameters β_{ikl} are estimated by a regression analysis. These beta coefficients, also known as part-worth utilities, can be used to establish a number of things. Firstly, the value of these coefficients indicates the amount of any effect that an attribute has on overall utility of the profiles– the larger the coefficient, the greater the impact. Secondly, part-worths can be used for preference-based segmentation. Namely, given that part worth utilities are calculated at the individual level, if preference heterogeneity is present, the researcher can find it. Therefore, part-worths can be used for preference-based segmentation. Respondents who place similar value to the various attribute levels will be grouped together into a segment. Segmentation of conjoint part-worths produces true “benefit segments”. Widely used method for preference-based segmentation across industries is *k*-means cluster procedure. Thirdly, part-worths can be used to calculate the relative importance of each attribute, also known as an importance value. These values are calculated by taking the utility range for each attribute separately, and then dividing it by the sum of the utility ranges for all of the attributes. Thus the relative importance that *i*th respondent assigned to the attribute *k* is given by

$$W_{ik} = \frac{\max\{\beta_{ik1}, \beta_{ik2}, ..., \beta_{ikL_k}\} - \min\{\beta_{ik1}, \beta_{ik2}, ..., \beta_{ikL_k}\}}{\sum_{k=1}^{K} \left(\max\{\beta_{ik1}, \beta_{ik2}, ..., \beta_{ikL_k}\} - \min\{\beta_{ik1}, \beta_{ik2}, ..., \beta_{ikL_k}\} \right)}, \; i = 1,...,I, \, k = 1,...,K \qquad (2)$$

These individual level impedances are then averaged to include the respondents with similar preferences. Thus, the importance of attribute *k* in segment *s* is given by:

$$W_{ks} = \frac{1}{I_s} \sum_{i=1}^{I_s} W_{ik}, \quad k = 1,...,K, \, s = 1,...,S, \qquad (3)$$

where I_s is the number of respondents from the segment *s*.

Part-worth utilities can be further used to obtain overall utility values for all possible combination of attribute levels. It will be done by inserting the appropriate part-worths into equation 1.

Methodological framework of proposed approach

The approach proposed here for the evaluation of teachers by students, includes two-part survey. The methodological framework of proposed approach is given in Figure 1.

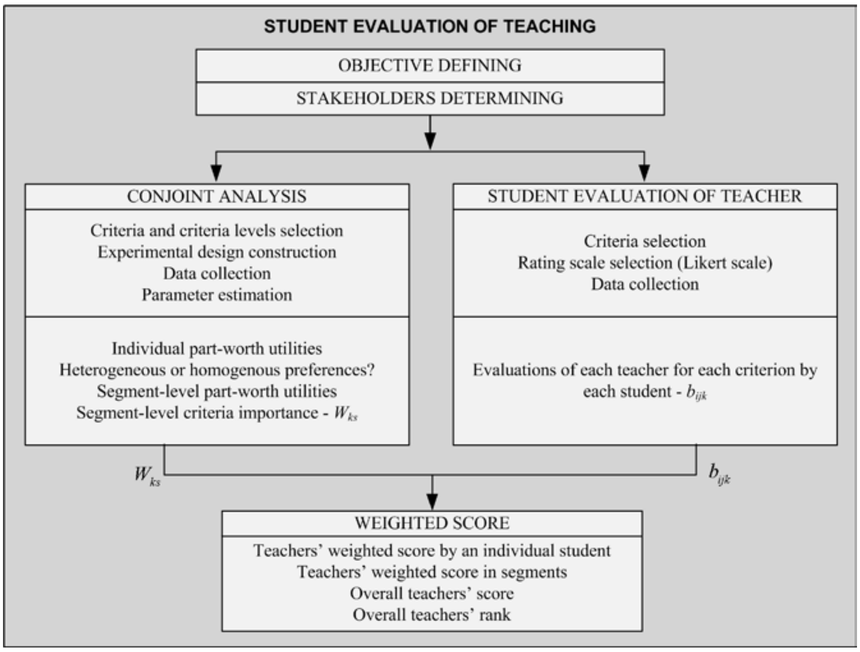

Fig. 1. Methodological framework of proposed approach

One aspect of procedure involved using conjoint analysis to determine the preferences of individual students according to specific attributes (here denotes as criteria), as well as criteria importance. Whether the population is heterogeneous is determined, as well as the extent of heterogeneity, thus segments of different preferences are insulated, and criteria importance in those segments are determined. Along with that, conventional evaluation of teachers by students is done, with the Likert scale, where students evaluate each teacher on every presented criterion. After collecting data on preferences and evaluations, they are summarized in order to formulate a comprehensive evaluation of the efficiency of teachers (here denoted as Weighted Score).

These two studies can be conducted simultaneously on the same sample of students, or if it is not possible from any reason, they can be done as two independent studies. In the second case, in order to create comprehensive evaluation of the teachers' efficiency, aggregated data should be used.

Because not all criteria are equally important for all students or segments, it is suggested that criteria importance are used as weighting factors (weights), i.e. to multiply scores assigned to individual teachers by the value of criterion importance, to produce overall score. Formally, if *i*th student belongs to *s*th segment, then the weighted score of the teacher ***j***, by the student, equals:

$$WSI_{ij} = \sum_{k=1}^{K} W_{ks} b_{ijk}, \quad i = 1,...,I_s, \; s = 1,...,S, \quad j = 1,...,J \quad , \tag{4}$$

where W_{ks} is the importance of the *k*th criterion in the segment *s*, and b_{ijk} is a score by the *i*th student assigned to *j*th teacher, judging by the *k*th criterion. In the case of a sample of homogeneous preferences, the weights are determined by the aggregated criteria importance values.

In addition to weighted scores of an individual student for each teacher, the weighted scores in all isolated segments (*WSS*) can be determined, as well as in general at population level. Weighted score of the *j*th teacher in segment *s* is calculated as follows:

$$WSS_{js} = \frac{1}{I_s} \sum_{i=1}^{I_s} \sum_{k=1}^{K} W_{ks} b_{ijk}, \quad s = 1,...,S, \quad j = 1,...,J \; , \tag{5}$$

while the overall weighted score (*WSO*) of the teacher *j* at the course level i.e. the whole population level, is equal to:

$$WSO_j = \frac{1}{I}\sum_{s=1}^{S}\sum_{i=1}^{I_s}\sum_{k=1}^{K} W_{ks} b_{ijk}, \quad j = 1,...,J \tag{6}$$

Using the obtained scores, the teachers can be further ranked by any of the criteria, and comprehensive. It can be shown that in some situations the same teacher is extremely differently evaluated in isolated segments. If these segments are significantly different in size, this should be borne in mind when considering rank and effectiveness of teachers. This will be shown at illustrative example.

Illustration

Conjoint data

In order to illustrate the proposed methodology, and confirm the possibilities of its application for student evaluation of teaching we used the conjoint data previously collected. The list of criteria and their levels used in the study as well as mean part-worths assigned to each of the criteria levels are given in Table 1, while the importance scores of attributes are shown on Figure 2.

It can be notice that the most important criterion on aggregate level is A1 (Clear and understandable presentation), followed by A2 (Methodical and systematic approach), A3 (Tempo of lectures) and A9 (Teacher availability). These four criteria cover almost 60% of the total importance. However, the question is whether these results reflect the student preferences truly. That is, if all the students in the sample most prefer clarity of the teacher's presentation, or whether they less prefer teacher's preparedness for lecture? And whether it is for all students the teacher-student relationship negligible significant?

Table 1. Criteria, corresponding levels and part-worth utilities (aggregated and segment level)

No	Criteria	Criteria levels	Part-worth utilities		
			Aggregate	Segment 1 n=53 (37%)	Segment 2 n=90 (63%)
A1	Clear and understandable presentation	Yes	0.836	0.46	1.05
		No	-0.836	-0.46	-1.05
A2	Methodical and systematic approach	Yes	0.692	0.46	0.83
		No	-0.692	-0.46	-0.83
A3	Tempo of lectures	Moderate	0.446	0.32	0.52
		Too fast	-0.123	-0.26	-0.04
		Too slow	-0.324	-0.06	-0.48
A4	Preparedness for a lecture	Good	0.279	0.14	0.36
		Poor	-0.279	-0.14	-0.36
A5	The accuracy of arrival to the lecture	On time	0.309	0.32	0.30
		Late	-0.309	-0.32	-0.30
A6	Encouraging students to participate in classes	Yes	0.316	0.54	0.18
		No	-0.316	-0.54	-0.18
A7	Informing students about their work	Yes	0.335	0.28	0.37
		No	-0.335	-0.28	-0.37
A8	Considering student comments and answering questions	Yes	0.316	0.46	0.23
		No	-0.316	-0.46	-0.23
A9	Availability (through individual teacher/student meetings or via e-mail)	Always available	0.220	0.31	0.17
		Mostly available	0.041	-0.19	0.18
		Mostly unavailable	-0.261	-0.11	-0.35

A more detailed analysis revealed heterogeneity in student preferences. Therefore, a cluster analysis was performed to classify respondents into more homogeneous preference groups.

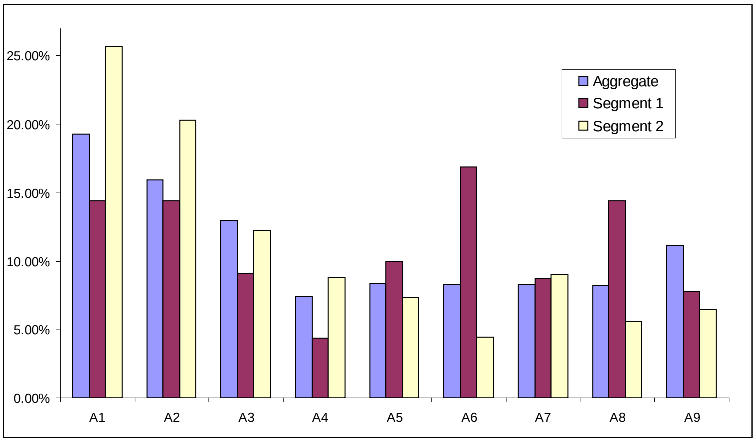

Figure 2. Aggregated and segment level criteria importance

The most important criterion to segment 1 is A6 (Encouraging students to participate in classes), followed by three equally important criteria, A1, A2 and A8 (see Fig. 2), while the least important criteria in this group of student is A4 (Preparedness for a lecture). The criterion with the greatest importance in segment 2 is A1 (Clear and understandable presentation), followed by the criterion A2 (Methodical and systematic approach). Other criteria are much less important. It is interesting that the criterion with the highest importance value in the first segment, A6, is by far in last place in this (second) segment.

The impact of heterogeneity of students' preference on the overall evaluation of teaching

Given that the survey revealed heterogeneity in students 'preferences for different aspects of teaching we analyzed its effects on the overall evaluation of certain teacher. For that purpose, Table 3 provides ratings of 20 teachers from a randomly selected *i*th student (columns A1 to A9). Ratings are on a scale from 1 to 5, with 1 being the lowest and 5 the highest score for given criterion. The analysis is performed first under the assumption that preferences are taken into account, but at the aggregate level, then the assumption is the student belongs to segment 1, and finally, that he belongs to segment 2. These results (Weighted Scores), as well as evaluations provided as average score by all criteria (Mean Score) are shown in Table 3. For both measures, corresponding ranks of teachers are given in the brackets.

Table 3. Teachers' evaluations by randomly selected student (using different evaluation measures)

	Scores per criteria									Mean score	Weighted scores (WSI)		
Teacher	A1	A2	A3	A4	A5	A6	A7	A8	A9	Value	Aggregate	Segment 1	Segment 2
Teacher 1	5	5	5	5	4	4	5	5	5	4.78 (1)	4.83 (1)	4.73 (2)	4.88 (1)
Teacher 2	4	5	5	5	4	5	5	5	5	4.78 (1)	4.72 (3)	4.76 (1)	4.67 (4)
Teacher 3	4	4	5	5	5	5	4	5	5	4.67 (3)	4.56 (4)	4.63 (3)	4.45 (7)
Teacher 4	5	5	5	5	5	4	4	4	5	4.67 (3)	4.75 (2)	4.60 (4)	4.81 (2)
Teacher 5	5	5	5	5	4	4	4	4	4	4.44 (5)	4.56 (5)	4.42 (6)	4.67 (3)
Teacher 6	4	4	4	4	4	5	5	5	5	4.44 (5)	4.36 (8)	4.48 (5)	4.26 (8)
Teacher 7	3	4	5	5	3	4	5	5	5	4.33 (7)	4.20 (10)	4.20 (9)	4.09 (11)
Teacher 8	5	5	5	4	4	4	4	3	5	4.33 (7)	4.51 (6)	4.31 (8)	4.59 (5)
Teacher 9	5	5	5	5	3	3	4	3	5	4.22 (9)	4.42 (7)	4.09 (10)	4.56 (6)
Teacher 10	4	5	3	3	4	5	4	5	5	4.22 (9)	4.23 (9)	4.40 (7)	4.16 (9)
Teacher 11	5	5	5	4	3	1	1	1	2	3.00 (16)	3.43 (14)	2.92 (17)	3.81 (12)
Teacher 12	5	5	4	4	5	1	1	1	1	3.00 (16)	3.36 (16)	2.95 (16)	3.77 (13)
Teacher 13	3	2	5	4	1	4	1	2	5	3.00 (16)	3.06 (18)	2.89 (18)	2.92 (19)
Teacher 14	3	3	3	3	4	4	4	4	5	3.67 (11)	3.55 (12)	3.66 (12)	3.39 (16)
Teacher 15	3	3	3	4	5	3	4	3	5	3.67 (11)	3.55 (13)	3.49 (14)	3.46 (15)
Teacher 16	2	2	2	4	5	4	5	4	5	3.67 (11)	3.31 (17)	3.51 (13)	3.06 (18)
Teacher 17	5	5	4	3	3	3	3	3	4	3.67 (11)	3.95 (11)	3.74 (11)	4.11 (10)
Teacher 18	1	1	1	5	5	5	5	5	1	3.22 (15)	2.62 (20)	3.18 (15)	2.41 (20)
Teacher 19	5	5	5	1	1	1	1	1	5	2.78 (19)	3.38 (15)	2.83 (19)	3.59 (14)

Teacher 20	5	5	5	1	1	1	1	1	1	2.33 (20)	2.93 (19)	2.51 (20)	3.33 (17)

Based on the results shown in Table 3, it can be seen that discriminatory power of the "Mean score" approach is very poor. Some teachers with qualitatively different characteristics achieve the same mean score value. For example, four teachers have the same mean score of 3.67, i.e. Teacher 14, 15, 16 and 17, while there is vast rating diversity according to criteria, what could be seen from table 3.

On the other hand, if the criteria importance derived from conjoint analysis is used as criteria weights (either at the aggregate level or at segment level) much better results are obtained (see Table 3). Discriminatory power of this approach, even viewed at the aggregate level, is much better. The ranks of teachers are clearly defined, and there are not teachers with the same rank. In addition, the ranks are different, some are lower and some higher than in the case of Mean Score approach. This makes sense because better rating of more importance criterion increases overall assessment score more than better rating of less criterion importance.

It can be further seen that the overall scores and ranks, for the same ratings, are significantly different from segment to segment. This is especially obvious in Teachers 9, 11, 14 and 18. This information may be of particular importance when the segments are of substantially different sizes, or when their preferences are significantly different. Simplification could hide substantially important information, and the results would be distorted image of reality.

We performed another analysis and compared the results. We analyzed overall ratings for 8 teachers given by 10 students. These are generated (hypothetical) scores for hypothetical teachers, because in conducting conjoint analysis, conventional evaluation of specific teachers is not conducted.

According to the identified segment sizes, we also assumed that 4 out of 10 students belong to the segment S1, while remaining 6 belong to the segment S2. Table 4 presents the standard summary measures derived from two teaching evaluation instruments: the conventional teaching evaluation instrument (Mean Score) and proposed approach based on conjoint data (Weighted Score). Corresponding teachers' ranks are given in the brackets.

Table 4. Summary measures for eight teachers (ranks are in the brackets)

	Conventional approach (Mean Score)	Proposed approach (Weighted Scores)		
Teacher	Overall	Segment 1	Segment 2	Overall
1	4.49 (1)	4.68 (1)	4.39 (3)	4.51 (2)
2	4.49 (1)	4.25 (4)	4.62 (1)	4.47 (3)
3	3.20 (8)	3.70 (6)	3.40 (8)	3.52 (7)
4	4.32 (3)	4.55 (2)	4.50 (2)	4.52 (1)
5	3.92 (4)	4.29 (3)	3.99 (4)	4.11 (4)
6	3.64 (6)	3.49 (8)	3.52 (7)	3.51 (8)
7	3.62 (7)	3.88 (5)	3.70 (6)	3.77 (5)
8	3.92 (4)	3.51 (7)	3.82 (5)	3.69 (6)

As in the previous analysis, data given in Table 4 indicate poor discriminatory power of the conventional approach based on the averaging ratings by criteria and at the level of the sample, without taking into account student preferences. Consider for example Teacher 5, whose Mean score value equal to 3.92. If we take into account the heterogeneity of preferences, and if these preferences are incorporated into an overall score, weighted score for Teacher 5 in segment 1 is 4.29, in segment 2, this value is 3.99, and the Overall score is 4.11. It may be noted that ratings, both at the segment and sample level, are significantly higher than the Mean score, so it can be concluded that this teacher is underestimated if preferences are not taken into account.

On the other hand, consider Teacher 8. His Mean Score value is also 3.92, but the teacher was, in both segments and the overall rated lower by Weighted Score approach (3.51, 3.82 and 3.69 respectively). In other words, the teacher may be overestimated if student preferences and their heterogeneity are not taken into account. A similar situation can be observed in the case of some other teachers.

Let us now consider the ranks of teachers obtained by the previously discussed two approaches, and compare them. Consider first Teacher 4. He is third-ranked according to conventional approach, but first-ranked according to approach we proposed. The same teacher is better ranked in both segments (rank is 2) than according to conventional approach. In the case of Teacher 2, situation is reversed. He is first-ranked according to conventional approach, but third-ranked in our approach. However, in this teacher case, particularly important are information on the rank in the segment. In fact, this teacher was at fourth place in segment 1, while first-placed in segment 2. A similar analysis could be done for other teachers.

Table 5. Correlation between evaluation measures

	Weighted Score (Seg. 1)	Weighted Score (Seg. 2)	Weighted Score (Overall)	Mean Score
Weighted Score (Seg. 1)	1			
Weighted Score (Seg. 2)	0.714	1		
Weighted Score (Overall)	0.929	0.881	1	
Mean Score	0.649	0.918	0.761	1

Table 5 provides correlation between measures previously discussed. Correlation of ranks in Segment 1 and Segment 2 is quite low (0,714), which makes sense, because these are groups of students with different preferences. It is also notable that correlation of ranks by the conventional approach and our approach (weighted score) is 0,761.

Conclusions

The paper proposes a new approach to student evaluation of university teaching based on data from conjoint analysis. Proposed approach includes two-part study. The first part involves the use of conjoint analysis in order to determine the students' preferences toward specific aspect of teaching, as well as importance of those aspects. It also determines whether and to what extent the population is heterogeneous. Accordingly, the groups of students with similar preferences are identifying. The second part of the study includes the conventional evaluation of teachers by students. Using the Likert scale students evaluate each teacher by each of the specified aspects. After the data on preferences and ratings are obtained, they are summarized in order to formulate the comprehensive evaluation of the teachers' efficiency.

Using real conjoint data, we tested proposed approach. First, we show that the proposed approach has better discriminator power than conventional approach to teaching and teacher evaluation. But it also offers the possibility of further deeper analysis of student preferences, which could be used to get a better idea of true picture, and assess more objectively the efficiency and effectiveness of teachers. It is possible to take into account the heterogeneity in the creation of a comprehensive evaluation.

Even in situations where the research is carried out separately, it is possible to identify the aggregate preferences of students based on conjoint analysis, and using those data to calculate weighted score for each teacher. This has proved the usage power of our approach in practice.

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A PROPOSAL FOR METHODOLOGY FOR NEGOTIATION PRACTICUM WITH EFFECTIVE USE OF ICT
- A TECHNOLOGY ENHANCED COURSE FOR COMMUNICATION FOR TRUST BUILDING -

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Abstract

Abstract: This paper purports to demonstrate a problem solving case in the course of the development of methodology, in which the quality of the negotiation practicum is maintained or raised without sacrificing the class contact hours for the lessons for reading comprehension skills, on which the essence of negotiation practicum is solely based. In this problem solving, the effective implementation of the ICT is crucially employed.

In an effort to foster better communication skills to build a sound relationship (one of the fundamental academic skills to be acquired as a university student) during the four years of academic life, Kansai University has been introducing a new genre of course in the general education especially for freshmen and sophomores. It is a negotiation practicum in which students learn the basic communication skills through role modeling in simulated situations. Although the intention for developing a new course was great, this new attempt faced some difficulties in order to achieve a higher level of learning outcome. In the course, in order to describe in detail the simulated situation reflecting on actual real-life situation, students are required to demonstrate high level of reading comprehension competency in order to read carefully the detailed description of the situation and to understand and analyze the view points of the characters so that the students can clearly set the mission, associated zopa, and it batna before they exercise the negotiation in the role playing session.

This paper reports an optimal solution making use of the information technology without sacrificing the quality of the negotiation practicum due to the students' low level of reading comprehension skills.

Keywords: course development, PBL, communication, empathy, negotiation, ICT, reading comprehension, role playing

Instroduction

This paper purports to demonstrate a problem solving case in the development of a new communication course with negotiation. It is stated that the quality of the negotiation practicum is maintained without sacrificing the course contact hours that are spent only for raising the students' reading comprehension skills.

It has been a common practice that the academic education is based on the fundamental concept of the communication being mainly composed of logic in information. As a matter of fact, in the last few years, the universities in Japan have just begun offering such courses as logical thinking, critical thinking, and debate as subjects for the general education to freshmen and sophomores before they begin their special areas of study. However, it has been revealed that human communication is not mainly based on the logical thinking but rather on empathy. In other words, the basis of communication may be supported not mainly by logic or critical thinking but more or less by some empathy driven factor. Because the university has the mission to raise promising potential members for the future society, a new concept for a course has come out in which the successful communication consists of both logical and critical thinking on the one hand, and emotion or empathy on the other. We have been forgetting that the main purpose of communication is for building trust.

It is natural that a new course design will encounter some difficulties. This new practicum based course is heavily dependent on students' reading comprehension skills to deeply understand the description of the detailed situation in which various levels of negotiation processes are involved. Thus, the low level of students' reading

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comprehension skills will reduce the understanding of the description. This paper attempts to tackle with such issue in terms of the information technology available to us.

First, the description of the new course, negotiation practicum is given in detail. Second, the grave problem in this type of course is described in detail, in which a low level of the students' reading comprehension skills reduces the chance of deeper understanding of grasping the given situation reflecting the real-life situation, and, thus, prevents further development of negotiation skills. And, third, in the conclusion, our optimal solution is given with the results of our experiment. Also, a conclusion with further suggestion of research is stated.

2. Negotiation Practicum: A New Communication Course Incorporating Empathy and Negotiation

In this section, a negotiation practicum, a new approach to communication incorporating empathy and negotiation, is elaborated in detail.

Definition: Basic Academic Skills

First, it may be helpful to begin the basic academic skills which are fundamental to the negotiation practicum. The basic academic skills generally include proactive action with stick-to-itiveness, thinking skills such as problem identifying/solving, and planning a project while taking possible risks in mind, in addition to creativity, information processing skills (information gathering, sorting, categorizing, prioritizing, logical thinking, and meta-cognition). Further, the skills also include the cooperative communication skills in order to work in a team and to comply with the rules and conditions (teamwork, leadership, and compliance).

Traditionally Speaking: Debate for Ultimate Logical and Critical Thinking

So far, most universities in Japan have incorporated in the curriculum the various basic academic courses to foster all components of the basic academic skills mentioned above. For example, Kansai University has in the curriculum the basic study skills courses including problem identifying, problem solving, note taking, report writing, presentation, computer literary, and debate. There, debate is placed as one of the most advanced courses in the basic study skills courses, which incorporate the logical thinking and meta-cognition skills. However, the debate course does not offer anything to build trust and maintain good relation between students. Furthermore, it has been evident that emotion or empathy was not in any part of the communication in the debate. Rather, it is considered as a virtue to hide emotion while debate is in progress. Yet, debate has been considered as the most advanced academic skill, in which emotion or empathy is considered out of the range of such domain. On the other hand, however, it is observed that the chances for the students to have debate in the daily life are less than the chances for them to communicate with others in order to maintain good relationship. In other words, people communicate daily to have or maintain good relationship. Trust building seems to be the key as well as the reason to communication.

Kansai University's Challenge to Design a New Course

In order to remedy the lack of empathy or emotion in the debate course and to build trust in communication, Kansai University designed a new course for communication incorporating empathy and negotiation to be introduced in the curriculum to enhance the series of courses for the basic academic skills.

In the course of such incorporation, trust building through communication is fostered through negotiation practicum including exercises in groups. In such a course, the simulation experience with role modeling is crucially employed. The rationale behind this is that the simulation of the real experience will have extremely high learning outcome, as Edger Dale claims. See Fig. I for Edger Dale's Cone of Learning.

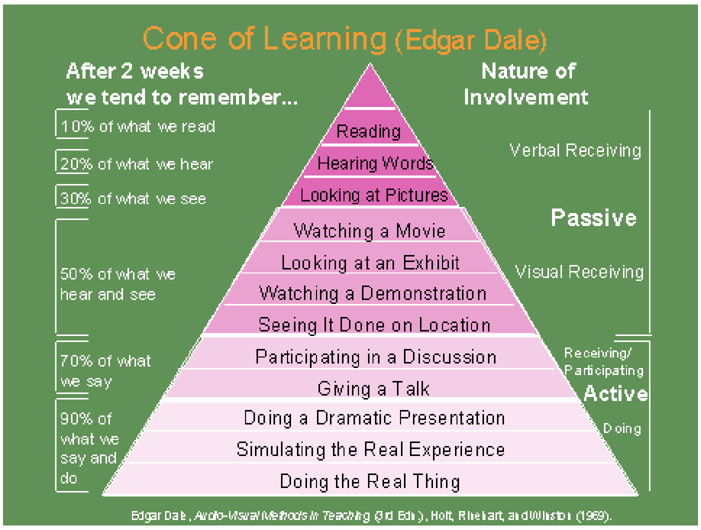

Fig. 1. Edger Dale's Cone of Learning (source: http://www.cals.ncsu.edu/agexed/sae/ppt1/sld012.htm)

This new type of communication requires strategies to combine lectures, seminars for situation analysis, group-based negotiation strategy discussions, simulation exercises, and reflection both at the group level and at the individual level. In the end of the practicum, students fill out their learning reflection to be submitted to the e-Portfolio system.

Methodology Proposed by Dr. Roger Fisher at Harvard University

After researching methodologies for communication with empathy and negotiation, it was found that Dr. Roger Fisher at Harvard University developed a methodology for better communication with emotion or empathy incorporated in order to solve international conflicts. Afterwards, his methodology was applied to the business negotiation and has been taught at law schools as well as business schools in the U.S.

Dr. Roger Fisher's methodology has been considered as the methodology for building a long-term good relation with trust between people. For ease of exposition, the basic idea of Dr. Roger Fisher's methodology is summarized below.

The main goal of the methodology is generally called negotiation to lead to say yes. In short, it is called the negotiation. The negotiation requires prior preparation to set a mission, which is the optimal goal to be aimed at, in this case, for maintaining a long-term good relationship with trust. In order to accomplish such mission, some preparation is needed. Since it is not usually possible to achieve the 100% of the mission through a negotiation, a zone of possible agreement is set to limit the range between the maximum and the minimum goals prior to the actual negotiation. This zone of goals is called zopa. Furthermore, if all the options for possible agreements prepared for the zopa fail, the best alternative to the zopa, called batna, is further planned, as shown in Fig. 2.

The negotiation skill described above demonstrates the skill for gathering information for a certain topic and then making a decision based on the information. By understanding the common framework of negotiation consisting of the mission, zopa, and batna, and by conforming to them, it is possible to demonstrate the logical thinking skill, the critical thinking skill, as well as the skill to conform to the rules and conditions. Further, by exercising the framework of negotiation, students can develop their communication skills to elicit information necessary for the negotiation as well as the arrangement skill for conducting the negotiation. This can be only possible with the mission aiming at a long-term good relationship.

Fig. 2. The Framework for Negotiation. From: J. Tamura, et. al. (2010). "Visual Explanation: An Introduction to Negotiation", Nihon Keizai Shinbun.

New Course Design

Having the basic concepts of negotiation by Dr. R. Fisher, the negotiation methodology has been developed incorporating a case study and a role-playing simulation.

In the course, students are first divided into two groups for the later negotiation session. For ease of exposition, let us call these groups Group A and Group B. Further, in each group, four to five students are sub-grouped for the discussion for building strategies for the negotiation session. See Fig. 3. The each colored box represents a sub-group consisting of four to five students.

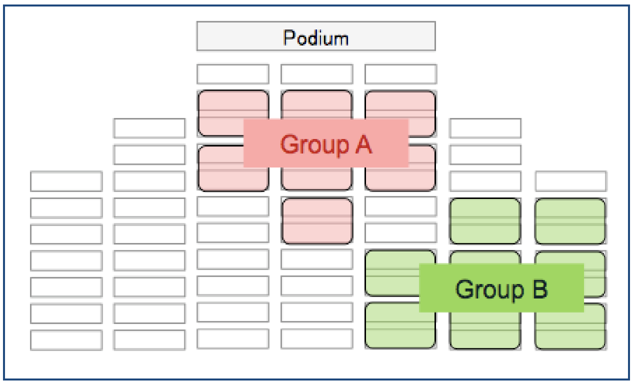

Fig. 3. Seating Layout for Groups (Group A is shown in red; Group B, in green. Each block represents 4 to 5 students in a group.)

While the students are seated in this formation, the following learning activities are conducted. First, a mini lecture is given to share the goal for the practicum with the students. Second, the house keeping rules for the practicum such as the basic concepts of negotiation, the procedures for the practicum are explained to the student. With such background information, reading materials for the negotiation situation are distributed. Both groups have a common situation sheet. See Fig. 3. And then each group is given their group-specific additional information. See Fig. 5 for the group-specific information sheet for Group A and Fig. 6 for the group-specific information sheet for Group B. With such preparation, the students proceed to Exercise 1. Exercise 1 is conducted on the individual student basis.

Fig. 3. Common Situation Sheet Fig. 4. Negotiation Worksheet
(Fig. 3 and Fig. 4 are by courtesy of GLIAL, Inc.)

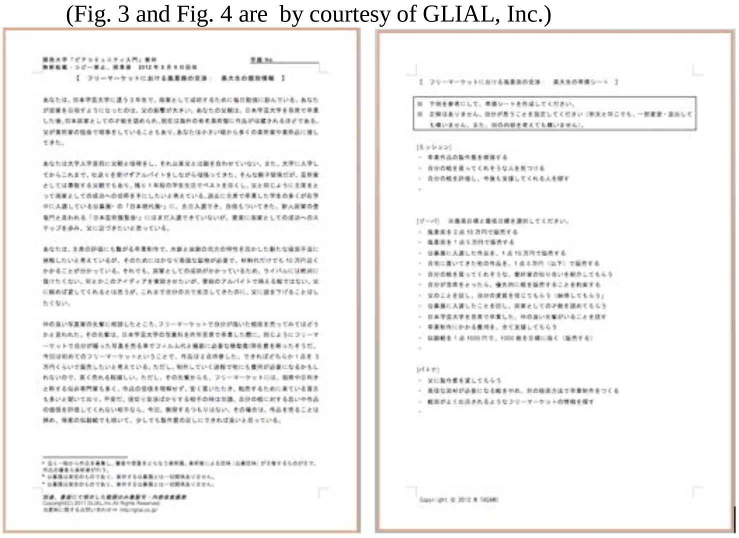

Fig. 5. Group-Specific Information Sheet for Group A (by courtesy of GLIAL, Inc.)

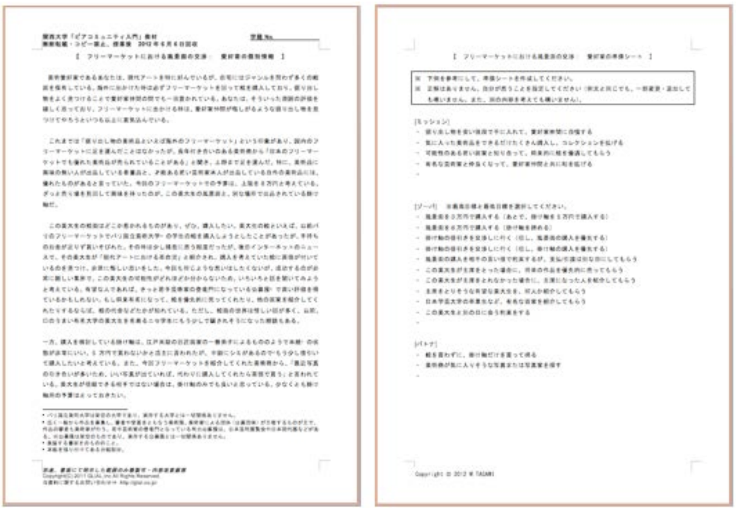

Fig. 6. Group-Specific Information Sheet for Group B (by courtesy of GLIAL, Inc.)

Each student reads the given situation sheets individually to understand the situation in which the character to be role modeled is. And then, he/she prepares for strategies for the negotiation with the worksheet. See Fig. 4.

When Exercise 1 is completed, students move forward to Exercise 2: Sub-Group Discussion, in which four to five students in each sub-group discuss and share their strategic plans to finely tune up their minute details while making reference to their worksheets. After Exercise 2, the main session of communication with empathy and negotiation is conducted. In the following Exercise 3, based on the worksheet and the result of the discussion in Exercise 2, paired students conduct the role-playing negotiation session. See Fig. 7 for seating arrangement.

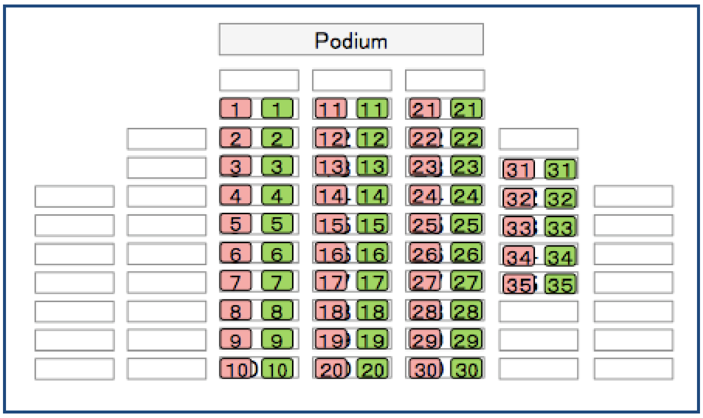

Fig. 7. Layout for One to One Negotiation Session:

Following Exercise 3, Exercise 4 is conducted. In Exercise 4 of the reflection session, the paired students have a reflection session together and share the moments of decision making during the negotiation session along the time line. When the paired reflection session is done, the instructor reflects the entire practicum consisting of four exercises, then summarizes the main points and gives the feedback to the class. In the end, as the final touch up, each student spends some time to reflect his/her learning activities from the practicum and writes down the reflection to be submitted to the course e-Portfolio. In this way, the entire practicum session is conducted.

Problem Revealed

The situation employed in the negotiation session must be a reflection of the real life or an example case from the real-life society. Otherwise, there is no point for the future societal member-to-be to practice and acquire the communication skill with empathy and negotiation.

The negotiation session described in the above section makes use of the written description of the situation. The description to offer common information as well as the group-specific information is the reflection of the real-life situation including emotions of the involved characters. Thus, the description includes true intentions and the subtle nuance of the emotions of the characters.

It follows that the students are required to have a very high level of reading comprehension skills to fully understand the described situation so that they acquire the maximum out of the communication exercises. However, the course is designed with 15 weeks of in-class sessions in a semester. Thus, not much time can be allocated for the students to be trained and improve their reading comprehenshion skills before getting involved in the negotiation session. From the course designer's point of view, it would be preferable to spend as much time as possible for raising the level of the students' competency for negotiation. We do not like to compromise and adopt the abridged version of the descriptions by adjusting to the level of students' reading competencies.

Is there any way not to sacrifice the quality of description because of the low level of students' reading comprehenshion skills? In other words, is there any way not to spend too much time for the students to understand the situation for the negotiation session? And yet, is there any way for the students to understand the situation deeply with the current level of reading comprehenshion and with a limited time allocated to the preparation session?

3. An Optimal Solution with the Use of ICT

In this section, an optimal solution to the problem is proposed that has been raised in the previous section in the negotiation practicum.

3.1 Optimizing Time for Students to Grasp the Situation

The main purpose of the negotiation practicum is to learn to gain experience of negotiation through the communication sessions, instead of spending most of the class contact hours for understanding the situation for the preparation of the negotiation session. Some may argue that teaching how to read deeply to comprehend the intended contents must come first before raising the communication skill through negotiation. However, the lesson that we learned through our experience is that the approach of reading to grasp the situation and then to form negotiation strategies has its grave limitations, three points of which are described below.

(i) Time-wise limitation

The classroom contact hours for a course are limited. A course usually consists of fifteen 90-minute lessons. In order to conduct one negotiation session, it requires two lessons in sequence. In one negotiation session ranging over two lessons, the allocated time for the students to grasp the negotiation situation is only thirty minutes. Within such a short time slot, the amount of information to be processed through the reading activity by the students is limited.

(ii) Limitation of the competence of students' reading comprehension

The students are of the age ranging from eighteen to twenty years old. Thus, these young adults do not have the full-fledged reading comprehension skill. They are the generation that read only from the smart phone screen and do not have the habit of reading newspapers daily. They tend to read slowly and the concentration for reading does not last long.

(iii) Adopted learning methodology: PBL

For the teaching methodology, we adopted a Problem-Based Learning approach. In the PBL classroom, all instructions and learning occur in the classroom, where "the feeling of being there" as well as the face-to-face group activities exist. In such a classroom, the communication with eye contacts as well as facial expressions is omnipresent. With such conditions, we must devise a method of boost the amount of the information within the limited conditions mentioned in (i) and (ii). Further, the contents-wise, more complicated negotiation situations should be developed reflecting the real-life situation in which more than two characters or opponents are involved.

3.2 Adoption of ICT

In order for the negotiation contents to reflect on the real-life situation, a real novel has been adopted. Further, we employed a novel and its dramatized video or movie. From the novel, excerpts relevant to the negotiation are prepared. Refer to the slide number 8 in Fig. 8 below. And further, the video clips corresponding to the excerpts are prepared. Refer to the slide numbers 4 and 5 in Fig. 8. In addition, to provide the students with background information for the video clips, synopses for the video clips are also prepared. Refer to the slide number 10 in Fig. 8.

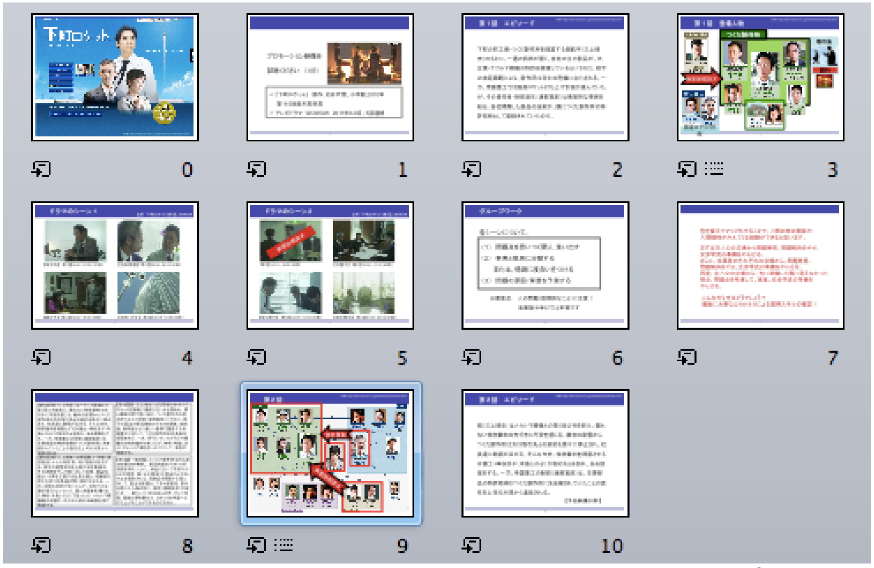

Fig. 8. Negotiation Practicum Enhanced with Video and Synopses. (Sources of Video clips: http://www.wowow.co.jp/ dramaw/rocket/index.html)

The excerpts can be read in the class or assigned as reading assignments prior to the session. In the class, the student's understanding from reading is enhanced and deepened before the preparation for the negotiation exercise.

4. Conclusion

An IT enhanced course for the communication with negotiation was developed and elaborated in this paper. In the course of development, Dr. Roger Fisher's methodology for negotiation was employed to fulfill the needs. With the help of ICT, the more information can be compacted in the limited time with deeper understanding of the negotiation situation reflecting the real life. Thus, more complicated situations can be presented in the allocated time in the session.

With the ingenuous application of ICT in the negotiation practicum, a class consisting of eighty students has shown some improvements in learning. See Table I. In the column on the left, the students are stratified into the three levels according to their understanding of the concepts of negotiation. Three strata are high achievers, mid achievers, and low achievers. The column in the middle shows the ratio of the students in the three strata with the approach by reading the description of the situation. The column on the right shows the ratio of the three strata after the session enhanced by ICT.

Table I: Frequency of Active Engagement by the Students.

Students (n=80)	Reading Only (without ICT)	ICT Incorporated
high achievers	20%	60%
mid achievers	60%	30%
Low achievers	20%	10%

It stands to reason that the negotiation practicum enhanced with ICT induced more active learning and thus deeper understanding of the provided situation and thus the students were able to out-perform in the negotiation role-play session.

For the future study, there are several points to be mentioned. First, the more contents inventory will be developed to provide students with more opportunities for the understanding of the communication with negotiation and empathy. Second, at this point, the students' learning progress can only be viewed by the students' reflective logs as well as the instructor's interactive observation of the students in the classroom. It has been planned that the full-fledged assessment system incorporating the e-Portfolio system with synchronous and longitudinal assessment tools for the learning progresses be developed.

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A STUDY OF THE SELECTION OF READING STRATEGIES AMONG GENDERS BY EFL COLLEGE STUDENTS

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Abstract

The purpose of this study was aimed to probe the question whether foreign language reading strategies use among EFL college freshmen differ according to different genders and the differences of frequency using types of reading strategies. Results indicated that the differences between male and female students on the types of reading strategies were significant, male students reported greater strategy use than their female counterparts regarding memory, cognitive, compensation strategies, while fewer males than females used strategies of meta-cognitive and social-affective while reading. In addition, males were more worried about unknown words compared to their counterparts while reading.

Keywords: Gender difference; Reading strategy; Meta-cognitive reading strategy

1. Introduction

English reading is a fundamental form of language inputs, and a psycholinguistic process for active reconstruction of a message from written language. Reading is not only essential to in-school academic learning but also to lifelong learning (Dole, Duffy, Roehler & Pearson, 1991; Durkin, 1993). During reading, readers generalize some positive reading behaviors and afford reference for learners to learn English; the reader's task is to comprehend the text that a writer creates, thereby the construction of reading comprehension from text is considered to be the most crucial academic skill learned in school, since it is an indication of the subjects' meaningful interpretation of the selected passages in reading texts (Mastropiere & Scruggs, 1997) The reading process is the interaction between what the author has written and the reader's own background and experience. In other words, it is a cognitive process and the reduction of uncertainty about meaning. Even though we know of the importance of reading strategies, little research exists on whether or not ESL males and females have similar or different strategic reading habits. Although students' perspectives are different, it is hard for a teacher to cater to each of the students' needs. It would be useful for instructors to know male and female students' preferences regarding learning styles as well as the factors influencing their reading habits. Thus, teachers can make a more educated decision by understanding the underlying factors for male and female students' differing choices between strategic reading selections.

According to Rumelhart's interactive model of reading (1994), reading is an interactive process,a synthesis activity, which involves both sensory information (graphemic information, and visual information), and nonsensory information (orthographic knowledge, lexical knowledge, syntactical knowledge, semantic knowledge, and pragmatic knowledge), all of "these sources of knowledge come together at one place, and the reading process is the product of the simultaneous joint application of all the knowledge sources" (p.1164).

2. The Importance of Reading Strategy

Several researchers have proclaimed that EFL reading as a complete grasp of meaning in a written text in which a dynamic and growing appreciation of interrelationships in the text is required (Yang, 2002). Studies describe reading as an interactive cognitive process in which readers interact with the text using their prior knowledge and cultural background (Carrell &

Eisterhold, 1983; Carrell, 1987; Pritchard, 1990; McNamara & Kintsch, 1996; Huang, 1997), and the success of reading comprehension depends on factors such as types of text, the genre of text structure, readers' language proficiency, text difficulty, and task demands (Alderson, 2000). Research findings have indicated that reading strategies, in particular, are important to students' comprehension, and not only can improve reading comprehension, but also differentiate good comprehenders from poor ones (Kletzien, 1993; Dole, Brown, & Trathen, 1996). Reading strategies indicate how readers conceive of a task, how they make sense of what they read, and what they do when they don't understand. Basically, reading strategies can be any comprehension-enhancing action taken by the readers. These strategies consist of a whole range of strategies including skimming and scanning, contextual guessing, and reading for meaning, utilizing background knowledge, recognizing text structure, and so forth. (Cohen, 1998; Hsu, 2006).

The importance of using reading strategies has been found to be obligatory and is especially critical for those English as a ESL/EFL learners desirous of a high level of English language literacy and success in US academic institutions (Schunk & Rice, 1992; Sheorey & Mokhtari, 2001). The application of reading strategies as heuristics and aids that can facilitate reading comprehension and overcome comprehension breakdowns at both the word and sentence levels (Aarnoutse & Schellings, 2003). Academic reading requires in-depth comprehension; it also includes "the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear, usually in the service of some concrete goal or objective" (Adamson, 1992, p.232).

3. Gender Differences in Reading Strategy Use

Gender difference also plays a significant role in reading research, empirical studies have shown that male and female learners act differently in EFL reading performance and strategy use such as Griva, Alevriadou, & Geladari (2009), who studied the gender differences on the effects of selections of EFL reading strategies use, concluded that female students were reported making extensive use of a wider range of strategy repertoire and showed more strategic knowledge and flexibility in using both cognitive and metacognitive strategies. A study investigated by Brantmeier (2003), found that male and female readers reading comprehension performance varied according to the topics of the texts due to their differences on background knowledge, especially when the content of the reading passages were feminine-related, female readers tended to do better than their counterparts. Furthermore, a lot of research findings show that males and females use different strategies in language learning particularly in reading comprehension (Chavez, 2001; Abu-Rabia; 1999; Sheorey, 1999; Kaylani, 1996; Green, & Oxford, 1995; Mayer, 1996). In addition, males and females may use the same number of strategies in language learning but females are more skillful at applying these strategies qualitatively, (Young & Oxford, 1997, Clark, Osborne & Akerman, 2008). It has also been found that females show a more positive attitude to reading (Swalander & Taube, 2007), and the girl students used listening strategies more frequently and held more positive attitudes toward English listening than the boy students (Norton, 2000, Abilock, 2002).

Several studies show that females tend to be more active strategy users than their male counterparts, most of which were carried out using Oxford's Strategy Inventory for Language Learning or SILL. A study of gender and English learning strategy use using the SILL was conducted by Xu (2004), who studied 1554 students as participants from junior high schools through satisfied cluster random sampling, found that female students scored higher grades in cognitive strategy and compensation strategy than male students. Another related study also pointed out that significant differences were found between males and females in the categories of compensation and affective strategies, yet not in the other four categories of memory, cognitive metacognitive , and social strategies (Goh and Foong, 1997). However, in Phakiti study (2009) found there were no gender differences in either reading performance or use of cognitive and metacognitive strategies.

4. Purpose of the study

English reading is not only an obligatory course for those English as a Second Language (ESL) students of English language literacy in academic institutions, but also the main medium to absorb outside knowledge and learn other curricular areas. There are growing numbers of research the field of reading strategy use among EFL learners. However, little knowledge has been declared about the differences on the favorite reading strategy use between males and females learners, especially at college level. Thus, the purpose of this study is to explore whether the application of reading strategies were varied according to gender diversities. Based on this notion, the research question was thereby framed as follows: “Do gender differences exist in reading strategies use among EFL college students? In keeping with this purpose, the following hypothesis was proposed: “There are no significant differences existing in reading strategies use among EFL college students”. We hope such a study may provide language instructors with some insight into the type of language learning pedagogy to which males and females may be more suited.

5. Methodology

5.1 Participants

In this study, the participants were daytime college freshmen from a university of technology with varied majors, who were taking the freshman English course for two hours a week among 4 classes (i.e., Industrial engineering & management; electronic; Applied foreign languages and Cosmetology and styling). Originally, the formal questionnaires were distributed to 159 participants, but of the 159 returned questionnaires, 3 questionnaires were discarded as invalid; therefore, the acceptable, valid questionnaires were 156 copies. The valid responses consisted of 84 males, accounting for 52.8 %, and 72 females, accounting for 45.3 %, approximately a response rate of 98.1% of all collected.

5.2 Instrument

A modified version of 39-item questionnaire called “Strategy Inventory for EFL Students’ Reading” was developed, which partially derived from the strategy taxonomy of Oxford (1990), but in order to fix the EFL cultural distinction and the intention of this research survey, several new items were added. In addition, in order to eliminate the possible misunderstandings on survey items due to language barriers, the questionnaire was administered to participants with Chinese version of students’ mother tongue. The statements on the questionnaire consists of five types of reading behaviors: memory, (items 1 to 8), cognitive (items 9 to 18), compensation (items 19 to 24), metacognitive (items 25 to 31), and social-affective (items 32 to 39). The internal consistency reliability coefficients for each subscale were .78, .79, .65, .75, .83 respectively and reliability for the total items was .92. In order to avoid unnecessary misreading and miscomprehension, the instrument was conducted in participants’ mother tongue－Mandarin Chinese.

5.3 Pilot Study

Before the formal study, the researcher conducted a pilot study to ascertain the appropriateness of the data collection instruments, and administration procedures. The pilot administration was conduct during the participants’ regular class to 89 college freshmen students, including 45 females and 44 males. All the participants completely answered questionnaires and both of them were classified as valid responses. In order to recognize if the questionnaire could reach internal consistency, the researcher utilized Statistic Package for the Social Science (SPSS) version 13.0 to conduct the value of Cronabch alpha coefficient. The internal reliability coefficient of the pre-test of the pilot study yield to 0.91 means there is high reliability, and the statements in the questionnaire could be formally conducted in the official study. Also, three EFL professors who specialized in the field of English teaching helped to review the validity of the questionnaire and adequacy of the wording, some problems related to the miscomprehension and inappropriateness of the questionnaire were therefore modified to improve the efficiency of the survey. Therefore, this process yielded the complete “Strategy Inventory for Language Learning” form for the present study.

6. Data analysis

After the data were collected, the Statistical Package for the Social Sciences, version 13.0 was employed to run the data by using descriptive statistical methods. Frequencies and percentages for all items of the questionnaires were obtained. Moreover, *t*-tests, ANOVA, and Pearson correlation were performed; the level of statistical significance for all ANOVA and *t*-tests was set at .05, and for correlation tests, at .01. The Independent- Samples t- test revealed that there were significant difference between males and females in terms of five types of reading behaviors on memory($t = 65.78$, $p<.05$), cognitive($t = 70.19$, $p< .05$), compensation strategies($t= 67.56$, $p<.05$), meta-cognitive($t= 70.41$, $p<.05$), and social-affective reading strategies($t= 66.46$, $p<.05$).

Results indicated the most frequently used reading strategy by male students was “I like to study English articles.” (No.32); the least frequently used strategy by male students was “I make guesses from the context when I encounter an unfamiliar word.”(No. 20) The most frequently used reading strategy by female students was “I make plans and urge myself to read as often as possible.” (No. 31) The least frequently used strategy by female students was “I make guesses from the context when I encounter an unfamiliar word.”(No.20).

Table 1 presented the results of the MANVO for gender differences in the five types of reading behaviors, including memory, cognitive, compensation, metacognitive, and social-affective strategy use.

Table 1. Multivariate Test for Students’ Reading Strategy Use by Genders

Effect		Value	*F*	df	Error df	*P*
Gender* Memory	Wilk’s Lambda	.64	1.45	60.00	728.82	.017
	Multivariate sig.	.48	1.48	60.00	738.00	.013
Gender* Cognitive	Wilk’s Lambda	.62	1.44	64.00	710.86	.017
	Multivariate sig.	.51	1.44	64.00	718.00	.017
Gender*com -pensation	Wilk’s Lambda	.72	1.64	40.00	748.86	.008
	Multivariate sig.	.35	1.69	40.00	782.00	.006
Gender* meta-cognitive	Wilk’s Lambda	.66	1.60	52.00	737.98	.005
	Multivariate sig.	.44	1.61	52.00	754.00	.005
Gender* social-affective	Wilk’s Lambda	.47	2.33	64.00	706.94	.000
	Multivariate sig.	.85	2.37	64.00	714.00	.000

As indicated in Table 2, there were significant differences in the overall and specific types of strategy use between male and female students. The means for the use of five strategy types among male and female students were within the range of 2.29 to 2.78 and 2.17 to 2.97 respectively. Among the five types of reading behaviors, male students reported greater strategy use than their female counterparts on memory, cognitive, compensation strategies, while fewer reported than females for those strategies of social-affective meta-cognitive strategy use.

Table 2. Statistics of Five Types of Reading Behaviors between Male and Female Students &Independent T-tests on Individual Strategy x Gender

Reading Strategies	Male		Female		*t*	*df*	*Sig.*
	M	SD	M	SD			
memory	2.49	.65	2.43	.54	65.78	227	.00
cognitive	2.43	.58	2.37	.47	70.19	227	.00
compensation	2.29	.55	2.17	.45	67.56	227	.00
meta-cognitive	2.53	.59	2.60	.53	70.41	227	.00
social-affective	2.78	.69	2.97	.64	66.46	227	.00
Overall strategies	2.51	.51	2.52	.41	84.99	227	.00

P<.05

Among the five types of reading behaviors, male students reported greater strategy use than their female counterparts on memory, cognitive, compensation strategies, while fewer reported than females for those strategies of social-affective meta-cognitive strategy use. Both male and female students ranked the same order of the use of five strategy types. The top three types of strategy choice were found to be social-affective, meta-cognitive, and memory. The two bottom ones were compensation and cognitive strategies. On the whole, participants in either male or female students, showed the use of social-affective reading strategies more frequently, followed by meta-cognitive, and memory reading strategies, with cognitive and compensation reading strategies being the least two employed .

Comparing the mean figures with those from males, the female students have a lower mean scores across two of the top three items in the memory reading strategy use, except for “I use new English words in a sentence so I can remember them” (No.2). Both male and female students all listed “I take notes when I read important words or sentences” (No.18) and “I analyze sentence patterns and grammar structures while reading”(No.12) as two of the top three most-used cognitive reading strategies, whereas, male students listed “I make summaries while reading” (No.10) as one of their top three choices, and female students listed “I try not to translate word-for-word while reading” (No.11) as one of their top three choices. Comparing the mean figures with those from females, the male students have higher mean scores across two of the top three items in the cognitive reading strategy use.

A closer examination of the top three compensating reading strategies most often used among male and female students showed that the “I study English without looking up every unfamiliar word.” (No.19), had the highest average frequency for both males and females. However, for those male students the next was “I underline or make a notation for unclear words or phrases, for instance, with a question mark or some other symbols” (No.23), followed by “I make guesses on what the information will lead to or what the ending will be like” (No.21). As for those females, the next was “I make guesses on what the information will lead to or what the ending will be like” (No.21), followed by “I underline or make a notation for unclear words or phrases, for instance, with a question mark or some other symbols”
(No.23). Comparing the mean figures with those from females, the male students have a higher mean scores across two of the top three items in the compensation reading strategy use, except for “I study English without looking up every unfamiliar word.” (No.19). In addition, both male and female students all listed the same top three metacognitive reading strategies as their most often used ones and with the same orders. They all listed “I make plans and urge myself to read as often as possible.” (No.31), followed by “I estimate how much time I will spend on a reading.” (No.29) and “ I reread because I appreciate the writing style of an article. ” (No.28). Comparing the mean figures, female students reported greater strategy use than their male counterparts on metacognitive strategy use.

A closer examination of social-affective reading strategy use showed that male and female students all listed “I like to study English articles.” (No.32) and “I discuss an English article I read with my classmates or friends.”(No.39) as two of their top three most-used social-affective reading strategies, whereas, male students listed “When my reading comprehension is blocked. I still insist on reading through the whole article.” (No.35) as one of their top three choices, while female students listed “I listen to the music while I am reading.” (No.33) as one of their top three choices. Comparing the mean figures with those from males, the female students have higher mean scores across top three items in the social-affective reading strategy use.

7. Results, Conclusion and Recommendation

The present findings were consistent with previous studies (Ehrman &Oxford, 1989; Young & Oxford, 1997; Sheorey, 1999; Norton, 2000; Clark, Osborne & Akerman, 2008) that there were gender differences on the selection of reading strategies among genders of EFL college students. This finding is similar to those of Young & Oxford, 1997; Sheorey, 1999), that female students were found to report significantly more use of metacognitive and social-affective strategies than their counterparts, whereas males reported higher use of memory, cognitive and compensation strategies than their counterparts. The results of this study were opposite to the previous research (Green & Oxford, 1995; Sy, 1996; Chen, 1999; Phakiti ,2009), women used more learning strategies than men. Instead, in the present study, females were only found to report more use of metacognitive and social-affective strategies than males. But females demonstrated lower levels of strategy use than males in memory, cognitive, compensation learning strategy. However, in this study, males and females were found to employ the same order of preference in their reading strategy use.

Among their top three memory reading strategies, we found that females outperform on the strategy of “I use new English words in a sentence so I can remember them“ than males, which indicted .female students were more agile in applying new knowledge to help learning or produce target language, while males outperform on the strategy of “I read with imagining. For instance, when I read “The old man and the sea, I would imaging I am on the sea.” than females, it means that males were more capable of creating mental linkages and are more accustomed to the model of applying the visual and auditory stimuli to improve reading outcomes results when reading.

Among their top four cognitive reading strategies, we found that male students on average performed three higher levels of strategy use than females. "Cognitive reading strategies" is about taking notes, summary, drawing stress, etc., however, females employed the mode of I notice headings, subheadings and topic sentences of an article to help understand, which wasn't found in males' choices, and outperform on the strategy of "I try not to translate word-for-word while reading" than males. This indicated females utilized more top down strategies than males.

Both male and female students listed the same top three compensation strategies as their most often used ones. However, female students performed lower strategies use in two of them than males, except for "I study English without looking up every unfamiliar word". Among their top three compensation strategies found that both EFL students no matter males or females knew how to make guesses from the context without looking up every unfamiliar word; to predict what the ending will be like and to underline or make a notation for unclear words or phrases when reading. In other words, both male and female students employed three main approaches of top-down, bottom-up, and parallel processing to help study English.

Among their top three of metacognitive strategies we found that both male and female students all listed the same types of items as their most often used strategies and with same order of preference. However, females were found to report significantly more use of metacognitive strategies than males. The possible interpretations for this result are due to females who tend to be better language learners in L2 learning environments as found in previous research.

Among the top three social-affective strategies we found that male and female students listed the same two types of strategy as two of their top three most frequently used strategies. Female students on average performed higher levels of strategy use than females in this item, which indicted female students knew how to interact with teachers or peers or by using effective control over emotions to facilitate learning and employed self-reinforcement to enhance English learning.

All in all, based on the findings, metacognitive and cognitive strategies were most correlated with overall strategy use; these two types best predicted college EFL students' strategic behaviors of reading. Significant gender effects were found in the use of individual strategies; females significantly employed more underlining and highlighting strategies as noticing subheadings and topic sentences of an article and tried not to translate word-for-word while reading, namely, females were employed more bottom-up strategies and were better in practicing from top to bottom and from bottom to top in their interaction with the reading passages.

Among the five types of reading behaviors, participants in either male or female students showed the use of social-affective reading strategies more frequently, followed by meta-cognitive, and memory reading strategies, with cognitive and compensation reading strategies being the least two employed. However, Females use metacognitive strategies and social/affective strategies more often than males do. It indicated that EFL learners not only knew how to interact with others or self-assurance, or go through the processes of questioning, cooperation, self-talk, and self-reinforcement, but also became aware of multiple strategies using both word analysis and contextual clues to determine the meaning of an unfamiliar word. Namely, implementing both top-down and bottom-up strategies to facilitate their English learning.

It is hoped that this research will provide a valuable insight into foreign language learning for learners, teachers, and shed light on future gender research in particular. In addition, teachers may note that EFL learning requires a higher level of psychological process. Thus, teachers may through systematic instruction help learners to think metacognitively about the strategies they could use to improve their reading comprehension and become an autonomous strategic learner and reader. This study may also function as a trigger for EFL teachers in terms of the curriculum planning, the selection of reading content across strategies use of EFL with different genders and therefore it may benefit both genders in different ways. Lastly, the present study implemented a quantitative method only, future researchers may try to combine a multiple-task, using a semi-constructed assessment to interview the participants to get qualitative data, It may provide a key to a better understanding of gender differences in strategy use.

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A STUDY OF USING WEBCAM IN COMPUTER CLASSROOM

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Abstract

The webcams are installed on students' LCD monitors to take, via an ordinary video processing program, the half-length pictures of students in a real-time manner whenever they are distracted from the class or not in their seats. Result shows that the grades of the students in the experiment group become less scattered. This means the difference among students' grades have been reduced and students' overall grades have also been improved.

Keywords: webcam; real-time learning monitor system

Introduction

It is found in our continuous teaching activities that students are more enthusiastic about computer and the Internet than what teachers teach in computer classes. Also, we find in the teaching process that a good classroom order can be maintained if teachers' teaching is displayed on the monitors through a teaching broadcasting system and when a DV is recording the class because most students don't want to become the focal point in the video. Considering this, a system has been designed using a local network and webcams. The webcams are installed on students' LCD monitors to take, via an ordinary video processing program, the half-length pictures of students in a real-time manner whenever they are distracted from the class or not in their seats. This system allows teachers to publish unobservant students' grades on the teaching broadcasting system or a teaching website to serve as a warning to further achieve a better classroom order. In addition, it also enables teachers to fully grasp students' learning situation.

System Design

As webcam is used to grab pictures in this study, it is necessary to know how to operate a webcam. Due to the wide use of webcams, many mobile phones, all-in-one PCs and laptops nowadays are equipped with a built-in video camera. When Microsoft was developing its Windows 95 operating system, it put forth a resolution to video multimedia. For example, Meeting Server, Microsoft's video server in early stage, allows users to connect their webcams to the server so that people around the world could see each other. To enable webcams produced by different manufacturers across the world to grab pictures via its operating system and drivers, Microsoft also came up with highly compatible VFW (Video For Windows) for easy control of webcams.

In this study, Visual Basic 6.0 is used to develop a system in which the writing of a picture grabbing program needs to take into account the connection of the operating system and video camera, sound card as well as device. The device here acts like an interface we use to control the video camera and sound card. After the webcam become controllable, a program is written to grab pictures and video clips.

This study focuses on the search for the movement of students' upper body in a real-time video and the reduction of background noises to the minimum. As a result, people's movement is the focus. A webcam is used as the input device and its refreshing rate is set at 60Hz the same as that of the fluorescent light in the room. Two pictures are grabbed using the webcam to obtain the outlines of the figures in the pictures by eliminating the background using background subtraction method. The two pictures are grabbed at a fixed position for background subtraction. After that, the grey-scale value is checked to see if it has reached a certain threshold value. If yes, the target can be judged to be a moving object and when a minor difference is detected between the two pictures, a judgment can be made as to whether this moving object is within the monitoring scope.

Results

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The analysis focuses on influence of the classroom monitoring program on the two group students' learning effect in computer class and the comparison of their pre-test and post-test grades.

SD indicates the extent to which the grades of students in the same group scatter. Tables 1 show the SDs of the pre-test and post-test grades of students in the control group and experiment group. In the pre-test, the SDs of the experiment group and control group are 6.529 and 5.454 respectively, as opposed to 5.038 and 6.214 for the post-test. This shows that after the computer classroom monitoring program has been installed, the grades of the students in the experiment group become less scattered. This means the difference among students' grades have been reduced and students' overall grades have also been improved.

Table 1. A comparison of grades between the experiment group and control group – a t-test of independent samples

	Group	Number of students	Average grade	SD	t value	Significance (two-tailed)
Pre-test	Experiment group	42	71.90	6.529	1.723	0.089
	Control group	42	69.64	5.454		
Post-test	Experiment group	42	85.48	5.038	9.837	0.000*
	Control group	42	73.33	6.214		
*p<.05						

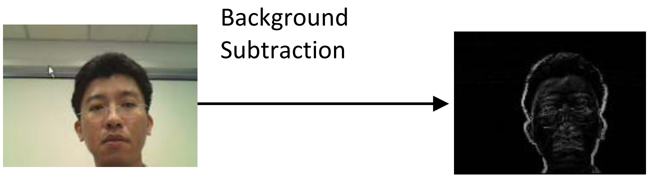

Fig. 1. Example of a ONE-COLUMN figure caption

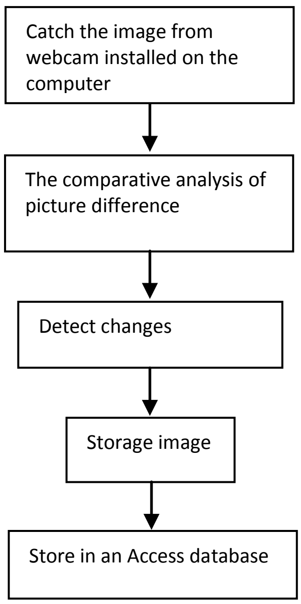

Fig. 1. Example of a ONE-COLUMN figure caption

Conclusions

In this paper, a computer lab area network design real-time monitoring of student learning conditions and order of the state system, teachers can monitor the program through a local area network management students in computer usage, if the students on site and installation of illegal software piracy program, through the regional network monitoring program will shut down the game program and website, and record the Internet case, another student sitting in front of computer monitors, his every move on the computer screen at the top of the camera monitors, through this network cameras, the students leave a record number of seats, and the students recorded illegal information, to achieve the orderly management of computer classes to classes.

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A STUDY TO EVALUATE THE SOCIAL MEDIA TRENDS AMONG UNIVERSITY STUDENTS

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Abstract

The study was conducted to a). examine the trend of using social media among university students, b). evaluate reasons behind using social media, and c). identify the problems of university students in using social media. The population of the study consisted on all 4th semesters' students of Faculty of Education of the Islamia University of Bahawalpur, Pakistan. The sample size comprised of 600 students taken through convenient sampling technique. A questionnaire was developed for data collection. The research tool was finalized after its pilot testing. The study revealed that majority (90%) of the students was inclined to use face-book. They used social media for exchanging academic activities and developing social networks throughout the world. They used such media for sharing their learning experiences with their colleagues and international community. It was obvious from the study that social media played a crucial role in promoting collaboration and linkage to develop Virtual Community across the world. The respondents also faced some problems in using social media. They faced problems of bandwidth of internet and electricity break down/ load shedding.

Keywords: Social Media, Internet, Academic Collaboration, Face Book, Virtual Community

Introduction

The prevalence of internet and its usage in higher education has revamped the scenario the world over. Presently, the advancements in its capabilities have opened up new avenues of interactions for sharing of knowledge and experiences. The innovative usage has generated new opportunities of sharing academic experiences, and research practices of the eminent scholars of the world. It appears to be reshaping the instruction and instructional interactions. Internet has promoted virtual interactions for sharing research findings. Such internet enhanced interactions for communication are termed as social media. It is an internet led technology used for promotion of social interaction among the user community. Social media is used for enhancing communication by using media tools and internet sites termed social networking sites.

The social networking sites have audio and visual capabilities consisting of web-blogs, wikis, social bookmarking, media sharing spaces, RSS Feeds, micro-blogging sites, face-book, LinkedIn having capabilities to promote synchronous or asynchronous interactions and communication (Armstrong & Franklin, 2008).

Apparently, there appears an enhanced trend among users to embrace the above social media sites particularly at university level. It seems to have changed communication patterns even at local level. The advocates of social including Palen (2008); Palen, Vieweg, Liu, & Hughes (2007) asserted that social media "…can provide [new] ways for people to interact both within and outside the spatial bounds of the event" (p.468). Some international events have proved the above assertion that social media can form opinion and bring about social change. These events along others include London Riots (2011), change of Libyan and Egyptian Rule (2011) etc. Palen, Vieweg, Liu, & Hughes (2007) further stated that media particularly social media is used as a tool for publicizing information and enhancing access of masses to it at the right time. The example of WikiLeaks can best be understood which publicized the critical and secret information to common people that otherwise seemed impossible to access.

The trend of using social media among university students seems to be increasing day by day and a large number of them is relying on its usage for interactions and communication. Seemingly, the number of students particularly at higher education level is using social media forgetting about their physical, mental and psychological health. Nevertheless, country profile and availability of the infrastructure play a crucial role in its

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enhanced usage. Smith, Smith, Sherman, Goodwin, Crothers, Billot, & et al (2009) worked on Second World Internet Project New Zealand Survey. The project survey revealed that 83% of New Zealand citizens used internet; out of which 80% used it for communication on daily basis, 33% instant messaging, 25% played online games at least once a week and 50% reported to be the members of social networking sites.

Social Media for Academic Purpose

Apparently, social media is being used increasingly by university students. It is promoting virtual communities and virtual learning environments (VLEs) for expanding (Hussain, 2005) distributed learning among users. The students interact in their virtual communities freely with members of the community. They can share information and study experiences, research projects and job opportunities with each other. Various factors contribute towards the use of social media for educational purposes. Armstrong & Franklin (2008) compiled a comprehensive report 2008. The report indicated that the students used social media in different manners to enhancing and strengthening their learning, through reflection and collaborative activities in virtual environments. However, they depended upon infrastructure including and the skill of using social media.

Now a days, the ever increasing use of social media at higher education level seems to be transforming the prediction of Armstrong & Franklin (2008) that “Universities will lose their privileged role as a primary producer of knowledge, and gatekeeper to it, as knowledge becomes more widely accessible through other sources and is produced by more people in more ways” (p.27) into reality.

The usage of social media by university students is an interesting area of research for educationists and social scientists. Hamid, Chang, & Kurnia (2009) were of the view that the available literature contains beneficial designs and styles of using it at university level. It describes the creation of contents and less focus on how to share, interact, and collaborate and socialize by its use. There seem different reasons to justify the usage of social media in higher education. It usage was affirmed by upholding the stance that it is used to enhance study experiences of students by provision of e-support services to them (Dabner, 2011). It is used to facilitate communication among and between students in virtual communities. Amongst others, the Facebook appears to be the most favourite was suggested as a means of communication for interacting with students (Mack, Behler, Roberts, & Rimland, 2007).

The present time is regarded to be the information age providing open access to all. The younger generation called Net-Generation appears to be much inclined towards having information by using modern technologies. Educational usage of social media seems useful for all levels of education but university students are much crazy to use it (Davis, Dabner, Mackey, Morrow, Astall, Cowan, & et al., 2011).

Social media can be said to be the communication facilitator and students wish their institutions to use social networking sites for strengthening classroom (Roblyer, McDaniel, Webb, Herman, & Witty, 2010) instruction. In this regard Madge, Meek, Wellens, & Hooley (2009) stated that they lead to use social media to enhance educational access and interaction. Moreover, social networking can fill the learning gap informally between “digital native” students and “digital immigrant” faculty (Bull, Thompson, Searson, Garofalo, Park, Young, , & Lee, 2008).

Social Media –Challenges and Issues

The user community seems to be facing some challenges and issues because of the social media. These issues were reported by students (Olson, Clough, & Penning, 2009) and social media policy makers (Grimmelmann, 2009) at higher education level including moral and social concerns. The study of Cain, Scott, & Akers (2009) affirmed the enhanced usage of Facebook by pharmacy students with low understanding of the issues related with e-professionalism and accountability.

A common disagreement appeared among faculty and students over the use social media. According to a face-book survey (2006) one third of the students were not in favour that their faculty should be present on Facebook at all. The qualitative study conducted by Selwyn (2009) on United Kingdoms’ University students using Facebook reported that they used Facebook for criticizing learning, exchanging information, extending moral support and, paradoxically, promoting themselves to be academically disengaged or incompetent.

Objectives of the Study

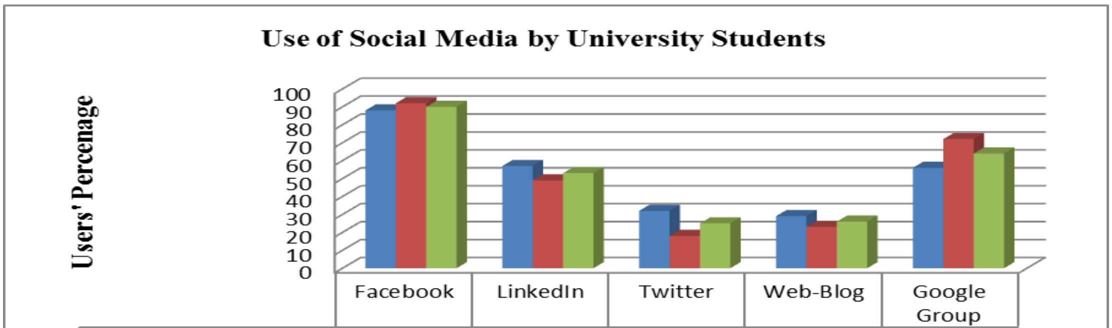
The researcher conducted present study conducted with the objectives to
a). examine the trend of using social media among university students,
b). evaluate reasons behind using social media, and
c). identify the problems of university students in using social media.

Research Methodology

The study was conducted with the main focus on evaluating the trend of university students to using social media. The researcher adopted survey approach for data collection. The population of the study consisted of students of the Faculty of Education of the Islamia University of Bahawalpur, Pakistan. For data collection one research tool-Questionnaire was developed to elicit the opinions of the respondents. The researcher validated the research tool through its pilot testing on 50 students of the department of education. The finalized research tool was administered through volunteer participation of the respondents. Convenient sampling technique was adopted to administer the research tool (questionnaire) on 600 students. The response rate was 89.70% (as 538 responses complete in all respects were received). The data were coded and analyzed through Ms-Excel in terms of percentage and presented in tabular cum graphical form

Data Analysis and Findings of the Study

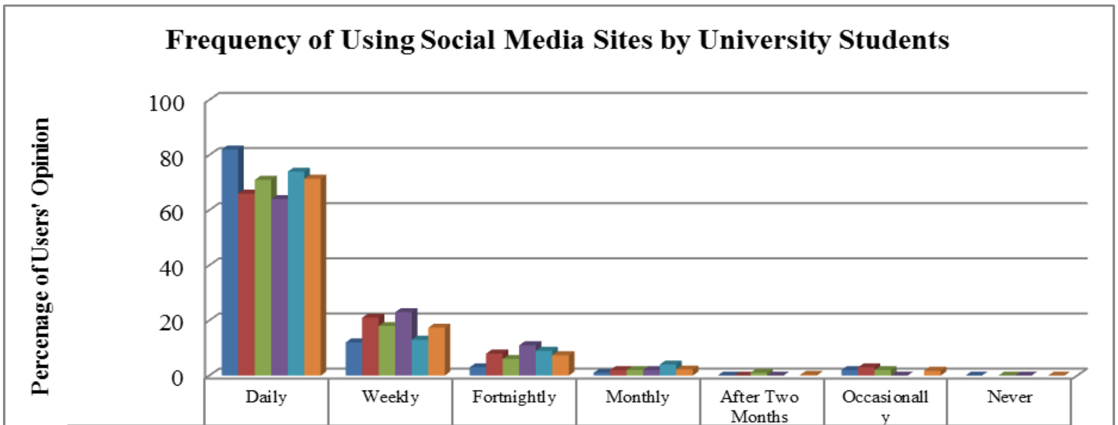
The data collected through questionnaire was analyzed through MS-Excel Programme and the results are presented in tabular cum graphical form.



	Facebook	LinkedIn	Twitter	Web-Blog	Google Group
Male	88	57	32	29	56
Female	92	49	18	23	72
Average Percentage	90	53	25	26	64

Figure-1: Types of Social Media used by University Students

Figure-1 reflects the preference of students to use different types of social media. According to the figure 90% of the university students preferred to use Facebook, and 53% LinkedIn, whereas used 25% twitter, and 26% had their own web-blog; however, 64% joined Google Groups for their academic and social purpose.



	Daily	Weekly	Fortnightly	Monthly	After Two Months	Occasionally	Never
Facebook	82	12	3	1	0	2	0
LinkedIn	66	21	8	2	0	3	
Twitter	71	18	6	2	1	2	0
Web-Blog	64	23	11	2	0	0	0
Google Group	74	13	9	4			
Average	71.4	17.4	7.4	2.2	0.3	1.8	0.0

Figure 2: Frequency of using Social Media by University Students

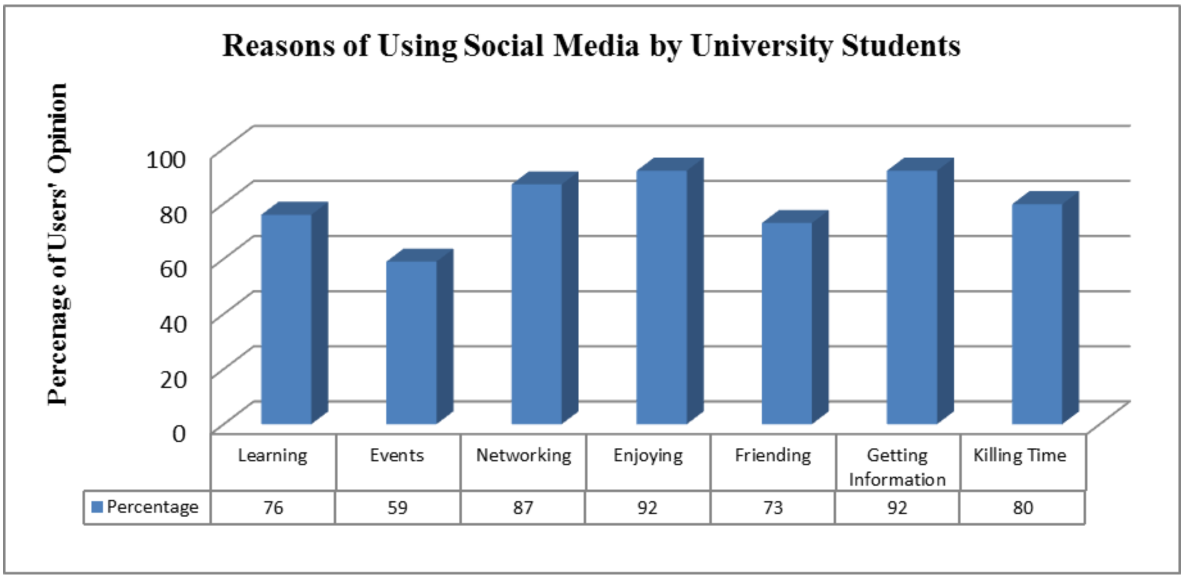


Figure 3: Reasons of Using Social Media Used by University Students

Similarly, Figure-2 indicates the frequency of using social media by university students. The data indicated that 71.4% of the students used social media websites on daily basis, 17.4% did so weekly whereas 7.4% logged in fortnightly. However, rest of the respondents appeared to be casual in using social media as 2.2% used it on monthly basis, 1.8 occasionally and only 0.3% reminded to use after two months.

However, fIgure-3 indicates the reasons of using social media by university students. According to the data 92% of the users community used social media for getting enjoyment and 73% used it for searching and making friends. However, there was academic use of social media as 76% of them affirmed that they used such media for sharing their learning experiences and research findings, 59% shared academic events over the media, 92% used for getting latest information related with their studies, educational developments/ opportunities and current affairs. Likewise, 87% of the users were of the view that they used it for academic networking at national and international level. But there was another category of the users without any academic or social purpose and such 80% used social media for killing the time.

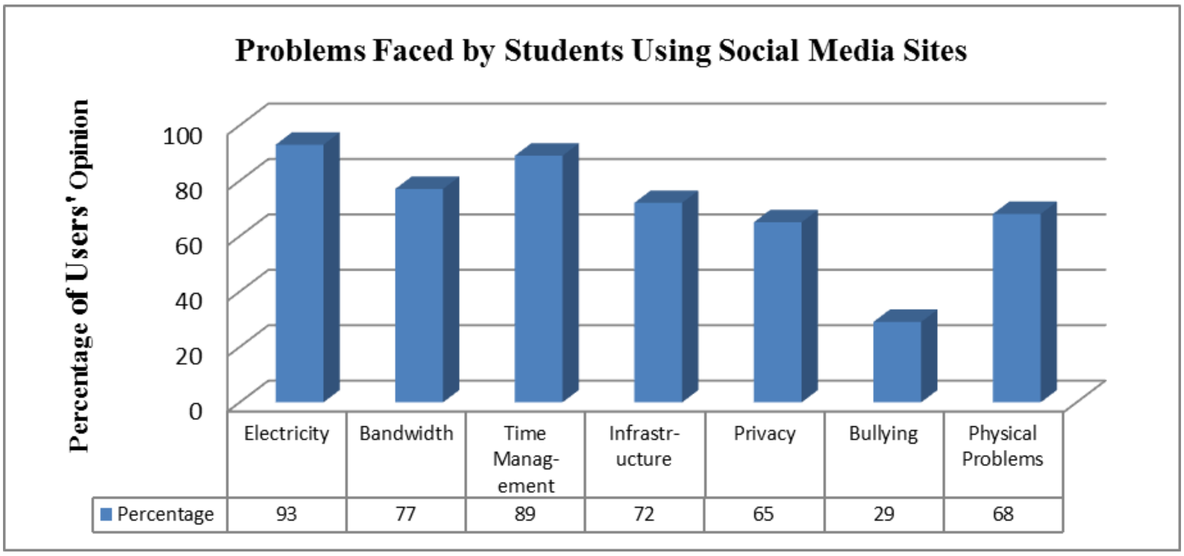


Figure 4: Types of Social Media Used by University Students

Figure-4 shows the problems which were reported by the users of social media websites. The respondents asserted that they faced problems of electricity failure (93%). Low bandwidth of the internet (77%), lack of infrastructure like computers and laptops (72%), managing time for using social media (89%) during the semester, leakage of privacy (65%) to their co-learners, cyber bullying (29%) as they received some unwanted messages/ pictures and (68%) reported their physical problems like backache, fingers' joint pain, dry face and blurred vision due to longer use of computer.

Conclusion of the Study

The study revealed that university students preferred Facebook as it is most popular media. The trend indicated that they used social media to enjoy, and friendship. However, they preferred to share their study experiences & research projects, educational events, information, and developing networks. They faced some problems like electricity failure, low bandwidth of the internet, lack of infrastructure and using social media during the semester, leakage of privacy, and physical problems.

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A TIME AND COST EFFECTIVE APPROACH TO 3D SCENARIO BUILDING IN A DIGITAL GAME DESIGN CLASS

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Abstract

This paper demonstrates an integration of modern technologies to provide an effective approach that can help teachers and students focus on creative design rather than on complex graphic tools or commercial game engines in a capstone class. Ignoring the unnecessary functions of expensive commercial packages, we develop and implement our own solution package that includes Google SketchUp, 3D Warehouse and Microsoft Virtual Worlds technology to teach gaming context and content design with 3D scenario building. The empirical experiment proved the feasibility of our work when the students were able to visualize and present their designs of digital games with less cost and fewer efforts than would be needed with the commercial software packages that are generally used to achieve this.

Keywords: Digital Game Design, 3D Scenario, Google SketchUp, 3D warehouse

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Introduction

There has been an increasing interest in game-based learning and bringing digital game design into the classroom due to the widespread popularity of such games, and particularly of 3D multi-user role-playing games, which are based online and allow the players' avatars to exist in realistic virtual environments. However when teachers try to help students who are interested in designing 3D gaming worlds, or aim to enter the digital gaming industry after graduation, they face a number of challenges. These include the budget that is available for such classes, which influences the decision about which software to use for training, and the time available for both delivering design theories as well as assessing students' performance.

From the students' perspective, the first challenge they may encounter when attempting to create a 3D game design is the significant efforts that are required to learn how to use the 3D modeling software to create game characters, buildings and objects, such as MAYA or 3DS Max from Autodesk^{TM}, as well as the high cost of such packages if they wish to use them outside of class. Although there are arguments about the value of teaching 3D modeling in a design class, exposure to it is essential preparation for many careers, and it can also expands students' design-related thinking (Cockburn & McKenzie, 2001). Research on student perceptions of game-based learning courseware found that the majority (58.2%) favored 3D animation over 2D (22.6%) (Zin, Yue, & Jaafar, 2009). Although in Karl's research the skills required for carrying out games design (Jeffries, 2011) using 3D Studio Max were not seen as important by any subject of the academic respondents, the ability to present both the game and players in a public context, so that they can be assessed, was seen as very important by the respondents who were practitioners. Our argument in the current work is thus that visualizing the design of the game in some form that can undergo peer reviews will improve the quality of a design class, if the 3D learning curve is well controlled.

Teachers of digital game design classes thus need to overcome the following challenges: preventing the teaching of complex 3D software issues from taking up limited credit hours in a class that should spend more time on game design; obtaining the budget needed to teach effective classes; and dealing with the frustration that students feel if they do not understand why they have to spend a lot of time and effort carrying out 3D modeling instead of focusing on the theoretical and creative aspects of game design.

Furthermore, even the students have successfully prepared their collections of 3D objects or digital content, they need a virtual stage to practice and eventually demonstrate their ideas about game stories and scenarios, as well as prototypes, so that both the teacher and classmates can review and comment on them. They thus face problems with regard to the expense of buying commercial game engines, such as Unreal ^{TM}, Virtools^{TM}, and Torque Engine^{TM}, in addition to the learning efforts required, which will make heavy demands on their time. In Albert's study on creating a game development course with limited resources (Ritzhaupt, 2009), which used the Torque Engine^{TM}, indicated that the cost and difficulty of the selected platform was seen as 5 on a 5-point scale, even higher than the 4 points for the difficulty in learning how to use the 3D software, again highlighting the problems of high costs and steep learning curves.

These concerns were also raised by students in another study (E. Vincent Cross et al., 2008). All the students surveyed in the article noted that the expense and difficulty of the game engine was the biggest problem that they faced on the course. One respondent even stated that while their participation in the course was empowered by their creativity, it was hindered by their limited resources. A number of subjects in the study suggested that the course should be split into two separate courses, the first part being theory and the second part practice. However, the strategy of trading time for resources is sometimes limited by teachers, the policies of the related institutions, or other factors.

This work aims to help teachers and students focus on their creative design activity rather than software operations, and to reduce the need to buy expensive software when only a few of its functions are used in the class.

Design and development

The groundwork

This study is based on two elements: enhancing student creativity with regard to 3D game design, and developing a platform for students to practice and demonstrate what they have learned in class. The major considerations are the expense and the ease of use of the software.

3D modeling software

3DS Max and Maya are the most commonly used 3D modeling, animation and rendering software, they are often very difficult to learn how to use, especially for teachers or students who do not have a digital arts or computer science background. However, Google' s free SketchUp 3D modeling software is relatively intuitive to use, and thus has attracted more and more users from various disciplines. Moreover, the accompanying free 3D warehouse website (Google, 2012) provides a huge collections of 3D models, which means that students do no need to build their own content from the very beginning, but can instead modify existing designs, as shown in Fig. 1, and this can save a great deal of time and money.

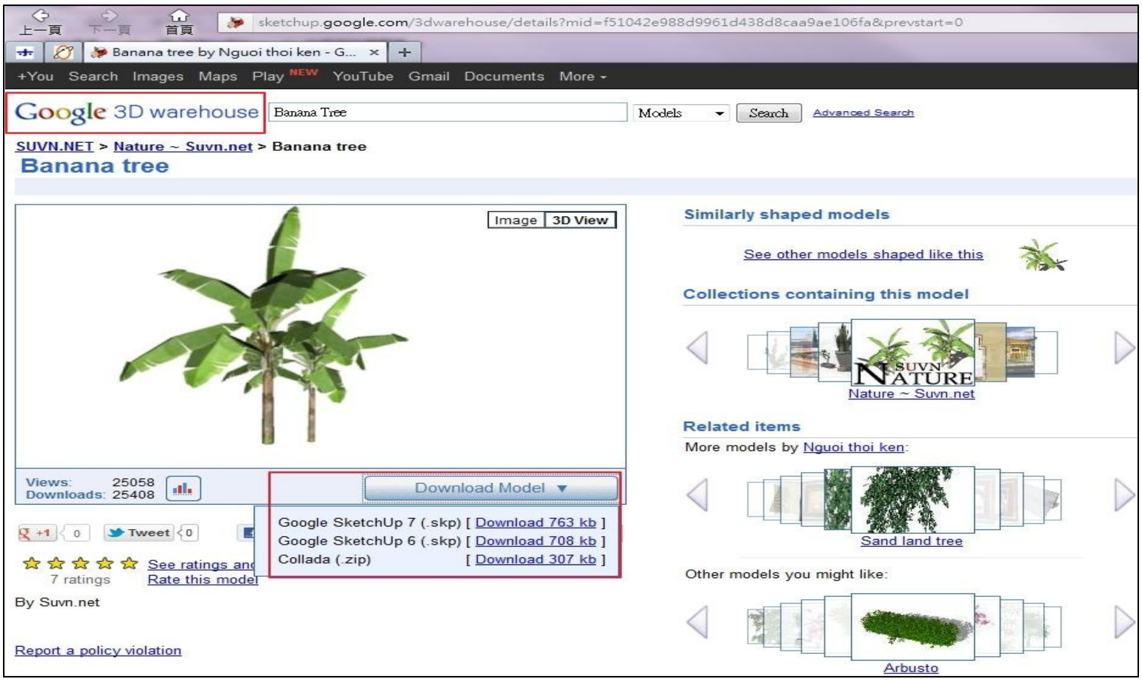

Fig. 1. The Google 3D warehouse provides many free and downloadable 3D models that students can then modify

So that it can work with our presentation platform, which will be discussed in the next section, the output from SketchUp is converted into the Microsoft DirectX format by the free 3D RAD exporter plugin (3DRAD.com, 2012). Most students in Taiwan use the Windows™ operating system, and thus the DirectX file format is a viable one. Moreover, when in text mode it can be easily edited by text editing applications like Notepad, which is bundled with Windows. Using this system, students can easily replace the texture files of a 3D object and quickly see the new effects, and then save the object into a binary compressed format to reduce the file size for easier online transmission. This process is shown in Fig. 2.

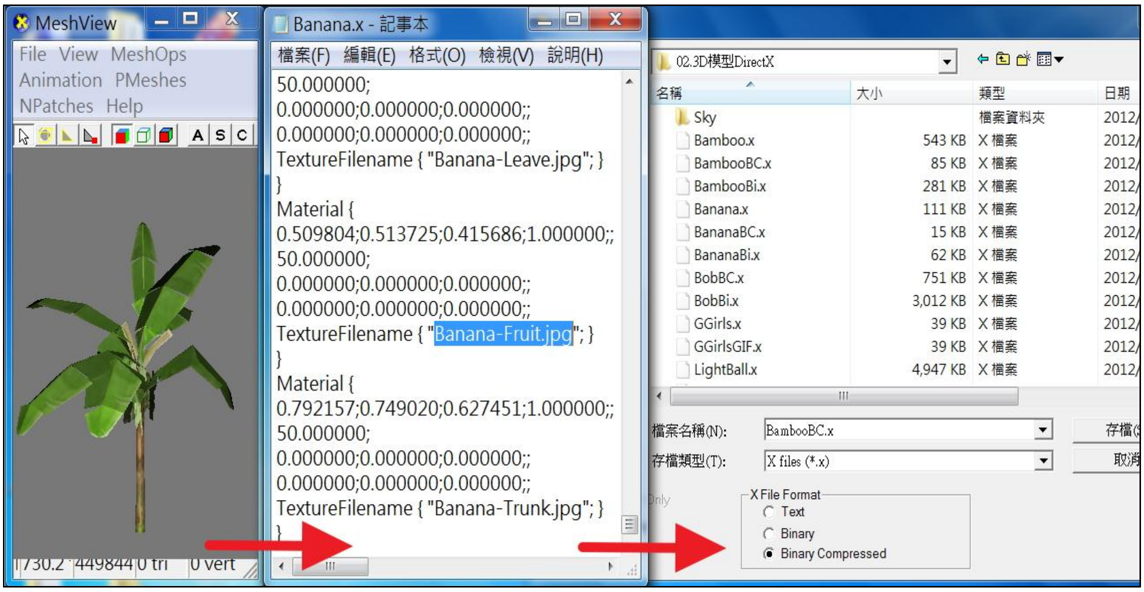

Fig. 2. Using a text editor to replace the texture file of a 3D object, and then compress the file size using the free DirectX Mesh Viewer

In addition, we develop an http handler for the 3D objects so that students can retrieve their texture files from any remote web server via the http protocol that uses TCP/IP port 80. Part of the code for this is shown below:

...... MeshMaterialList{1; 2; 0, 0;;Material {1.000000;1.000000;1.000000;1.000000;;3.200000;0.000000;0.000000;0.000000;;0.000000;0.000000;0.000000;;TextureFilename {
"http://RemoteServerIP/getImage.ashx?ImageUrl=/Upload/StudentNo/TextureFor3DObject01.jpg";} ……

This can help game designers change the appearance of distributed 3D objects easily by replacing the texture files which are stored on one or more central websites, without repacking and redistributing the whole files, which may be very large and consume too much bandwidth.

The platform solution

Before recommending a cheaper and easier to use platform for students, we tested some commercial engines, such as the Virtools, Unity3D, Second Life, and so on. In addition to reducing the price and learning curve, the following characteristics are suggested for any platform: multi-user capability for remote and collaborative peer reviews; the ability to meet firewall criteria in most educational networks, which block various gaming ports to avoid bandwidth abuse; as few steps as possible needed for the students to import and manipulate their 3D objects; extensibility to ensure that the system can evolve to meet future needs.

After examining the currently available software and developing the criteria listed above, we chose to develop our own solution based on the Microsoft Virtual Worlds research project (Vellon, Marple, Mitchell, & Drucker, 1998). Although the source code for this software is out of date, it is free of charge for teaching purposes and compatible with the Windows operating system. Moreover, we modified the source code to meet the aims of this study. First of all, the kernel for the supporting operating system was modified from Windows 95 to the more recent Windows 7, and there was also a move from IE 5.5 to IE 9 for the user interface, and from Windows 2000 to Windows 2008 for the 3D multi-user server. Second, in addition to using the http port 80 to distribute 3D and other web contents over the Internet, we modified and compiled the source code of the 3D multi-user server so that it could communicate with multiple clients via port 443, which is very widely used online. These modifications meant that this software was able to comply with most of the firewall rules used on campus networks, thus allowing a collaborative virtual environment. Last but not least, the client user interface was redesigned using a browser and HTML, as this means the text of the menu items and tool tips can be easily translated into other languages, such as Traditional Chinese for our subject students, as shown in Figs. 3 and 4.

Fig. 3. Using the IE browser as the client interface, so that the text can easily be translated by editing the HTML

Fig. 4. The user interface to organize 3D content

Because ActiveX, which was used as the API, and the IE browser, which was used as the interface and bundled with Windows, this approach has good extensibility and can work with many other online applications. There are more programmers capable of using ASP.Net, HTML5 and other mainstream web technologies than there are who can use certain commercial platforms, such as Virtools or Unreal 3D. In addition, commercial game engines sometimes focus on only one genre, such as first-person shooter games. Figure 5 shows an online multi-learner activity applying our solution, which integrates ASP.Net, Ajax, Adobe Flash and YouTube video, and thus our approach is easy to operate for people with general web programming skills, and can easily be expanded with other browser-based technologies, such as internet-based voice conferencing. Besides, the feasibility of this system has been demonstrated in educational contexts, such as game-based learning projects (Kuo, Chuang, Lin, & Chou, 2011; Kuo & Lin, 2010; Kuo, Lin, Ma, & Chen, 2009) and it has also shown potential for being used in digital game design classes.

Fig. 5. The platform integrates ASP.Net, AJAX, Flash and other web-based technologies

The basic physical deployment of our system is shown in Fig. 6. The clients use web browsers and a web portal to connect to the virtual 3D environments which are generated by one or several distributed 3D multi-user platforms, as introduced above. The database server can store all of the information that is needed to carry out any of the associated activities.

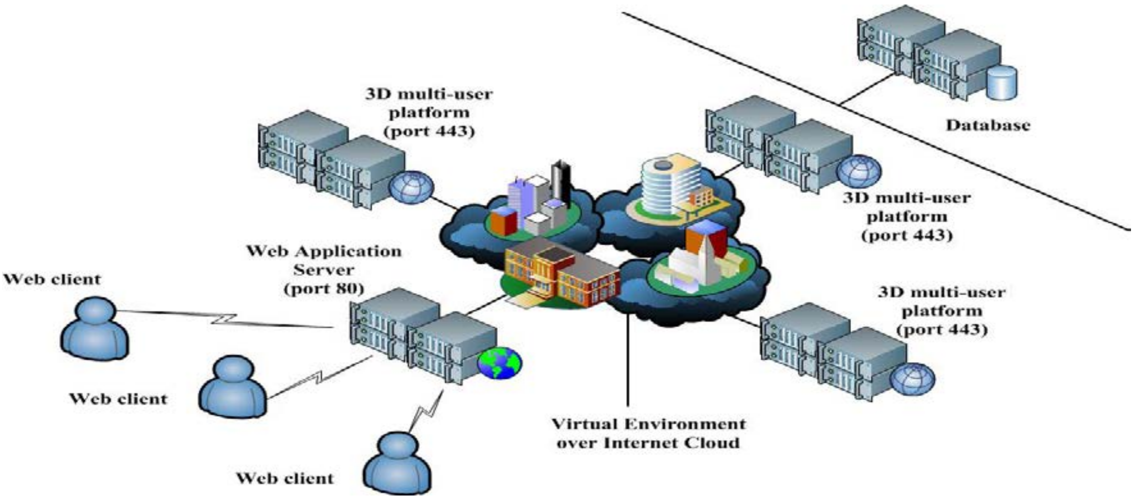

Fig. 6. The physical structure of the platform deployment

The practical implementation of the system can be arranged as in Fig. 7, which shows a 3D collaborative online learning activity. Supported by forums, avatars, instant messages and various other applications, learners are able to gather in a virtual learning space to carry out their learning tasks.

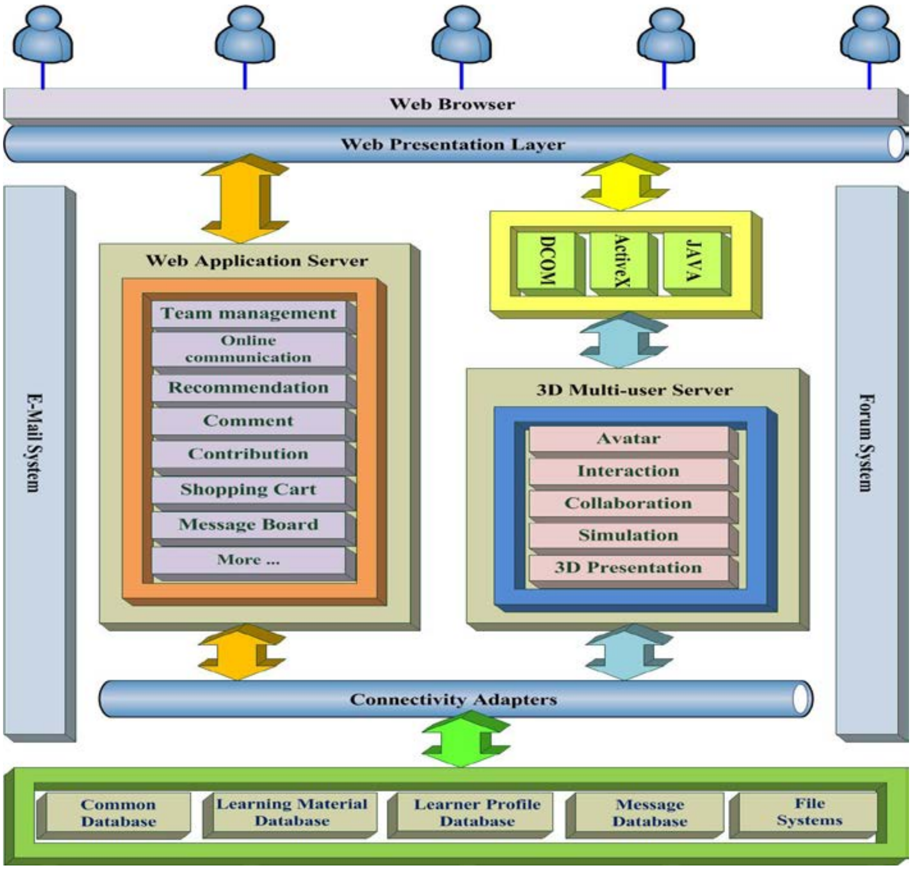

Fig. 7. An example of an implementation of the system

An experiment for testing system feasibility was run first at the campus of the National Pingtung University of Science and Technology (NPUST), with seven juniors from the Department of Management Information Systems. Subject students were told to begin their design work after watching a pre-recorded series of video tutorials which were hosted on the E-learning website of NPUST and called "The practice of 3D internet multi-user environments." The total length of the video series is just under five hours, including about 45 minutes introducing the basic principles of using Google SketchUp, and two hours of assigned hands-on labs activities.

The results and implementation

After the online video instruction and the system feasibility were tested at NPUST, the system is now being adopted in a digital game design class with 40 sophomores and three seniors from the Department of Information and Learning Technology, three juniors from the Department of Fine Arts, two juniors and one senior from the Department of Computer Science and Information Engineering, and one senior student from the Department of Drama Creation and Application at the National University of Tainan (NUTN). The students are divided into 12 groups of four or five members each for brain storming and collaborative game design. Each week, starting in the ninth week, two groups are required to demonstrate their designs to the rest of the class. The theoretical part of the instruction is delivered in lectures by the teacher in the class, while the practical part is introduced only in the first week and then supported by the online learning materials, which students can repeatedly view via network or by offline DVD videos. In addition, students can post their questions and comments on a course discussion board.

Conclusions

The purpose of this study was to find a more efficient method for teachers and students to work on projects in a 3D game design class. The system developed in this work can help the feasibility of students' game designs be discussed in more detail before investments in valuable class time or expensive and complicated software. For 3D manipulation, the system uses DirectX in text format so that the students can easily change the texture of a 3D object before compressing the object into a smaller file size in binary format in order to share the results. By taking advantage of Google's free yet powerful 3D modeling tool, along with its free 3D warehouse website, students can save both time and money when building 3D models.

For the digital presentation stage, our system uses the free Microsoft Virtual Worlds technology, as this can reduce the costs and learning curve associated with a 3D digital game design class. The extensibility and maintenance of our system are also considered, and these are not problematic due to the use of popular web- and internet-based programming languages, rather than dedicated, commercial game engines. In addition, the TCP/IP port the system used was set at 80 and 443, as these work well with academic networks, which often block the gaming ports used by commercial game engines.

The prototype of our solution was successfully tested at NPUST, and a full scale implementation is now being carried out in a digital game design class at NUTN. The 3D design software and presentation platform are both free and easy to use, and teachers and students can review and comment on every design produced by the class without needing to make large investments of time, money or efforts.

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A VALIDATION OF THE UTAUT MEASURE INSTRUMENT FOR EDUCATIONAL TECHNOLOGY ACCEPTANCE IN TURKEY

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Abstract

The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003, 2012) proposes a major model of educational technology acceptance (ETA), which has been yet validated only in few languages and cultures. Based on acceptance and cultural data from a large sample (N = 1723) of educational technology users, this study validates UTAUT in Turkey. The Turkish UTAUT questionnaire displays good convergent and discriminant validity. Structural equations modeling confirms the model validity and reveals specific ETA patterns. Conclusions are drawn with respect to further research and to UTAUT applicability in Turkish contemporary education.

Keywords: Educational technology acceptance; Unified Theory of Acceptance and Use of Technology; structural equations modeling

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Introduction

Significant efforts are sustained all over the world to enhance learning by the use of educational technology. However, a successful implementation primordially depends on the acceptance and diffusion of the used educational technology. This is why educational technology acceptance (ETA) is a topic of increasing importance in educational research and practice. After more than two decades of acceptance research (Šumak, Heričko & Pušnik, 2011; Venkatesh, Thong & Xu, 2012), Straub (2009) establishes that the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh, Morris, Davis & Davis, 2003; Venkatesh et al., 2012), a prominent acceptance theory synthesizing its major predecessors, is still insufficiently validated. In line with this statement, Nistor, Weinberger, Ceobanu and Heymann (2011) find a major shortcoming of previous acceptance research laying in the unilateral sample choice, i.e. most of the previous acceptance studies were carried out in Western countries with strong technological and educational infrastructure. However, the increasing internationalization of education calls for cross-cultural validation of ETA theories and models.

Against this background, due to special cultural, economical and political features, Turkey appears particularly interesting as a context for cross-cultural validation. Therefore, the study at hand investigates ETA on the basis of UTAUT (Venkatesh et al., 2003, 2012) and examines a large sample of Turkish educational technology users. For educational practice, the study will provide educational designers and developers of educational software with a description of acceptance profiles of e-learners, and with specific recommendations how to more effectively support technology use in education.

Literature review

Educational technology acceptance

Technology acceptance models are based on the view of acceptance as an attitude towards technology, on the theory of reasoned action, and on its expanded version, the theory of planned behavior (Ajzen & Fishbein, 2000). In the context of technology adoption, these resulted in several models, synthesized by Venkatesh and his colleagues (2003) in their Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT describes technology use under the influence of use intention, further determined by performance expectancy, effort expectancy, and social influence. Additionally, facilitating conditions directly determine technology usage. The influence of the predictors named above on behavioral intention and use behavior is moderated by users' age, sex, experience, and by their voluntariness of use. On this ground, the UTAUT model explains up to 40% of the variance in the technology use behavior. By adding further acceptance predictors, from which habit seems to be the most important, an extended UTAUT version (Venkatesh et al., 2012) explains 52% of the same variance.

The studies cited so far are positioned in the domain of Information Systems. Only few efforts have been made to analyze technology acceptance from the perspective of technology-enhanced learning. Thus, Straub (2009) emphasizes that the UTAUT is still a relatively new model, with yet limited impact in educational research; further validation and replication of the UTAUT model appears to be essential. In a recent study, Nistor, Wagner, Istvánffy and Dragotă (2010) report findings that are consistent with Venkatesh and colleagues (2003), but increase the explanatory power of the UTAUT model by additionally considering the role of computer anxiety for ETA (cf. Beaudry & Pinsonneault, 2010; Conti-Ramsden, Durkin & Walker, 2010). However, the ecological validity of previous findings is limited by the low diversity of samples. The majority of the participants appear to be young technology users from Western countries, mostly with technological professions and displaying a high acceptance level. In spite of limitations, UTAUT appears to provide a robust and reliable model that can be used to gain deeper understanding of ETA. Additional validation is nevertheless necessary.

Educational technology in Turkey

Turkey is a Eurasian country located in Western Asia (Anatolian peninsula) and in Southeastern Europe. It has a population of 74.72 million people, from which 13.59 million (18,2%) live in Istanbul (TSI, 2012). Moreover, 77% of the population lives in 80 cities. Turkey is a democratic, secular, and constitutional republic country. The Islamic religion, recent political developments and its history link Turkey to Asia, while its memberships in the Council of Europe, NATO, OECD, OSCE and the G-20 major economies link it to Europe. Turkey's move towards Europe has begun with the acceptance of Western civilization at the turn of the 19th into the 20th century. More intensive and specific efforts have been done in the past two decades, aimed at entering the European Union (Bonnett, 2002). Actually, this process is still going on, major economical and cultural changes have been reported in the past decade (Parnell, Koseoglu & Dent, 2012).

Presently, the Turkish government has been promoting the use of educational technology for several years at all levels. In Turkish schools, Özdemir and Kılıc (2007) analyze a technology-based educational program in the early 2000s and observe successful integration of information and communication technologies (ICT) in the primary school system, however with several shortcomings caused, among other factors, by lacking necessary cultural changes, placing an emphasis on technology rather than on pedagogy, and limited knowledge and skills of the school personnel. Şerefoğlu Henkoğlu and Yıldırım (2012, p. 23) assert that "the most important of these problems are results of the elective status of computer education course and the limited time allocated for this course". From another perspective, Çağlar and Demirok (2010) demonstrate the positive effect of students using a computer at home on their computer skills, as opposed to using a computer at school, which proved less effective. In Turkish universities, Yurdakul (2011) finds positive attitudes toward technology use, and essential technology skills and knowledge to feel adequate in a technology-enhanced learning environment. Notably, this state-of-the-art was reported from less technological domains, such as social sciences and teacher education, which may be less expected to promptly adopt new technologies.

Methodology

In order to validate the UTAUT model (Venkatesh et al., 2003, 2012), a correlation study was conducted, recording transversal data in a one-shot survey, from various learning technology users. The collected sample ($N = 1723$) included $n = 962$ participants from Istanbul area and $n = 761$ from other regions. The sample provided further diversity in terms of sex (895 male and 828 female participants) and age (537 participants were under 30 years old, 1005 between 30 and 50, and 182 over 50).

The independent variables performance expectancy, effort expectancy, social influence, facilitating conditions, computer anxiety and computer literacy were measured, as well as the dependent variables use intention and use behavior. The research instrument consisted of a Turkish translation of the questionnaire proposed by Venkatesh et al. (2003, 2012) with variable values ranging from 1 = very low to 5 = very high acceptance. Aimed at surveying general attitudes and intentions towards technology, the questions were framed about "the computer as a learning tool", with specific references to office software, information search on the Internet, communication and interactions between Internet users (e.g. e-mail, discussion forums, chat etc.), and e-learning. Computer literacy was self-assessed based on the statement "I know what the following are and how they work", related on the technologies mentioned above. Data was collected calling for voluntary participation. Data analysis was performed using IBM SPSS Statistics version 19 and R version 2.11.1 (using Lavaan version 0.4-9 and SEM version 0.9-21).

Findings

A confirmatory factor analysis was performed. Several items were removed due to low factor loadings. The remaining items had satisfactory loadings and the average variance extracted was above 0.5, which demonstrates convergent validity of the instrument at item level. The square root of the average variance extracted was higher than any correlation with other constructs, which demonstrates the discriminant validity of the model. The comparative fit index (CFI) of the confirmatory factor analysis was 0.984, describing a good model fit.

The acceptance variables had mean values between $M = 4.13$ ($SD = 0.74$) for effort expectancy and $M = 2.07$ ($SD = 0.98$) for computer anxiety. The UTAUT path coefficients resulting from structural equations modeling with latent variables are provided in Fig. 1. Facilitating conditions were the strongest predictor of the UTAUT model, followed by social influence and computer anxiety. Remarkably, the intention to use educational technology had a very weak influence on the actual use behavior.

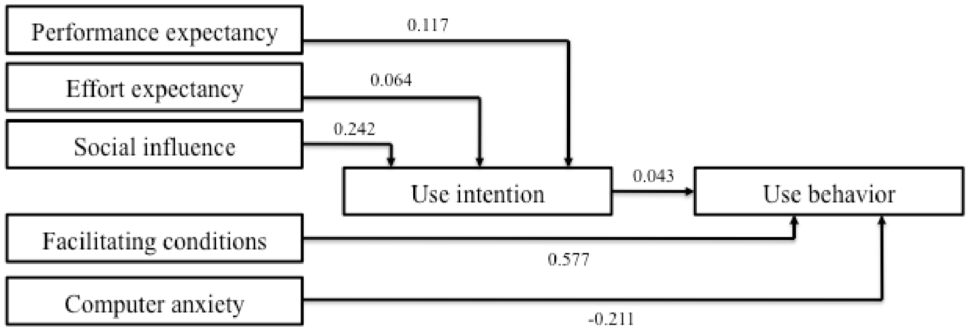

Fig. 1. Verification of the extended UTAUT model with path coefficients

Discussion and conclusions

The study validated UTAUT and the corresponding measurement instrument for Turkish language and culture, proving thus extended evidence of the applicability of educational technology acceptance as conceptualized by Venkatesh and colleagues (2003, 2012). Also, UTAUT was extended from the Information Systems domain, where it was initially developed, to educational sciences. In contrast to previous findings (e.g. Venkatesh et al., 2012), performance and effort expectancy were not the strongest acceptance predictors. This particular acceptance profile can be explained by a high diffusion grade of the computer as learning tool. Practically, there is no alternative to using computers for adult learning, hence use behavior does hardly depend on survey participants' use intention (Bagozzi, 2007; Liu, 2012; Nistor, under review), which are in turn less dependent of individual expectations. Also, participants' extensive computer knowledge and skills further decrease the influence of intentions on behavior (Venkatesh et al., 2012). On the other hand, the ongoing development of the technological infrastructure of education makes technology use behavior strongly dependent of facilitating conditions, and increases the impact of computer anxiety.

As a conclusion at theoretical level, further ETA conceptualization should take into consideration alternative explanations of educational technology use, for situations in which rational decisions in the sense of Ajzen and Fishbein (2000) are impossible due to, e.g., lacking media choice or insufficient information about performance and effort. As Bagozzi (2007, p. 245) observes, intention-behavior correlation is "probably the most uncritically accepted assumption in social science research in general and IS research in particular".

As a general conclusion for educational practice, this study emphasizes the importance of facilitating conditions, from which especially computer literacy and user support are tightly intertwined with the acceptance and use of educational technology. This may be directly supported by computer skills training, but also indirectly by supporting self-directed experiential learning (Çağlar & Demirok, 2010). Also, forced use of educational technology should be avoided (Liu, 2012), since it contradicts personal attitudes and intentions, and may thus increase computer anxiety and impair learning motivation (Deci & Ryan, 2000). Therefore, while implementing technology in education at all levels in Turkey, computer-based learning environments should be provided along with technology-free alternatives, or at least include face-to-face components. Finally, educational designers and educational software developers may use the validated UTAUT instrument for a better insight in learners' individual characteristics, which should be considered in association with design elements of learning environments. Relying on the paradigm of mass-customization (Nistor, Dehne & Drews, 2010), technology-enhanced learning environments may be designed for specific groups of users defined by acceptance profiles.

As a limitation of this study, the impact of culture on ETA was not yet analyzed. Further studies should examine technology acceptance in association with cultural data, and integrate culture in ETA theories and models.

Acknowledgements

We would like to thank Gurol Zırhlıoğlu for his contribution to statistical data processing. We are also grateful to Dr. Aytaç Göğüş's students from Project 102 course during spring and fall 2011 for their help with data collection in Turkey.

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A WEB APPLICATION SUPPORTED LEARNING ENVIRONMENT FOR ENHANCING CLASSROOM TEACHING AND LEARNING EXPERIENCES

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Abstract

Thanks to the advancement of information and communication technology (ICT), several tools and systems have been proposed to provide a quality classroom experience to instructors and students. Nevertheless, the most of them are a brand-new and stand-alone program that could influence users' teaching and learning experiences since users have to spend additional time and efforts to practice and maintain the tools or systems. In fact, in the era of Web 2.0, instructors and students are heavily immersed in various web applications daily, such as Wikis, Flickr, WordPress, and Google web applications, and familiar with the manipulation of these applications. Therefore, the well-known web applications could be a potential new way to engage the instructors and students in meaningful teaching and learning activities. Bearing this in mind, this study aims to apply well-known web applications to propose a web application supported learning environment for supporting classroom teaching and learning activities that can seamlessly enable instructors and students to meld with their daily use of Web 2.0 tools. Through the investigation of a case study, the results revealed that the instructor and students can administer teaching and learning activities efficiently and effectively. In addition, the learning motivation of participated students and interaction between each participant can also be facilitated through engaging in the proposed environment.

Keywords: Web 2.0; Web Applicaion; Classroom Experience

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Background and Objectives

Over the past decade, education has undergone significant changes as the advance of information and communication technology (ICT). Through the use of ICT, teachers can administer various educational activities to engage students in meaningful learning contexts. In addition, the learning motivation of students can be stimulated by integrating ICT into learning processes (Huang, Lin, & Cheng, 2010). Consequently, the ultimate goal of the use of ICT is to enhance the teaching and learning performances of teachers and students.

To date, several tools or systems have been proposed to support various classroom activities (Jou, Chuang, & Wu, 2010; Lee, Lu, Yang, & Hou, 2010; Lin, Tan, Kinshuk, & Huang, 2010). Nevertheless, the most of them are a brand-new and stand-alone program. This means that users (instructors and students) have to spend additional time and efforts to be familiar with the manipulation of the tools or systems. Moreover, the users may need to install additional programs on their own devices or apply a new account for these programs. The phenomena could influence the users' motivation on using the particular programs to support specific educational contexts (Lin, Lin, & Huang, 2011).

In the era of Web 2.0, most notably, there are several web applications that have been developed for serving each user openly and freely, such as Flickr, Wikis, WordPress, and Google services. All of these web applications provided friendly user interfaces and powerful functionalities. Moreover, instructors and students apparently embrace the web applications in their everyday lives. Based on these features, several literatures indicated that the well-known web applications could be a potential new way to engage participants in meaningful teaching and learning activities (Alexander, 2006; Hughes, 2009; Schneckenberg, Ehlers, & Adelsberger, 2011; Thompson, 2007; Wang, Woo, Quek, Yang, Liu, 2012). Furthermore, by using these applications, the instructors and students would be motivated to use them in an educational context and would already own the necessary technical skills (Dohn, 2009). Therefore, they only need to consider how to apply the applications to assist them in administering educational activities in their classes (Pretlow & Jayroe, 2010). In addition, previous studies also found that participants took part in a web-enhanced class outperformed those who in a traditional lecture format (Crook & Harrison, 2008; Hamann & Wilson, 2002). The effective use of the web applications could also weaken boundaries between formal and informal learning (Bennett, Bishop, Dalgarno, Waycott, & Kennedy, 2012).

Bearing this in mind, this study aims to apply Google web applications to propose a web application supported learning environment for supporting classroom teaching and learning activities that can seamlessly enable instructors and students to meld with their daily use of Web 2.0 tools. Indeed, Google is acting an important role in this generation. It has proposed several well-known web applications, such as Google Docs, Reader, Sites, and Plus. To investigate the effects of the proposed approach on participants' teaching and learning experiences, a case study was conducted at a university in Taiwan. The results revealed that the instructor and students can administer teaching and learning activities efficiently and effectively. Additionally, the learning motivation of the students and interaction between each participant can also be facilitated through engaging in the proposed environment.

Web application supported learning environment

In this study, a web application supported learning environment was proposed to enhance classroom teaching and learning experiences. Fig 1 shows the framework of the proposed environment, which consists of three main components, namely the web application side, teacher side, and student side.

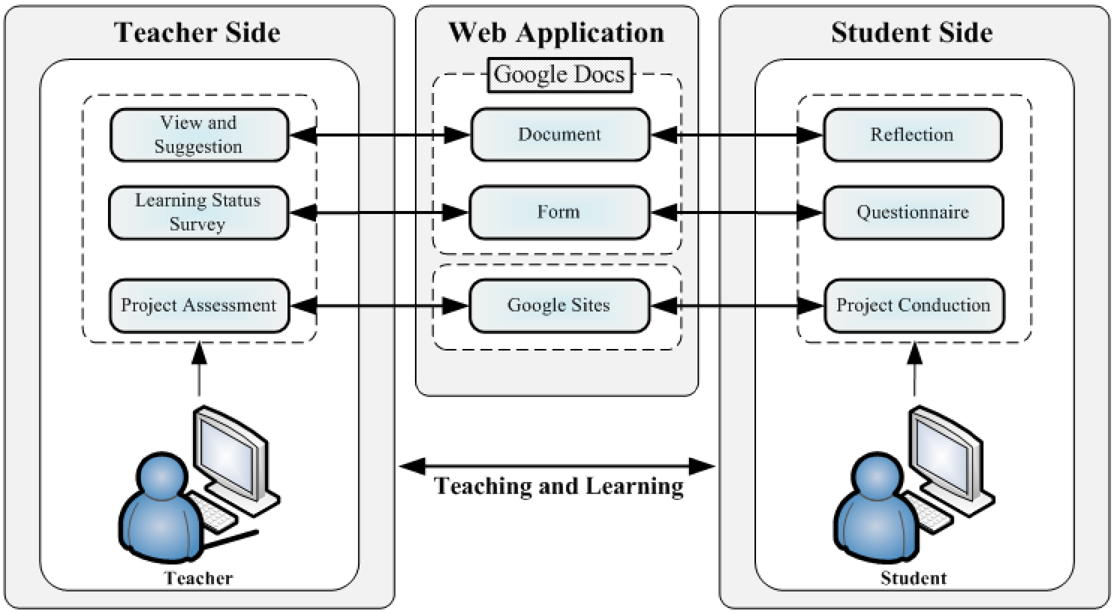

Fig. 1. The framework of the web application supported learning environment

Web application side

To achieve this aim, two Google web applications, Google Docs and Sites, were adopted to develop the learning environment. With regard to Google Docs, two types of Google Docs, document and form, were used to facilitate the participants' interactions. Google document provides a web-based document service that enables users to create and edit online documents through a web browser. Moreover, users can share their own documents to others easily. Furthermore, Google form provides an online questionnaire service that enables users to create an online questionnaire to conduct a survey efficiently and effectively. With regard to Google Sites, it provides an easy way to enable users to create dynamic web pages for team projects with teammates as easily as writing a document. This means that each user can use this service without obstacles even though they do not own any web programming skill.

Teacher side

Instructors can ask students to use Google document to conduct a reflection learning activity. Through reflection, the students can increase comprehension of their own thinking process (Jou & Shiau, 2012). Moreover, the instructors can also use Google document to view each student's document and give comments and suggestions immediately through the students' shares. Furthermore, by using Google form, the instructors can immediately administer an online questionnaire to capture students' learning status and performance during the teaching process, as shown in Fig 2. Further, the formative information could be an useful basis for the instructors to understand the students' thoughts and adjust teaching paces (Huang, Kuo, Lin, & Cheng, 2008). In addition, the instructors can lead the students to apply Google Sites to conduct a team project collaboratively.

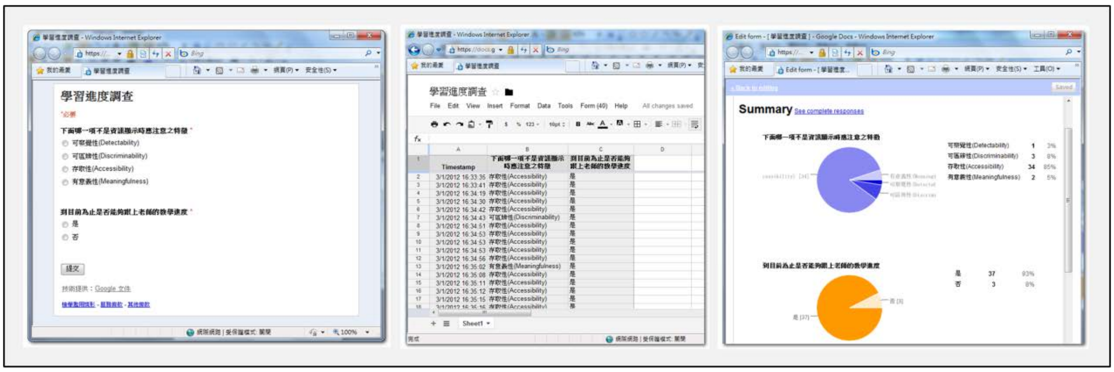

Fig. 2. The snapshot of online questionnaire through Google form

Student side

Students can create a Google document to record their learning status and notes just like using Microsoft Office Word. Moreover, they can express their opinions and thoughts by replying the instructors' Google form. In addition, the students can present their learning results with peers through the use of Google sites, as shown in Fig 3.

Fig. 3. The snapshots of project development through Google sites

Case study in an industrial course

To investigate the influence of web application supported learning environment in classroom teaching and learning, an experiment has been conducted on an industrial course at a university in Taiwan.

Research instrument, measures and goals

To evaluate the effects of the proposed approach on teaching and learning performance, two data sources were utilized, including questionnaires and interviews. The questionnaires were designed to document the students' learning motivation and learning attitude. The interviews were used to investigate the perception of the participants towards the entire teaching and learning process.

As mentioned above, to measure the students' learning motivation, the intrinsic value scale of learning motivation questionnaire MSLQ (Motivated Strategies for Learning Questionnaire) was adopted in this study. The intrinsic value scale has been recommended by researchers to measure students' goals and beliefs about the importance and interest of class work, using nine questionnaire items and a seven-point Likert scale (Pintrich & De Groot, 1990).

Moreover, the students' learning attitude was surveyed using a learning attitude questionnaire that consists of six questionnaire items with a five-point Likert scale. The questionnaire has been previously used to measure students' learning attitudes towards learning activities (Lai & Wu, 2006; Lin, Lin, & Huang, 2011).

Experimental design, participants and procedure

To investigate the effectiveness of the proposed approach, a quasi-experimental research was conducted on an industrial course at a university in Taiwan. The participants in the experiment were a course instructor and 40 university students. The average age of the students was 20. The experiment was conduct on a subject, product design. To perform the subject, a learning site was developed to consolidate all of the learning contents with regard to the subject, as shown in Fig 4. Furthermore, this subject was instructed in the sixth week of the syllabus of the industrial course, and it had a total of 500 min of learning activities, including instruction, discussion, reflection, and practice. The time distribution of each learning activity was planned by the course instructor, and these came in six stages, as illustrated in Table 1.

Fig. 4. The snapshot of the learning site

Table 1. Major teaching and learning activities in the industrial course

Subject: Product Design		
Unit	Instruction Activities	Time (min)
Design Theory	1. Instructor presentation (35) 2. Instruction of Google document manipulation (5) 3. Discussion (20) 4. Reflection (20)	80
Human Factors Engineering	1. Review of previous instruction (5) 2. Instructor presentation (35) 3. Discussion (20) 4. Reflection (20)	80
Ergonomics	1. Review of previous instruction (5) 2. Instructor presentation (35) 3. Discussion (20) 4. Reflection (20)	80
Product Patent	1. Review of previous instruction (5) 2. Instructor presentation (35) 3. Product patent practice (20) 4. Reflection (20)	80
Creative Design Management	1. Review of previous instruction (5) 2. Instructor presentation (35) 3. Discussion (20) 4. Reflection (20)	80
Team project presentation	1. Instruction of Google sites manipulation (20) 2. Development of team project (60) 3. Project presentation (20)	100

Fig 5 shows the experimental process. All students were asked to fill out the learning motivation questionnaire before participating in the learning activities. At the end of the learning activities, they were asked to complete the learning motivation questionnaire again. In the meantime, the learning attitude questionnaire was distributed to each participating student. In addition, at the conclusion of the questionnaire, two interviews served to document the perceptions of the participants towards the entire teaching and learning process.

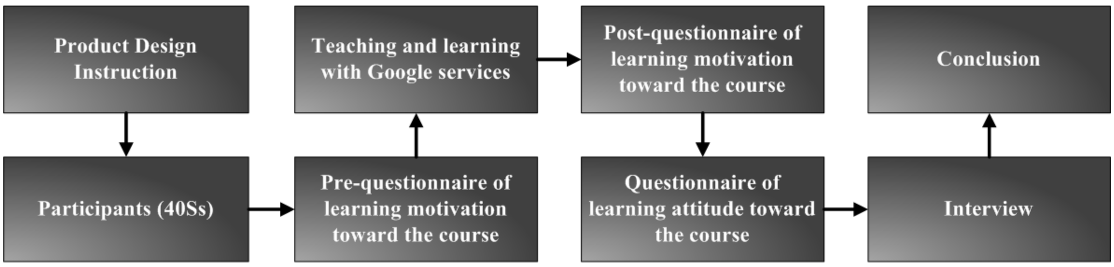

Fig. 5. The experimental process

Experimental Evaluation

Learning motivation survey

In this study, the web application supported learning environment has been practically applied to an industrial course in a university. Before and after participating in the learning activities, all students were asked to fill out the MSLQ questionnaire. The Cronbach's alpha values of the questionnaire items were .776 and .828, respectively. It was found that the students were significantly motivated after learning with the proposed approach. From the statistical results of the MSLQ questionnaire survey, it was found that the learning motivation of more than 87.5% of the students was increased after learning in the learning environment.

Moreover, the learning motivation of 12.5% of the students was decreased. In addition, to examine the differences in the learning motivation for each student before and after the learning activities, a paired *t*-test was used to analyze the participated students. The results revealed that the students were motivated after participating in the learning activities, as shown in Table 2.

Table 2. Paired-samples *t*-test on the learning motivation of the students

	Group	*N*	Mean	S.D.	*t*(39)
Learning Motivation	After participating in the learning activity	40	4.86	1.14	5.398*
	Before participating in the learning activity	40	4.06	1.01	

Learning attitude survey

In this experiment, students were asked about their attitudes to learn product design by filling out a learning attitude questionnaire after participating in the learning activities. The Cronbach's alpha value of the questionnaire items was .786. The statistical results are presented in Table 3.

To exam the results, overall, most students reported having positive attitudes towards learning in the web application supported learning environment (82.5%, Table 3, 'SA & A' column). Only 7.5% of the students said that they disliked the kind of learning ('D & SD' column). Moreover, most students indicated that the learning activities assigned by the instructor are helpful. Corresponding to the first item, a majority of students stated that they like to use the web applications in learning. Furthermore, nearly four-fifths of students felt that the use of the web applications are very easy, and almost no students disagreed. With regard to the interactions with participants, 80.0% of students agreed that they had good interactions with peers and the course instructor.

Table 3. Students' attitudes towards learning activities

#	Item	SA & A (%)	Neutral (%)	D & SD (%)	Mean
1	I like learning in the web application supported learning environment	82.5	10.0	7.5	4.10
2	The learning activities are helpful	87.5	7.5	5.0	4.35
3	I like to use the web applications in learning	87.5	5.0	7.5	4.35
4	Using the web applications are very easy	80.0	17.5	2.5	4.175
5	I had good interactions with other students	85.0	12.5	2.5	4.30
6	I had good interactions with the instructor	75.0	17.5	7.5	4.15

Interview Investigation

Next, the course instructor and the students were interviewed to capture their perceptions and impressions with regard to the teaching and learning. In all the interviews, the instructor's and students' responses were recorded and then transcribed. To clearly present the interview results, this study synthesizes the transcripts into the three main topics with regard to instruction, interaction, and technology aspects, as illustrated in Table 4.

Table 4. Example comments for the three topics

Inductive Topics	Sample Comments
Instruction Perspective	The instructor thought that the proposed approach could assist him in administering the class.
	The instructor observed that the students had higher learning motivation while integrating Google web applications in the activities.
	Most students felt that they could find self-fulfillment in using Google Sites for conducting team projects.
Interaction Perspective	The instructor felt that the use of Google document can enhance the students' interactions during the reflection activity.
	The instructor indicated that the use of Google Docs could enable him to capture the students' learning status and perceptions efficiently and effectively.
	The generality of students thought that they could express personal opinions better through Google Docs.
Technology Perspective	The instructor felt that the majority of the participants could accept the use of the web applications in this class.
	The instructor indicated that the web applications were convenient, and he could easily check the students' documents and projects anytime and anywhere.
	Most students indicated that the use of the web applications is easy for them.

Interview Investigation

The instructor thought that the proposed approach could assist him in administering the class especially reviewing the reflective notes and learning status of the students. Moreover, he stated that the students felt interest in using the web applications during the learning process since they have never used the web applications to support learning. He also observed that the students had higher learning motivation while integrating the web applications in the activities. In addition, the instructor said that Google Sites is an appropriate and useful tool to present individual or team projects for the students.

With regard to the interview with the students, the most of students thought that they had higher learning performance while learning in the web application supported learning environment. Moreover, they could find self-fulfillment in using Google Sites for conducting team projects because they did not own any programming skill and they could develop an individual web site. Nevertheless, only few students felt that the use of Google Sites could be an obstacle to administer their projects due to they were not familiar with the manipulation of Google Sites.

Interaction perspective

With regard to the interaction perspective, the instructor felt that the use of Google document can enhance the students' interactions during the reflection activity. Moreover, the instructor indicated that the use of Google Docs could enable him to capture the students' learning status and perceptions efficiently and effectively especially for some introverted students in the class. Furthermore, through sharing individual Google document, the instructor stated that he could easily provide learning suggestions and comments to the students according to their notes.

From the view of the students, the generality of students thought that they could express personal opinions better since the instructor applied Google form to survey their learning status. Moreover, several students said that Google Docs is a useful tool to assist them in conducting co-works with peers since it supports multiple people to view and make changes at the same time. Additionally, over half of students indicated that the use of Google Sites could strengthen their interactions with peers and further enhance their project productivity.

Technology perspective

The technology context synthesizes the experience of the participated students and the course instructor when engaging in the web application supported learning environment. The instructor felt that the majority of the participants could accept the use of the web applications in the class since the web applications have been widely used by them daily. Moreover, a significant benefit of the web applications is that all of the web applications can support each other, therefore, users can easily apply each web application to support different activities based on their requirements. Furthermore, the instructor indicated that the use of the web applications in the class is very convenient to him because he could easily check the students' documents and projects anytime and anywhere through Internet and various devices. In addition, he also observed that several students could use Google document to edit their reflection notes after-school. This implies that the web applications were convenient and useful, and so most students actively used them, which motivated them to reflect their learning after participating in the course.

In addition, the majority of the students indicated that the use of Google document is easy for them because the user interface of Google document is similar with Microsoft Office Word. Moreover, they also felt that

Google document is convenient to use for the reflection activity since they could access the document anytime and anywhere and did not worry about losing the document. Based on the advantages, they also stated that they would apply Google document to be a learning tool to note down everything they learned in other courses. Furthermore, several students thought that in addition to using Google Sites to conduct a team project, it is also a useful tool for them to administer a large-scale activity or study group.

Study Limitations

The proposed approach in this study was conducted in a computer-aided classroom. One study limitation was that the approach could not be conducted in a traditional classroom so far since tablet PC and smartphone did not popularize to each student. However, this issue will be resolved with future progress in the popularization of the kind of portable devices. Another limitation of this study was that although the majority of the participants were familiar with the web applications in their daily lives, many have a limited understanding of how the web applications could support their learning (Ng, 2012). Therefore, course instructors have to provide sufficient information and explicitly teaching to their students with regard to the use of the web applications for the educational purposes.

Conclusions

This study proposed a web application supported learning environment to support classroom teaching and learning activities that seamlessly enabled instructors and students to meld with their daily use of Web 2.0 tools. To evaluate the performance of the proposed approach, an experiment has been practically conducted in an industrial course at a university in Taiwan. Moreover, questionnaires and interviews were used to record the perceptions of participants, and the results revealed that the instructor and students appreciated the use of the web applications in the class.

Based on the investigation, the use of the web applications in the class has several advantages, such as engaging students in learning activities and interactions and facilitating the learning reflection and presentation. Furthermore, a significant advantage is that the web applications have been widely used by most students in daily life. Therefore, the proposed approach could delight the majority of participants in using the web applications in a new and meaningful way.

Finally, the future direction of this study is to apply appropriate web applications to strengthen the proposed learning environment for supporting different subjects and disciplines in variety of educational pedagogies. Moreover, through the further investigations, we can analyze the learning effects of participants in particular and develop suitable solutions to support the proposed approach by the use of application program interface (API).

Acknowledgements

The authors gratefully acknowledge the support of this study by the National Science Council of Taiwan, under the Grant No. 99-2511-S-003 -034 -MY3.

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Bilgisayar Destekli Eğitiminde Öğretmen Ve Öğrenci Rolleri

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Özet

Teknolojideki, toplumdaki, sanayideki ve bunlar haricinde diğer bir çok alanda olduğu gibi her alanda sürekli değişimler olmaktadır. Bu gelişmeler eğitime alanında da büyük değişimlere sebep olacaktır. Eğitimdeki gelişmeler haliyle eğitimin temel yapı taşı olan öğretmen ve öğrenciden beklenen beklentileri de farklılaştıracaktır. Bu değişikler öğretmen ve öğrencinin eğitimde farklı roller üstlenmeye itecektir. Bilgisayar Destekli Eğitim günümüzde bu gelişmelerin getirdiği en önemli değişikliktir.

Bilgisayar destekli eğitimde öğretmen ve öğrenci rolleri temel olarak klasik eğitimle aynı olsa da Bilgisayar destekli eğitim öğretmen ve öğrenciyi farklı roller üstlenmeye itecektir. Öğretmen her geçen gün eklenen yeniliklerle yaşam boyu öğrenci rolü alacağı gibi öğrenci bilgiyi hazır alan değil sürekli bilgiye ulaşmaya çalışan bir rol üstlenecektir.

Anahtar Kelimeler: Bilgisayar Desteki Eğitim, Öğrenci Rolleri, Öğretmen Rolleri

GİRİŞ

İnsanlar, “öğretmen” kavramına pek çok anlam yüklüyorlar. Bazı anlamlar, daha çok, öğretmen rolü oynayan insanların duygusal olmayan, doğrusal betimlemelerini ve onlardan yerine getirmeleri beklenen görevlerin teknik betimlemelerini yansıtıyor. Yükle-nen diğer anlamlar, kendilerini öğretmen olarak adlandıran insanların ve onların yaptıkları işlerin çok daha canlı, sıcak ve çok boyutlu bir anlayışla ele alınmasına dayanıyor. Anlamının zenginliğini ve önemini açığa çıkarmak için, kişinin, "öğretmen” kavramını irdelemesi yeterlidir.

Klasik eğitim anlayışında öğretmen, bilgiye sahip olan ve o bilgiyi alıcılara aktaran tek kaynak olarak görülmektedir. Ancak günümüz teknolojisinde bilginin elde edilmesi ve kullanılmasında yaşanan gelişmeler, öğretmenin sınıf içerisindeki rolünü değiştirmektedir. Öğretmen, sadece bilgiyi depolayan ve onu öğrenciye sunan tek kaynak olma işlevinden çok, öğrenciyi bilgiye yönlendiren kişi halini almaktadır. Bu anlayışla, zannedilenin aksine öğretmenin sınıf ortamındaki etkinliği ve sorumluluğu daha çok artmaktadır.

Öğretmenlik mesleği, özel uzmanlık bilgisi ve becerisi gerektiren bir meslek olduğuna göre, bu mesleği tercih eden insanların, mesleğin gereklerini tam olarak yerine getirebilmeleri için bir takım yeterliklere sahip olması gerekir (Şişman, 2001). Bu yeterliliklere öğretmen rolleri demek olanaklıdır. İyi bir öğretmenin, söz konusu rolleri etkin bir biçimde yerine getirmesi beklenir. Bu çalışmanın odak noktası olan öğretmenler, geleneksel eğitimin olduğu gibi uzaktan öğretimin de en önemli öğelerinden biridir. Uzaktan öğretimin başarılı olması büyük oranda öğretmene bağlıdır. Uzaktan öğretim, öğrencinin işini kolaylaştırırken, öğretmenin işleri ve sorumlulukları artırmış, bunun sonucu olarak da rollerin nitel ve nicel özellikleri değişmiştir.

BİLGİSAYAR DESTEKLİ EĞİTİM

Bilgisayar Destekli Eğitimin çeşitli tanımları verilmektedir. Bu tanımlardan ilkine göre Bilgisayar Destekli Eğitim bilgisayar teknolojisinin öğretim sürecindeki uygulamalarının her biridir. Bu uygulamalar bilgi sunmak, özel öğretmenlik yapmak, bir becerinin gelişmesine katkıda bulunmak, benzeşim gerçekleştirmek ve sorun çözücü veri sağlamak olabilir.

Başka bir tanıma göre ise, Bilgisayar Destekli Eğitim, öğrencilerinin bilgisayar sistemine programlanmış olan dersleri etkileşimde programlanmış olan dersleri etkileşimde bulunarak, doğrudan alabilmeleridir. Bu tanımların bir sentezini ise bu ünite için kabul edilecek bir başka tanım vermektedir.

Bu tanıma göre; Bilgisayar Destekli Eğitim, bilgisayarların ders içeriklerin doğrudan sunma, başka yöntemlerle öğrenilenleri tekrar etme, problem çözme, alıştırma yapma ve benzeri etkinliklerde öğrenme-öğretme aracı olarak kullanılmasıyla ilgili uygulamalardır.

Bilgisayar Destekli Eğitimin temelinde uyarı, yanıt ve pekiştirme öğeleri bulunmaktadır. Öğrenciye bilgisayara bağlı terminal veya monitörde uyarıcı olarak bilgi sunulmakta, bu bilgiye ilişkin soruya öğrenci yanıt vermekte, yanıtın niteliğine göre de kendisine pekiştirme sunulmaktadır. Bu etkinliklerin tekrarı belirli konularda öğrenci davranışında değişiklik yapmaktadır. Bu da öğrenmenin oluşması anlamına gelmektedir.

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BDE BİLEŞENLERİ

BDE uygulama sürecinde karşılaşılan birçok faktör, eğitimin verimliliğini etkileyebilmektedir. BDE uygulama sürecini etkileyen bileşenleri (faktörleri) şöyle sıralayabiliriz.

- Öğretmen
- Hedef kitle durumundaki öğrenci veya öğrenci grubu
- Bilgisayar donanımı
- BDE ders yazılımları

Öğretmen, BDE'nin etkinliğinin sağlanmasında şüphesiz en etkili görev öğretmenlere düşmektedir. Eğitimde bilgisayar, öğretmenin yerini tutacak bir şey değil aksine isini kolaylaştıracak bir araç olduğu için öğretmenlerin bu konuda aldıkları eğitim önemlidir. BDE'de geleneksel eğitime göre öğretmenin rolü azalmamakta aksine artmaktadır.

Öğrenci, kendi öğrenme sorumluluğuna sahip, seviyesine ve gereksinimlerine bağlı olarak konuların dağılımını, isleyişini ve zamanını belirleyen, sadece bilgiyi alan değil aynı zamanda keşfeden kişidir.

Bilgisayar donanımı; her şeyden önce, bir öğretim yazılımının kullanılabilmesi için mutlaka gerekli donanımın bulunması gerekir. Sınıfların ya da okulların BDE için gerekli donanımlara erişimi bazen zor ve pahalı bir süreç olabilir. Bunun yanında, öğretimsel yazılımların kullanılabilmesi için bilgisayarlara ek olarak özel donanımlara ihtiyaç duyulabilir. Diğer öğretim materyallerinin bir çoğunda olmadığı halde, BDE ortamında donanım ve yazılıma sürekli yatırım yapılması gerekliliği göz ardı edilemeyecek bir gerçektir. Özellikle de teknolojik özellikleri çok gelişmiş olan yazılımlar, donanımın da sürekli güncelleştirilmesini ve yenilenmesini gerektirebilir. Bu BDE için gerekli donanım ve yazılımın alımında ve bilgisayar okuryazarlığı eğitimlerinde maliyet – fayda analizleri yapılmalı, eldeki kaynaklar en akılcı ve etkin biçimde kullanılmalıdır.

BDE ders yazılımları, kullanıldıkları ortamlara ve kullanıcıların niteliklerine göre değişik özellikler barındırmaktadırlar. Örneğin evde kendi başına çalışma biçimine göre hazırlanmış bir ders yazılımının özellikleri ile bilgisayar laboratuarında öğretmen ve sınıf eşliğinde ve belirli bir ders saatinde uygulanacak ders yazılımının özellikleri önemli ölçüde farklıdır.

Eğitim yazılımlarının özellikleri incelenirken yazılımın ilişki içinde bulunduğu kesimlere yönelik özellikleri ve yazılımın kullanıldığı ortamlara yönelik farklılıkları ele alınmalıdır. Eğitim yazılımlarının ilişki içinde bulunduğu kesimlerin (katılımcılar) başında yazılımı çalıştıran bilgisayar gelir. Diğer katılımcılar, yazılımı kullanan öğrenci, varsa yazılımı aynı anda kullanan ikinci öğrenci, sınıf ve öğretmen olarak tanımlanır. Bir eğitim yazılımı bilgisayarın diğer dört katılımcıya yönelik yönergeleri doğrultusunda işleyişine devam eder.

ÖĞRETMENLİK VE ÖĞRETMENİN ROLLERİ

İnsanlarla ilişkiler yönünden öğretmenlik, diğer bazı mesleklerden farklı olarak geniş bir insan kesimiyle ilişki ve etkileşim içinde yerine getirilen bir meslektir. Öğretmenlik, sadece okul ve sınıf ortamında öğrencilerle değil, okul dışında veliler ve toplumla da iç içe olan bir meslektir. Öğretmen özellikle hizmet verdiği bölge ve toplum yapısı, kültürü de dikkate alındığında öğretmenden beklentiler de değişebilmektedir. Şöyle ki, küçük bir köy ya da mezradaki bir öğretmen o belde için "köyün en önde gelen, en prestijli" kişisidir. O bölge için öğretmen "her şeyi bilendir".

Bununla birlikte öğretmen mezra, köy, kasaba ve şehir ayrımı yapılmak-sızın nerede çalışırsa çalışsın öğretmenlerin en çok muhatap oldukları insan grubu kuşkusuz öğrencilerdir. Öğretmenlerin bu kitle ile birliktelikleri ve ilişkileri, okul yaşamında ve sonrasında yıllarca sürebilmektedir. İlişkilerin niteliği yönünden her ne kadar öğretmen-öğrenci ilişkileri, ilgili yasa ve yönetmeliklerce belirlenmiş resmi nitelikte ilişkiler ise de mesleğin doğası gereği bu ilişkiler, duygusal yönü de ağır basan ilişkilerdir. Örneğin, hemen hemen hepimizin unutamadığı bir öğretme-ni ve özellikle ilk öğretmeni vardır. İlk öğretmenlerimizi hep adıyla, yaşadığımız anılarıyla ve tatlı acı hatıralarıyla hatırlayabilmekteyiz.

Öğrencileri, eğitim programlarında önerilen hedef davranışlara, ulaştırabilmek için eğitimcilerin öğrencilere yardım etmesi gerekir. Öğrencilerin, eğitici tarafından hazırlanmış eğitim çevresiyle etkileşimli ilişkileri bulunmaktadır. Bu davranışlar nedeniyle eğitim, "Davranış geliştirme, yetenek geliştirme, bilgi ve beceri sürecinin kazanılması" olarak tanımlanabilir. (VAROL,1997)

Son yıllarda, öğretmen modeli, giderek artan bir şekilde reformcular ve basın tarafından, zeki, liberal bir eğitim görmüş, sosyal hayata önem veren bir profesyonel olarak tanımlanmaktadır. Bu öğretmen modeli, bir ya da daha fazla bilim dalına sıkı sıkıya bağlı-dır ve öğrenciler için bilginin erişilebilir ve faydalı olması için zekice çalışır. Bu tip öğret-menin oluşturduğu imaj, ihtiyaçları, yetenekleri veya koşulları ne olursa olsun, bütün öğrencilerin başarılı olmasına yardım eden bir insan portresine uymaktadır.

Çok açıktır ki, insanlar, öğretmenlerde içeriği aktarma ve öğrencilere beceri kazandırma yeteneklerinden daha fazlasını aramaktadırlar. Öğretmenler, sözleri ve hareketleri yoluyla, aydınlanmış, çalışkan, erdemli ve eğitimli bir insan olmanın ne anlama geldiğini göstermektedirler. Öğretmenler, toplumun bu izlenimi doğrultusunda hem öğrencileri şekillendirmekte hem de kendileri şekillenmektedir. (ÇELİKTEN. ŞANAL, YENİ, *2005)*

Etkili Bir Öğretmende Bulunması Öngörülen Özellikler

* Sabırlı davranır, olaylar karşısında dayanıklıdır ve duygularını kontrol altında tutar.
* Farklı inanç, görüş ve gruplara saygılı ve uzlaştırıcıdır.
* Kılık kıyafetine, temizlik ve düzene özen gösterir.
* Kendini geliştirmeye ve eleştirmeye açıktır.
* Kişisel sorunlarıyla sınıfı ve okulu meşgul etmez.
* Öğrencileri güdüleyici özelliklere sahiptir.
* Başarıya odaklanmıştır, öğrenciden yüksek başarı beklentisi içinde, destekleyicidir.
* Düşünce ve davranışlarıyla öğrenciler için modeldir.
* Öğrencilere karşı güler yüzlü, hoşgörülü ve sevecendir.
* Öğrencilere karşı güvenilir, dürüst, objektif, sırdaş ve dosttur.
* Sınıfta yapıcı ve eğitsel bir disiplin oluşturur.
* Liderlik özelliklerine sahiptir.
* Öğrencileri, velileri, çevresini etkilemede başarılıdır.
* Arabuluculuk, hakemlik, temsilcilik özelliklerine sahiptir.
* Cesaretlendirici ve destekleyicidir.
* Sevecen, anlayışlı ve esprilidir.
* Sorunlardan yakınmak yerine çözüm bulmak için çaba harcar.
* Verdiği ödevleri takip ve kontrol eder.
* Eğitim bilimlerinin temel kavramlarını tanır ve öğrenmeyi kolaylaştı-rır.
* İyi bir gözlemcidir, kendini sürekli yenileme gayreti içindedir.

Çelikten ve Can'ın İdeal Öğretmen konusunda yaptıkları uygulamalı araştırma sonuçları da yukarıda sıralanan ve açıklanan özelliklerle paralellik göstermektedir. Anılan araştırmacılara göre "İdeal Öğretmen" öğrencilere karşı güler yüzlü, hoşgörülü, sevecen, güvenilir, dürüst, objektif, sırdaş ve dost olmalı, düşünce ve davranışlarıyla öğrenciler için bir model olmalıdır. Öğretmenin başarıya odaklanması, öğrencilerden yüksek beklentiler içinde bulunması, öğretmenlerce çok önemli bulunan öğretmen özelliklerindendir.(Çelikten, M. ve Can, N. 2003).

ÖĞRENCİ VE ÖĞRENCİNİN ROLLERİ

Öğrenci eğitimde en can alıcı unsur. Eğitimin varoluş nedeni öğrenci, eğitim sisteminin kuruluş nedeni yine öğrenci. Eğitim sisteminin içinde var olan herkesin varlık nedeni yine öğrencidir. Öğrenci olmasa okullar, öğretmenler kısaca eğitim sisteminin varolmasının bir anlamı da olmazdı. Okullar öğrencilerle canlılık kazanır. Okulların tatil olduğu dönemlerde her alanda bir sessizlik vardır. Elbette öğrencilerin okula gitmediği zamanlarda sokaklar çocuk sesleriyle cıvıl cıvıl olur ama okulların açık olduğu dönemlerdeki heyecan, hareketlilik, canlılık hiçbir zaman olmaz.

Eğitim sisteminin geliştirilmesine dair yapılan tartışmalarda öğrenci merkezli eğitim, öğrencinin aktif olması, eğitim sisteminin, okulların, eğitim öğretimin öğrenciye göre düzenlenmesi gibi konular son dönemlerde daha fazla ön plana çıkmaktadır. Okulun başarısı öğrenci başarısına, öğrenci başarısı da değişik faktörlere bağlıdır. Öğrenci başarısını etkileyen faktörler belirlenebilirse bunlar üzerinde durularak başarı arttırılabilir. Dolayısıyla okul başarısı da arttırılmış olur.

Öğrenci Nitelikleri:

- Bilişsel giriş davranışları
- Duyuşsal giriş özellikleri

Bilişsel giriş davranışları
- Genel yetenek,
- Okuduğunu anlama gücü
- Temel matematik becerileri
- Temel öğrenme becerileri

Duyuşsal giriş özellikleri
- Öğrenme güdüsü
- Akademik özgüven

Öğrencinin okul başarısı üzerinde yapılan görüşmeler, konuşmalar, fikir yürütmelerde çeşitli unsurlar ön plana çıkar. Öğrencinin okul başarısını etkileyen unsurlar neler sorusu üzerinde durulduğunda öğrenciyle etkileşime giren unsurları düşünmek gerekir. Öğrencinin etkileşime girdiği unsurlar şöyle sıralanabilir. Öğrenciler öncelikle bir ailenin parçası olarak dünyaya gelir ve okula gidinceye kadar aile ortamında büyür, gelişir, temel becerileri alır. Öğrenci başarısı aileden kaynaklanan bir takım faktörlerden olumlu veya olumsuz etkilenmektedir. Bu anlamda aileyi oluşturan anne, baba, kardeşler öğrencinin okul başarısında etkin olan ilk unsurlardır. Anne babanın eğitim düzeyi, eğitime bakışı, ailenin ekonomik, sosyal, kültürel ve diğer her tür yapısı öğrencinin okul başarısını öncelikle etkiler.

Eğitimle uğraşan alan uzmanları eğitimin belirlediği niteliklerin etkin bir şekilde kazandırılabilmesi için okul-aile ve çevrenin işbirliğinin şart olduğunu söylemektedir. Bu üçlü sacayağı arasındaki koordinasyon ne kadar güçlü olursa öğrencilerin nitelikleri ve eğitimin ulaşmak istediği hedeflere o derece üst düzeyde ulaşılabilir.

Öğrencinin okul başarısı denilince öğrencinin bulunduğu sınıf yani düzey de önemlidir. Ama öncelikle eğitim öğretim yıllarının ilk dönemleri oldukça önemlidir. Öğrenci disiplinli olma, düzenli çalışma alışkanlığını ilk yaşlardan itibaren kazanmalıdır. Ailede edinilen bu yöndeki temel alışkanlıklar okul tarafından da desteklenmelidir. Ailede alınan sağlam bir temelin üzerine okul da her türlü maddi ve manevi unsurları inşa etmeye devam ederse her yönüyle istenen şekilde yetişmiş insanlar elde edilir.

Bilgi ve iletişim teknolojilerin etkisiyle eğitim alanında yaşanan dönüşümleri doğru anlamlandırabilmek için kullanılan teknolojilerin insanlar/öğrenciler üzerindeki etkisini kavrayabilmek büyük önem taşımaktadır. Bu nedenle günümüzde, dijital teknolojilerle çevrilmiş bir ortamda büyüyen yeni nesil öğrencilerin sahip olduğu nitelikleri daha iyi anlayabilmek amacıyla alan yazındaki kuramsal betimlemelerin yanında, evrensel ve yerel araştırma verileri birlikte dikkate alınarak *Yeni Binyılın Öğrencileri* kavramını değerlendirmenin eğitimde daha doğru sonuçlara ulaşılmasını sağlayacağı düşünülmektedir. (ŞAHİN, 2009)

BDE'NİN AMAÇLARI

Bilgisayar destekli eğitim yetişkin öğrencilere sunduğu avantaj nedeni ile kullanılmaktadır. BDE yalnızca mantık çerçevesinde beceri geliştirme, problem çözme ve verilen talimatları takip etmeyi sağlamaz (Askov ve Bixler, 1996), aynı zamanda okuma ve kelime bilgisi, dil, yazma, dinleme gibi alanlarda akademik yeterlilikleri iyileştirmede yardımcı olur (Askov ve Bixler, 1996: Huss, Lane, ve Willets, 1990: Tousignant, 1996, akt. Osei, 2001). Bir çok yetişkin öğrenci BDE'yi sever çünkü öğrenme ilgi çekici ve eğlencelidir (Tousignant, 1996, akt. Osei, 2001).

Yetişkinler gün süresince kendi istedikleri zamanlarda kendi hızlarında, akşamları veya haftasonları bilgisayarları kullanabilirler (Applications of Computer-Aided Instruction in Adult Education and Literacy Report, 1992, s.3).

Eğitmenler ve öğrenciler BDE ile rahat hissederler. Öğrenciler PCler ile büyürler. Çünkü onlar(PCler) son derece sabırlıdır, asla yorulmaz, asla sinirlenmez ya da kızmaz ve öğrencilerin hata yapmasından rahtsızlık duymamasını sağlarlar. Bütün bunlar öğrenciye doğru bir deneyim sağlar, hatalarından dolayı utandırmaz, farklı seçenekler ile çalışmayı mümkün kılar, ileriki hayatlarında değerli olabilecek bilgisayar kullanımındaki yeterliliğini arttırır (Romanenko ve Nikitina, 2011, s.548).

BDE'nin Amaçları;

- Öğrencinin motivasyonunu artırmak
- Öğrencinin bilimsel düşünme yeteneğini geliştirmek
- Gurup çalışmalarını desteklemek
- Öğretme yöntemlerini genişletmek
- Öğrencinin kendi kendine öğrenme yeteneğini geliştirmek
- Öğrencinin ileri düzey düşünme becerisinin geliştirilmesini desteklemek
- Geleneksel öğretim yöntemlerini daha etkili hale getirmek
- Öğrenme sürecini hızlandırmak
- Zengin bir materyal sağlamak
- Ucuz ve etkili öğretimi gerçekleştirmek

- Gereksinmeye dayalı öğretimi gerçekleştirmek
- Telafi edici öğretimi sağlamak
- Bireysel öğretimi gerçekleştirmek

ÖĞRENCİ AÇISINDAN BDE'NİN OLUMLU YÖNLERİ

Öğrenme ve ilerleme hızı kişiye bağlıdır. BDE'de derhal uyarı ve dönütler verilerek öğrenimin kişiselleştirilmesi sağlanır. Bilgisayarlar birer çoklu ortam aracıdır. Birlikte kullanılan yazı, ses, görüntü özellikleriyle bilgisayarlar birçok teknolojiyi etkili biçimde birleştirebilirler. Etkileşimli video ve CD-ROM teknolojileri bilgisayar tabanlı öğretim üniteleri, dersleri ve öğrenme ortamlarını birleştirebilirler. Bilgisayarlar etkileşimli araçlardır. Birçok paket program çalıştırılabilen mikro bilgisayarlar kullanım kolaylığı ve azami öğrenci kontrolü sağlar. Bilgisayar teknolojisi sürekli ilerlemektedir. Her geçen gün yenilikler olmakta bununla beraber fiyatlar da düşmektedir. İhtiyaçların doğru anlaşılması ve gelecek gereksinimlerin doğru tahmin edilmesi, öğretmenin bilgisayar donanım ve yazılım konularıyla etkili biçimde başa çıkmasını sağlar. Bilgisayarlarla ulaşılabilirlik artar. Yerel, bölgesel ve ulusal ağlar kaynakları ve bireyleri, nerede olurlarsa olsunlar, birbirine bağlar. Aslında, birçok kurum ve kuruluş bilgisayar tabanlı kaynaklar sunmaktadır.

Beynin yeteneklerinin ortaya çıkarılması amaçlanmaktadır . Öğrenme materyallerini kullanan öğrenciler, çalışmalarını daha hızlı sürdürmekte ve daha hızlı öğrenmektedir. Öğrenciler yaşları ve gereksinimlerine uygun materyallerle çalışmaktadır. Öğretimin bu kişiselleştirilmiş şekli etkinliği arttırmaktadır. Matematik ve dil yeteneğini geliştirmede büyük kolaylıklar sağlar. Öğrencinin bilgi alışverişi sayesinde sosyal iletişimde bulunma yeteneğini geliştirir. Öğrenci bireysel çalışmalar yapabildiğinden problem çözme ve dikkatini bir noktada toplama yeteneğini geliştirmesine yardımcı olur. Kendine güven duygusunu geliştirerek öğrenciyi hayata hazırlar.

Öğrenme hızı:

BDE'nin sunduğu en önemli fayda, belki de, öğrencilerin kendi öğrenme hızlarına uygun olarak konuyu işlemeleri ve gerek duyduklarında aynı konuyu tekrar çalışma olanağı bulabilmeleridir. Özellikle yavaş öğrenen öğrenciler için BDE uygulamaları, bu öğrencilerin düzeyine ulaşmasında önemli bir avantaj sağlamaktadır. Diğer taraftan, öğrenilecek konuyu hali hazırda bilen ya da sınıftaki diğer öğrencilere oranla daha hızlı öğrenen öğrenciler ise, diğer öğrencileri beklemeden bir sonraki konuya geçebilirler.

Katılımcı öğrenme:

Her ne kadar BDE uygulamaları öğrencilerin kendi kendilerine ve kendi öğrenme hızlarına uygun öğrenme ortamları sunsa da, grup çalışmasını destekleyebilmesi açısından da etkin materyallerdir. Bir çok BDE yazılımı, öğrencinin verdiği cevaplar doğrultusunda dersi sunar ya da öğrenciye belli aralıklarla dönüt sağlar. Bu yüzden, BDE ortamındaki her öğrenci aktif şekilde derse katılır ve dersteki performansını gösterebilme imkanı vermesi ve öğrenciye dönüt sağlayabilmesi nedeniyle, BDE ortamları öğrencinin derse katılımını sürekli hale getirir(*Bright, 1983: 144-153*).

Öğretimsel etkinliklerin çeşitliliği:

Diğer materyallerle karşılaştırıldığında, görsel – işitsel öğelerin en etkin kullanılabildiği ortam BDE ortamıdır. Öğretim ortamının farklı etkinliklerle zenginleştirilmesi, öğrencinin başarıya ulaşmasında önemli bir etkendir. İşte bu bakımdandır ki, BDE ortamları, sağladıkları öğretimsel etkinliklerin niteliği ve niceliği açısından en etkin ortamlardır.

ÖĞRETMEN AÇISINDAN BDE'NİN OLUMLU YÖNLERİ

Öğretmen öğrencinin performansını izleyip gerektiğinde müdahale edebilir. Bilgisayar öğretmenin en çok zamanını alacak işlerini üstlenecek bir araçtır. Öğretmen kalan zamanda eğitimin verimliliği ve mesleki konularda kendini geliştirebilir. Derslerde konu anlatımında kullanabileceği bir yardımcı malzemedir. Öğretmen tarafından planlanmış grup ve bireysel çalışmalara kaynak olur. Öğretmen daha çok bir yol gösterici rol alır. Öğrencinin aktifliğini sağlama. Kanaat için ek alternatif . Öğretmen niteliğini yükseltebilir. Konuların sistematik bir şekilde işlenmesini sağlar.

Öğrenci etkinliklerinin ve performansının izlenebilmesi:

BDE ortamındaki bir öğrencinin bir konu üzerinde harcadığı zaman ve gösterdiği performans, bilgisayar tarafından kayıt edilebilir ve istendiği zaman öğretmenin kullanımına sunulabilir. Öğrenci performansı hakkındaki bu bilgiler, öğretmenin öğrencileri gözlemlemesi ve onları ihtiyaçları doğrultusunda yönlendirmesi bakımından oldukça önemlidir. Klasik öğrenme ortamlarında, öğretmenin her öğrencinin performansını gözlemlemesi ve buna bağlı olarak öğrenciyi yönlendirmesi oldukça zordur. Özellikle kalabalık sınıflarda öğretmenin bu etkinlikleri başarması neredeyse imkansızdır. Bu bakımdan, BDE ortamının sunduğu bu özellik, öğretim etkinliğinin geliştirilmesi için önemli bir unsurdur. Bunun yanında, bilgisayarın kaydedip saklayabildiği bu bilgiler, okul yönetimi için de önemlidir. Bu bilgilerin erişilebilir ve saklanabilir olması, eğitim programlarının ve öğretim etkinliklerinin geliştirilmesi ve okul – aile işbirliğinin geliştirilmesinde okul yönetimi için büyük önem taşımaktadır.

Zamandan ve ortamdan bağımsızlık:
Klasik öğretim ortamlarındaki öğrenciler, belli konuları belli zaman dilimleri içinde öğrenmeli ve belirlenmiş öğretimsel etkinlikler yine belirli zaman dilimleri içinde gerçekleştirilmelidir. Diğer taraftan, BDE ortamındaki bir öğrenci istediği öğretimsel etkinlikleri istediği zaman, ders saati dışında kalan zamanlarda da, uygulayabilir ya da tekrar edilebilir. Hatta bu etkinlikleri evinde, bilgisayar başında uygulama şansı bulabilir (ŞAHİN, Tuğba Yanpar – YILDIRIM, Soner,1999 ,Öğretim Teknolojileri ve Materyal Geliştirme, ANI yay.,s.58-62).

BDE'DE ÖĞRENCİNİN ROLÜ

Bilgisayar Destekli Eğitimde öğrenciye de bazı görevler düşmektedir. BDE'ye geçiş prensiplerinin biride kişilere daha verimli öğretim ortamları sağlamaktır. Öğrencilerin kendi işlerini kendilerinin görmesi daha doğrusu bağımsız öğrenme etkinlikleriyle yaptıkları işlemler öz güven duygusunu geliştirir. Öğrenciler, öğrenilmesi güç olan matematik ya da yabancı dil gibi dersleri daha kolay öğrenmektedirler.

Bilgisayarın, programdaki her derste konuyu öğretmesi anlamına gelmemekle beraber, her derste bazı konuları ele almak için uygun bir alet olduğu görülmektedir. BDE 'in amacını öğrenciye bilgiyi daha verimli ve kendi yollarıyla verebilme amacı taşır. Öğrenci BDE ortamında bilgi verilen değil; bilgiyi alan keşfeden kişidir. Kendi seviyesine uygun olarak konu dağılımı veya işleyişini belirler ve bilgisayarla etkileşime girerek istediklerini serbestçe yapma imkânı kazanır.

- Araştıran,sorgulayan, değişik bakış açıları ve yaklaşımlar ortaya koyabilen,kendi öğrenmesinden sorumlu,özetle öğrenme sürecinin her aşamasına etkin bir biçimde katılan bireyler bilgisayar destekli öğretim ortamlarındaki öğrenci kimliğini ifade etmektedir.
- Bilgisayar destekli öğretim ortamlarının gerektirdiği teknolojik yeterlilikleri yerine getirebilmeleri öğretim etkinlikleri farklı beceriler gerektiriyorsa öğrenciler ders işlemeye başlamadan önce gerekli becerilerin öğretilmesi için eğitime alınmalı ve öğrencilere gerekli konularda eğitim verilmelidir. Aksi taktirde öğrencilerin başarısız olma ihtimalleri ortaya çıkar.
- İşbirliğine dayalı ortamlarda görev alabilmeleri öğrencilerin yaşam boyu öğrenme becerileri elde edebilmeleri ve meslek yaşamlarına hazırlanabilmeleri için işbirlikli çalışmalar yapmaları gerekmektedir.
- Öğrenme süreçlerinde öğrencilerin etkin olmaları Bilgisayar destekli öğretim süreçlerinde öğrenciler yeni bilgileri araştırarak, çeşitli deney süreçlerinden geçirerek bireysel olarak anlamlandırırlar
- Öğrenci öğrenme süreçlerinde sorumluluk almaları Grup çalışmalarında öğrenciler öğretmenlerinin veya diğer öğrencilerin kontrolleri altında öğrenmelerini devam ettirebilirler
- Öğretmenlerine katkı sağlayabilecek her türlü olanaktan yararlanmaları Bilgisayar destekli öğrenme ortamları öğrencilere farklı kaynaklardan yararlanma fırsatı sunmaktadır.öğrenciler ulaştıkları farklı kaynakları öğrenmeleri açısından düşünmeli ve öğrenmeleri mümkün olan en fazla sayıda kaynaktan gerçekleştirmelidirler.
- Öğrendiklerini kullanmak ve uygulamak için fırsatları Değerlendirmeleri Bilgisayar destekli öğretim uygulamaları öğrencilere öğrendikleri bilgileri animasyonlar ve çeşitli öğretim programları yardımıyla pratik yapma olanağı vermektedir.öğrenciler bu programlar yardımıyla bilgilerini pratik uygulamalara dökmeli ve olanak bulduklarında da gerçek yaşamlarında uygulamalıdırlar.
- Öğrenci-öğrenci ve öğrenci-öğretmen etkileşiminin sağlanmasına yönelik çaba göstermeleri Etkili öğrenmeler öğrenci-öğrenci ve öğrenci-öğretmen etkileşiminin üst düzeyde olduğu ortamlarda gerçekleşmektedir. Öğrenciler de bilgisayar destekli öğretim uygulamalarının sağladığı katkılardan yararlanarak etkileşimlerini arttırmalı ve öğrenmelerini en üst düzeye çıkarmalıdır

Öğrenci Merkezlilik

Çağdaş yapısalcı öğrenme yaklaşımının Vygotsky(1962) ile başladığını söyleyebiliriz. Vygotsky'e göre, öğrenmenin temeli bireyler arası etkileşimdir. Birey kendisinden daha bilgili olan bir arkadaşıyla veya bir yetişkinle iletişim kurarak bilgi inşasında gerekli desteği alabilir. Daha bilgili olanın düşünme örüntüsünü modeller ve edinir. Kubaşık etkinlik bilginin iletişimini, paylaşılmasını ve içselleştirilmesini mümkün kılar.

Vygotsky'e göre öğrenmede ikinci önemli ilke bireyin bildiklerini kullanarak ve destekle öğrenebileceği bilgi düzeyinin belirlenmesidir. Dolayısıyla bireye düzeyinin biraz üstündeki öğrenme malzemesini öğretmenin klavuzluğunda verilmelidir ki önsel bilgilerin işe koşulması ve yeni bilgi inşası meydana gelebilsin.

Sosyal etkileşim ve gelişimsel erişim alanı kavramlarının ortaya çıkardığı diğer kavram ve ilke de bilişsel çıraklık ilkesidir. Vygotsky, bireyin içinde bulunduğu kültürün iletişim dilini ve iletişim örüntülerini kazanarak öğrenmeyi gerçekleştirdiğini ileri sürer. Herhangi bir konu alanında da öğrenme, o konudaki iletişim örüntülerinin keşfi ile olacaktır. Bu keşfin bilişsel çıraklıktaki birinci koşulu öğrencinin aktif olarak bir etkinliği yerine getirmesidir. Bir bütün olarak verilen karmaşık etkinliğin yerine getirilmesi bir uzmanın gözetiminde olmalıdır. Kavramdan da anlaşılacağı üzere bilişsel çıraklığa en iyi örnek oto tamirhanesinde çırak olarak işe başlayan bir bireyin onarım işlerinin yapmasını ustasından nasıl öğreneceğini incelemek olacaktır. Çırak ustasının çalışmasını inceleyecek ve kendisine verilen işi ustasının gözetiminde yapacaktır. Ona verilen işbir bütündür ve bu bütünlüğün yardımla başarılmasını, yardımın azaltılması ve sıfıra indirilmesi izleyecektir.. Tüm etkinliklerde öğrencinin başrolde olması, hatalarınıdan öğrenmesi, etkinliğinin tek başına bir bilgi örüntüsü seti olması önemlidir. Tüm bu çalışmalar ustalık kültürünün bilgi, davranış ve normlarını bireye kazandırır.

Son olarak Vygotsky'nin yapısalcı teoriye katmış olduğu diğer bir kavram da "aracıyla öğrenme" kavramıdır. Yukarıda sözünü ettiğimiz öğretmen-bilgi-öğrenci üçgeninde, öğretmen bilgi ile öğrenci arasında bir arabuluculuk görevini yerine getirmektedir. Gerçekçi olan, öğrencinin aşina olduğu, yeterince karmaşık ve problemler içinde veya bunlar vasıtasıyla işlenen bilginin, öğrencinin varolan bilgisiyle adeta bir uzlaşma gerçekleştirmesi için öğretmen etkinlik organizasyonu yapmasıdır. Dolayısıyla, yapısalcı öğrenme yaklaşımında öğrenme malzemesinin öğrenciye sunumu genellikle bir problemle başlamalıdır. Böylece, öğrenci varolan bilgisini kullanarak onu çözmeye çalışacaktır. İşlemler, işe yarayan ve yaramayan bilgilerin belirlenmesi ve işe yarayan bilgilerin yardımıyla kazandırılması olacaktır.

Yapısalcı öğrenmede bilişsel değişim ve kavramsal gelişim, bireyin bilgiyi içselleştirmek için yapmak zorunda olduğu zihinsel işlemlere bağlıdır. Dolayısıyla tüm öğrenmeler bir keşiftir. Zihinsel işlem yapabilmenin öncelikle pekiştirilmesi gerekmektedir. Yani olguların sorgulanması önemlidir: Bu nedir? Nasıl olmaktadır? Niçin olmaktadır? Eğer belli değişkenler değişirse nasıl olur? Ne olur? Verilen olgulara benzer bilgilerim nelerdir? Onlar bana ne derecede yardımcı olur? Yardımcı olmazsa bunun nedeni nedir? Verileri anlamak ve çözüm üretebilmek için nasıl bir yaklaşım faydalı olabilir? Bütün bunlar ve benzeri sorgulama biçimlerinin öğrenciye kazandırılması kritik öneme sahiptir. Çünkü öğrenmeyi kontrol edebilecek düzeye gelen bir öğrenci, artık öğretmenin ya da daha bilgili bir arkadaşının yardımını almadan kendi kendine keşif yapabilir. Kısaca kendi öğrenme stratejileri, kazanılan bilgiyle öğrenci arasında bir arabuluculuk rolü oynar(Akpınar,2005).

BDE'DE ÖĞRETMENİN ROLÜ

Örgün öğretim kurumlarında öğrencilerde istendik davranış değişikliği meydana getirmek üzere, öğretim etkinliklerini planlama, gerekli fiziksel ortamı hazırlama, araç – gereç sağlama, öğretim etkinliklerini uygulama ve sonucu değerlendirme gibi işlemleri yürütme sorumluluğu öğretmene aittir (İşman, 2011, s:324). Burada bahsedilen görevler sadece ana başlıklardır. Öğretmen kavramı ve eğitim sistemi içerisinde son derece aktif rol alan öğretmen daha detaylı incelendiğinde ve günümüz şartlarında değerlendirildiğinde daha pek çok görev ve rollerinin olduğu ortaya çıkmaktadır. Günümüzde insanlar, "öğretmen" kavramına pek çok anlam yüklüyorlar. Bazı anlamlar, daha çok, öğretmen rolü oynayan insanların duygusal olmayan, doğrusal betimlemelerini ve onlardan yerine getirmeleri beklenen görevlerin teknik betimlemelerini yansıtıyor. Yüklenen diğer anlamlar, kendilerini öğretmen olarak adlandıran insanların ve onların yaptıkları işlerin çok daha canlı, sıcak ve çok boyutlu bir anlayışla ele alınmasına dayanıyor. Anlamının zenginliğini ve önemini açığa çıkarmak için, kişinin, "öğretmen" kavramını irdelemesi yeterlidir (Çelikten, Şanal, Yeni, 2005).

Bilgisayar Destekli Eğitimin verimliliğini sağlamada önemli rol oynayan etmenlerin başında öğretmen gelmektedir. Bilgisayar Destekli Eğitim konusunda öğretmenlerin yaklaşımı ise bu konuda aldıkları eğitime göre biçimlenmektedir. Her teknoloji gibi bilgisayar da kendi başına bir mucize değildir. Bu teknoloji de insan unsuruna bağımlı olup, onun yönetimi doğrultusunda iş yapabilmektedir. Dolayısıyla Bilgisayar Destekli Eğitimde yer alacak öğretmenlerin bu alanda eğitim almış olmaları gereklidir. Öğretmenler ancak bu eğitimi aldıkları takdirde Bilgisayar Destekli Eğitim yönetiminde başarılı olabilirler.

Öğretmenlik meslek bilgisi kapsamında, öğretimin verimini arttırmaya ve her öğrenci için üst düzeyde öğrenmeyi amaçlayan öğretimde denetimi sağlamak için öğretmenin öğretim etkinliği öncesinde, sırasında ve sonrasında kullanması gereken kimi nitelikleri de olmalıdır. Bu nitelikler Bilgisayar Destekli Eğitime aktarıldığında karşımıza çıkan tablo şöyle olacaktır;

• Öğretmen, yardımcı bellek birimlerinde ortaya çıkabilecek bir arızayı teşhis edip, sorumlulara telefonla aktarabilecek düzeyde, teknik terimleri öğrenmiş olmalıdır.

• Öğretmen telefon veya yazıyla kendisine iletilen ve silme, kopyalama gibi basit işlemlerden oluşan bir süreci gerçekleştirebilecek beceri düzeyinde olmalıdır.

• Öğretmen bir bilgisayarın onarım gerektirdiği durumu, basit bir müdahaleyle çözümlenebilecek durumlardan ayırt ede bilmelidir.
• Öğretmen donanımdan kaynaklanan problemleri, yazılımdan kaynaklanan problemlerden ayırt edebilmelidir.
• Öğretmen birkaç dakikada çözemeyeceği, yardıma ihtiyaç gerektiren durumları çok kısa süre içerisinde teşhis edebilmelidir. Ancak böylelikle ders içinde ortaya çıkan ve çözümü zaman alacak bir problemi çözmeye çalışarak zaman kaybetmesinin önüne geçebilir.

Uzun bir süre bilgisayar kullanıcısı olanlar, yukarıda sıralanan niteliklerin ancak orta vadede ve bilgisayar kullanımıyla edinebileceğini bilirler. Bu niteliklerin kazandırılmasında eğitim, sadece bu sürecin biraz kısaltılmasını sağlayabilir. Bilgisayar Destekli Eğitimde görevlendirilen öğretmenin başka ne türlü niteliklere sahip olması gereklidir?
Yukarıda sayılanlar dışında, öğretmenin bilgisayar konusunda sahip olması gereken nitelikler de şöyle sıralanabilir:

• Her şeyden önce öğretmenin Bilgisayar Destekli Eğitime inanması sağlanmalıdır. Bilgisayarın onun karşısında değil, yanında yer aldığına inanmayan bir öğretmenin her şey ne kadar kusursuz düzenlenirse düzenlensin- uygulamayı sabote etmesinin önüne geçilemez.
• Bilgisayar, öğretmenin en çok zamanını alan işlerini üstlenecektir. Öğretmene bu şekilde boşalan zamanını, eğitimin verimliliği ve kalitesini yükseltmek için, nasıl kullanması gerektiği öğretilmelidir. Bu, öğretmenin daha önce almış olduğu eğitimin bir bölümünün tekrarlanması anlamına gelebilir. Ancak belirli bir süre bilgi aktarıcı olarak görev yapan öğretmende, kolay kolay silinmeyecek alışkanlıkların oluştuğu unutulmamalıdır.
• Gerek bilgisayar programlarının sahip olduğu imkanları kullanarak, gerekse sınıf içinde dolaşıp öğrencileri gözleyerek izlemek, öğretmenin en önemli görevlerinden biri durumuna gelecektir. Öğretmene bu konuda yardım edilmelidir. Kaldı ki aktarma işinin bilgisayar tarafından üstlenildiği uygulamalarda, öğrencinin durumunu gösteren ipuçları da değişir. Öğretmenlerin bu konuda da bilgilendirilmesi gerekir. Ayrıca öğrencide teknoloji tarafından izlenme duygusunun yaratılmaması gibi ayrıntılar de Bilgisayar Destekli Eğitimin başarısı için büyük önem taşır.
• Öğretmenin sınıf içindeki davranışlarında, öğrenciyi izlemek dışında da önemli değişiklikler beklenebilir. Öğrencilerin anlamadıkları yerlerde soru sormalarını sağlamak, geleneksel yaklaşımdan daha büyük önem taşır ve daha zordur. Bilgisayar benzetimleriyle oluşturulmuş olan deney ortamlarında –öğrenciler için de yeni bir uygulama olması yüzünden- yönlendirme ihtiyacı oldukça yüksektir. Bilgisayar Destekli Eğitimin sağladığı bireysellik imkanını zedeleyecek davranışlardan kaçınılması için, bazı alışkanlıklardan kurtulmak gerekir. Bu tür örnekler çoğaltılabilir. Bütün bu örnekler, öğretmenlerin daha önce karşılaşmadıkları durumlardır ve bu durumlarda nasıl davranılacağı öğretmene öğretilmelidir.
• Ders bittikten sonra, öğrencilerin dersi izlemesi sırasında elde edilen ve bilgisayara kaydedilen veriler varsa, bu verilerin değerlendirilmesi de, Bilgisayar Destekli Eğitimin önemli potansiyellerinden biridir. Öğretmenin bu konuda da desteğe ihtiyacı vardır. Sınıf içindeki uygulamadan elde edilen verilerin nasıl değerlendirilebileceği önemli bir eğitim ihtiyacıdır. Sonuçların daha önceki yıllardaki sonuçlarla ve diğer sınıflarla karşılaştırılmasının sağlanabileceği avantajlar, öğretmene önemli ufuklar açar. Kolaylıkla görülebileceği gibi, Bilgisayar Destekli Eğitimde görev alacak öğretmenlerin yetiştirilmesi problemi, bilgisayar ağırlıklı değil, eğitim ağırlıklı bir eğitim programı gerektirir.

Öğretmenlerin BDE'ki rollerine karşı ilk tepkileri ve hisleri (Kenya Örneği)

%13 öğretmen BDE'yi sinir bozucu bulmuş
%12'si ilk başlarda şaşkınlık yaşamış
%12'si heyecanlı ve konforlu bulmuştur.
%25lik bir işletme eğitimi öğretmeni ilk önce kendilerini okutman sanmışlar ancak baskın bir grup rolünün "öğrenme sürecini kolaylaştırıcı" olarak değiştiğini hissetmiştir. (Tanui et al, 2008)
Genel Olarak;
%30 öğretmen, rolünün tehdit altında olduğunu hissetmiş
%40 öğretmen,
%30 öğretmen, yeni rolünün konforlu(rahat) olduğunu hissetmiş.
Ayrıca genel olarak karmaşıklık nedeniyle zor bulmuşlardır (Tanui et al, 2008).

Genel olarak BDE'de öğretmen rollerini inceleyecek olursak:

- ✓ Bilgisayar sisteminin temel parçalarını adı ve ilişki yönünden tanıma.
- ✓ Bilgisayar okur yazarlığı için temel becerilere sahip olma.
- ✓ BDÖ'in amacını ve ilkelerini açıklayabilmeli.

- ✓ Ders yazılımlarından bulunması gereken özellikleri tanıma ve açıklayabilme.
- ✓ Öğrencilere rehberlik edebilme.
- ✓ Bilgisayar teknolojisindeki gelişmeleri sürekli olarak izleyebilme.
- ✓ Amacına uygun donanımı seçebilme ve temin etme.
- ✓ Bilgisayar sisteminin temel bileşenlerini çalıştırma.
- ✓ Bir bilgisayar sisteminin bakım ihtiyaçlarını bilme.
- ✓ Giriş-çıkış birimlerini ve işlevlerini açıklama.
- ✓ Bellek-depolama birimlerini bilme.
- ✓ Basit kullanım arızalarını ve çözüm yollarını bilme.
- ✓ Dersler için soru bankasını oluşturma.
- ✓ Bilgisayarı ölçme değerlendirmede kullanma.
- ✓ Bilgisayarı araştırma amaçlı kullanmayı bilme.
- ✓ Yüksek kaliteli yazılımları düşük kaliteli yazılımlardan ayırabilme.
- ✓ Programlama mantığına sahip olma.
- ✓ Amaca uygun yazılım temin etme ve seçme.
- ✓ Basit düzeyde eğitsel yazılım geliştirme.
- ✓ Bilgisayarı eğitim programına uyarlayabilme.
- ✓ Bilgisayarlı eğitim ortamı için sınıfı organize etme.
- ✓ Mevcut bir eğitsel yazılımı değiştirme-uyarlama.
- ✓ Eğitsel yazılımları derste kullanabilme (Chang, 2002, p.143-150, Akt. Gündüz, 2009).

SONUÇ

Çağdaş eğitimde öğretmen, bir yönetici olarak kabul edilmektedir. Bu yönetici öğretmen, özel hedeflerini hazırlamakta, onları en kısa yoldan, az külfetle ve en kısa zamanda gerçekleştirecek şekilde öğrenme kaynaklarını düzenlemektedir. Öğrencilerin de motivasyonlarını yükseltmek için çabalar harcamaktadır. Daha sonra kullandığı yöntemlerin etkinliğini öğrenmek için yaptıklarını değerlendirmektedir. Eğitim teknolojisi, bu görevleri yapmasında öğretmene yardımcı olmaktadır. Böylece eğitim teknolojisi öğretmenin görevlerini genişletirken onu gereksiz islerden uzaklaştırmaktadır.

Sonuç olarak bilgisayar destekli öğretim, öğretme-öğrenme sürecinin verimini artıracak, öğretmenin ve öğrencinin süreç içerisindeki rolünü daha aktif hale getirebilecek, değişik uygulama yöntemlerine (gerçekleşme biçimleri) sahiptir. Bu yöntemlerden değişik öğretim amaçlarının gerçekleştirilmesinde, çok kısa bir süre için (5-10 dakika; örneğin alıştırma uygulama) yararlanılabileceği gibi dersin tamamını kapsayacak şekilde de (40-45 dakika; örneğin özel ders) yararlanılabilmektedir. Uygulamaların başarısında; yöntemin, kullanım alanlarının, öğretmenin, öğrencinin ve bilgisayarın rolünün iyi anlaşılması önem taşımaktadır.

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BİLGİSAYAR DESTEKLİ EĞİTİMDE LOGO PROGRAMLAMA DİLİ

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Abstract

Somut işlemler dönemindeki bir çocuğa programlama öğretmek etmek pek çok eğitimci tarafından olumsuz karşılanacaktır. Fakat Papert 'in temellerini attığı yapısalcılık kuramı ve onun uygulama ayağı olan LOGO programlama dili soyut işlemler döneminde edinilebilecek kazanımları somut işlemler dönemindeki çocuklara aktarmanın yolunu açmaktadır. Bu sayede okul öncesi çağındaki çocuklar soyut kavramları somutlaştırarak geometri, matematik , fizik , programlama gibi dersleri ve bunun yanında analitik düşünme,yaratıcı düşünme gibi yetileri de kazanmaktadırlar. Biz de çalışmamızda LOGO programlama dilini ve onun gelişimini ele aldık.

Programming to teach a child to the concrete operational period, the negative will be covered by many educators. But Papert 'thrown in the basics of the theory of constructivism and its application available from the leg of the LOGO programming language in the abstract operations to transfer the gains to children opens the way to the concrete operational period. This pre-school age children concretizing abstract concepts of geometry, mathematics, physics, programming, as well as courses such as analytical thinking, creative thinking skills, such as the gaining. In our study, we have considered the LOGO programming language and its development.

Keywords: Seymour Papert,Logo Programlama Dili,Yapısalcılık,Lego Mindstorms

Adını Görsel Çıktı Dili olarak ifade edebileceğimiz LOGO, Lisp adında bir yapay zeka programlama dilinden türetilmiştir.Özellikle okul öncesi ve ilk basamak düzeyindeki çocuklar için üretilen LOGO'nun kullanım amacı ise adının da ele verdiği gibi program üzerinde oluşturulan çeşitli disiplinlerdeki(geometri,matematik,fizik vs.) programların görsel olarak çıktılarını oluşturmaktır.

İlk bakışta somut işlemler dönemindeki çocuklara geometri ya da programlama öğretme fikri insana pedagojik olarak yanlış gelebilir.Fakat LOGO'nun geliştiricisi olan Papert'ın da tam olarak hedeflediği şey soyut işlem dönemindeki kazanımları somutlaştırarak çocuklara aktarmaktı.Seymour Papert bir matematikçi olmasının yanında bir süre Piaget ile birlikte çalışmıştır. Papert daha sonra MIT Medya Laboratuarında Marvin Minsky ile beraber yapay zeka çalışmalarına öncülük etmiştir. Bu noktada Papert Mindstorm(1980)'da belirttiği üzere Piaget'in teorilerinde bazı eksiklikler olduğu fikrini öne sürmüştür. Papert 'a göre Piaget teorilerinde bilişsel yaklaşımları öne çıkarmakla birlikte duyuşsal ve devinişsel öğrenme süreçlerini göz ardı etmektedir.

Papert "yapılandırmacılığa" karşı "yapısalcı" eğitim teorisini öne atmıştır.Onun ifadesi ile yapısalcılık şu şekilde ortaya konmuştur.

> Pskolojideki yapılandırmacı teorilerden öğrenme ile ilgili bilginin aktarımından çok yeniden oluşturulmasını/inşa edilmesini aldık. Sonra bu fikri öğrenenlerin aktiviteleri bir ürünün anlamlı bir parçası olduklarında öğrenmenin en kalıcı şekilde oluştuğu şeklinde genişlettik. (Papert,1987)

Baki(2000)'ye göre yapısalcı teori bilginin doğrudan doğruya aktarılamayacağını ancak öğrenin aktif katılımı ile kurulumunu zorunlu kılar. Papert bu noktada öğrencinin soyut olguları aktif olarak inşa edebilmesi için bir uygulama ortamı geliştirmeyi düşünmüştür.LOGO programlama dili tam da bu arayışın bir ürünüdür.

> Papert, logo çalışmalarına soyut olguları öğretmek için, çocuğun "formal düşünme" yaşına gelmesinin gerekmediği ve farklı uygulamalarla soyut kavramların öğretilebileceği düşüncesinden yola çıkarak başlamıştır. (Akpınar,1999).

İlk zamanlar LOGO dili zeminde programa girilen komutlara bağlı olarak çeşitli şekiller çizen kaplumbağaya benzer bir robotu kumanda etmek için kullanılmaktaydı.Bu sayede çocuklar örneğin geometride yönleri ve açıları görsel bir şekilde somutlaştırarak öğrenme şansına sahip oldular.Bu örnekte çocuklar aynı zamanda kaplumbağanın çizdiği şekilleri taklit ederek beden referanslı hareketlerde bulunabiliyorlardı.Bu öğrenmenin çocuk zihninde anlamlandırılması bakımından Piaget'in fikirleri ile de örtüşen bir yapı sunmaktadır.

Zamanla hantal robotlar yerlerini bilgisayar ekranlarındaki sevimli kaplumbağa ve oların türevlerine bıraktılar. Bu noktada kişisel bilgisayarların yaygınlaşması LOGO ve Papert'a yöneltilen en önemli eleştirileri olan sistemin pahalılığı sorununun aşılmasını sağladı. Papert'ın 1980'de Mindstorms'u yayınlaması ile LOGO oldukça geniş bir kullanım alanı bulmaya başladı.Başta ilk okullar ve okul öncesi kurumlarında çeşitli pilot projeler yürütülmeye başlandı.

LOGO öyle başarılı olmuştur ki Harvey'in ifadesi ile kendi başarısının kurbanı olmuş ve güçlü bir dil olmasına karşın salt çocuklara yönelik bir dil olarak görülmüştür.Papert(1996) bu başarının nedenini " dünyada çocuklar ve bilgisayarlar arasında tutkulu bir aşk ilişkisi vardır " diyerek açıklamaya çalışmıştır. Baki()'nin çalışmasında topladığı öğrenci görüşleri de bu noktada toplanmaktadır.Öğrenciler bilgisayarla öğrenmeyi klasik öğrenme yöntemlerinden daha eğlenceli bulmaktadırlar.

Bu konuda LOGO'nun bir diğer avantajı ise sunduğu çalışma ortamıdır. Forward,Right,Left ,Pen Up gibi temel bazı LOGO komutları her çocuğun kolaylıkla anlayabileceği kadar açıktır. Logo çocukların hatalarını anında görmelerini ve kendi hatalarını düzeltmelerini de sağlar. Örneğin forward komutunu yanlış girersek

- fowad
- I don't know how to fowad

eksik girdiğimizde ise

- forward
- Not enough inputs to forward

şeklinde geri bildirimler sayesinde çocuk hatasını düzeltme imkanı bulacaktır.

Bu da çocuğun kendi öğrenmesinden sorumlu olması bakımından önem taşımaktadır.LOGO da programlar prosedür denen ufak programcıklardan oluşmuştur.Bu durum çocukların büyük bir prblem karşısında parça-bütün ilişkisini görmesini sağlamaktadır.

Şimdi Jim Muller(1998)'in The Great Logo Adventure'de yayınlamış olduğu kartopu örneğinde LOGO dilini inceleyelim.

```
TO STARFLAKE
HT REPEAT 6 [SNOW RT 60]
END
TO SNOW
SNF FD 30 RT 45 SNF SNF
FD 10 BK 50 LT 90 SNF
SNF FD 10 BK 50 RT 45
FD 50 LT 45 S RT 45 BK 100
END
TO SNF
FD 20 RT 45 S LT 180 S RT 135
END
TO S
REPEAT 5 [FD 10 RT 144]
END
```

Muller çocuklar için hazırlanan her objede bolca bulunan kartopu simgesini kullanarak kültürel olarak çocuklara yakın bir örnek oluşturmuştur.Bu sayede çocuklar hayatlarında karşılaştıkları tanıdık bir objeyi kullanarak programı daha rahat geliştireceklerdir.

Bahsi geçen LOGO programı görüldüğü gibi dört farklı prosedürden(alt program) oluşmaktadır.Bu durum çocuğun problemi anlamlı parçalara bölmesine ihtiyaç verecektir.

Çocuk bu programları belirli bir sıra izleyerek oluşturucaktır.Örnekte önce S ,sonra SNF,SNOW ve STARFLAKE prosedürleri bu sırayla oluşturulmuştur.Görüldüğü gibi bir LOGO programındaki komutlar kısaltmalara izin vermektedir.FD 10 RT 144 ifadesi kaplumbağanın 10 birim ileri daha sonra da 144 derece sağa dönmesini ifade eder.

Probleme dayalı öğrenme logonun sınıf içi uygulamalarında temel alınan tekniktir. LOGO aktiviteleri gerçekteştirilirken dikkat edilmesi gerekenleri şu şekilde sıralanabilir.

- Tüm öğrenme aktiviteleri daha büyük bir görevle ilişkili olmalıdır.Bu öğrencinin yaptıklarını gerçek hayatla ilişkilendirmesi bakımından önemlidir.
- Öğrencinin problem çözme sürecinin tüm sorumluluğunu üstlenmesi sağlanılmalı.
- Öğrenci'ye uygun ve anlamlı öğrenmeye olanak veren bir görev verilmeli.
- Öğrenilen üzerine fikir yürütmelerine izin verilmeli böylece öğrenen öğrenme süreci hakkında bilgi sahibi olabilir.
- Farklı çözüm ve görüşlerin uygulanmasına imkan tanınmalı.

Burda sunulan uygulama tavsiyeleri aslında LOGO ortamında öğrenmenin temel ilkelerini de yanıstmaktadır. Papert ve Piaget bazı noktalarda ayrışsalar da ortak olarak belirttikleri bazı ilkeler bulunmaktadır. Bu ilkeler Akpınar(1999) tarafından ifade edilmiştir.

a) Öğrencilerin aktif olması
b) Daha önceki yaşantıların işe koşulması
c) Değişik (ilginç ve farklı) etkinlik organizasyonlarının bir ortam için hazırlanması

Günümüzde LOGO'nun çeşitli alanlar için özelleştirilen yüzlerce versiyonu bulunmaktadır.Hatta isterseniz LOGO'yu iPad'inize indirip kullanmanız bile mümkündür. Bu versiyonlardan özellikle Scratch 3 boyutlu yapısı ve birden fazla nesneye kontrol etme imkanı tanıması bakımından ayrılır. UCBLogo Apple bilgisayarlar için 80lerde tasarlanmıştır ve Logonun özellikle Amerikadaki okullarda yaygınlaşmasında ciddi bir rol üstlenmiştir. MSWLogo Windows platformu için tasarlanmıştır. Kullanımı , anlaşılması kolay ve dökümantasyonu yeterlidir. Microworlds ise Papert'in kendi geliştirdiği bir versiyondur. Elica Logo object oriented (nesne yönelimli) programlama yapısı ile dikkat çeker.

Bu versiyonlar içinde LEGO-LOGO versiyonu özel bir ilgiyi hak etmektedir.Bu versiyon Lego firmasının 1980lerde MIT ile işbirliği yaparak geliştirdiği özel Lego robotlarını (Lego Mindstroms setleri) kontrol etmeye yarayan bir versiyondur.

> LEGO/LOGO ilköğretimde fen eğitimi alanında yeni bir yaklaşımdır. LEGO/Logo mühendisliği ve dizaynı eğitim sürecinin merkezine koyar. Öğrenciler bu sistemi kullanarak LEGO parçaları ile (tekerlek, motor ve sensör içeren), makineleri bir bilgisayar ile haberleştirir, ve onları kontrol edecek programları yazarlar. (Resnick,Ocko,Papert ,TB. Lego,Logo and Design,1)

Çocuklar LEGO/LOGO sayes,nde analitik düşünme ve yaratıcı düşünme süreçlerini kullanır ve mühendislik yetileri kazanırlar.Lego First Lego Leage adlı bir oluşumla her yıl dünya çapında robot geliştirme yarışmaları yapmaktadır.

Logo programlama dili yapısalcılık kuramı üzerine temellenmiş soyut olguların somutlaştırılmasında kullanılabilecek, öğrenciye analitik düşünme, yaratıcı düşünme,öğrenmesinin sorumluluğunu alma gibi kazanımları sağlamada etkili bir araç olarak göze çarpmaktadır. Ülkemizde de her okulda bir bilgisayar laboratuvarı olması LOGO'nun kullanımına imkan vermektedir. Bununla birlikte en büyük boşluk eğitimcilerin LOGO gibi araçlardan çoğunlukla habersiz oluşudur.Fatih projesi ile birlikte bu konuda da ilerlemeler olmasını beklemekteyiz.

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Resnick,Ocko,Papert (TB). Lego,Logo and Design

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BİLGİSAYAR DESTEKLİ EĞİTİMDE DONANIM DEĞERLENDİRME

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Özet

Bu çalışmanın amacı, gelişen teknoloji ve artan ihtiyaçlar doğrultusunda hayatımızın bir parçası olan bilgisayar donanımı teknolojileri ve bilgisayar destekli eğitimde donanım değerlendirmesi incelenmesi üzerinedir. Bu çalışma gerçekleştirilirken bilgisayar destekli eğitimde kullanılan güncel ve geleneksel donanımlar, bu donanımların artıları ve eksileri ile ilgili bilgiler verilmiştir. Ayrıca bu donanımların bilgisayar destekli eğitimde nasıl kullanılması gerektiği konusunda bilgilere yer verilmiştir. Son olarak bilgisayar destekli eğitimde kullanılan donanımların geleceği ve yeni teknoloji trendleri ile ilgili bilgiler verilerek çalışma sonlandırılmıştır.

Anahtar Kelimeler: Bilgisayar Destekli Eğitim, Donanım Değerlendirme, Bilgisayar Destekli Eğitimde Donanım Değerlendirme.

Abstract

In this study, hardware technologies over computer based education which is a part of our daily life due to increasing needs and technology were investigated. Traditional and current hardwares which using with computer-based education and these technologies' advantages-disadvantages were investigated. In addition, how we can use the hardwares which using with computer based education efficiently at education were investigated. Finally the future of these technologies and new technology trends were investigated on this work.

Keywords: Computer Based Education, Hardware Evaluation, Hardware Evaluation on Computer Based Education .

1. Giriş

Günümüzde artık her gün heyecan verici ve aynı zamanda da eğitim problemleriyle mücadele eden bir çok teknoloji geliştirilmektedir. Bu tür eğitim teknolojilerinin stratejik kullanımı öğrenmeyi geliştirmekte ve kolaylaştırmaktadır. Bu teknolojilerin etkili olabilmesi için yeni eğitim teknolojileri mobil olma özelliğini, iletişimi ve işbirliği destekleyen özellikte olmalı ve bu özellikleri öne çıkaracak pedagojik yaklaşımlarla desteklenmelidir (Webster & Murphy, 2008). Bilgisayarlar diğer eğitim teknolojilerine göre farklılık göstermektedir. Bilgisayarlar;

• Donanım özellikleri artırılabilen,
• Başka cihazlarla beraber kullanıldığında farklı ortamlar yaratabilen,
• Geliştirilen farklı yazılımlar sayesinde kullanıcılara birden çok öğrenme yöntemi sunabilecek kapasitede araçlardır (Rıza, 2007).

Bilgisayarların donanımlarının değiştirilmesi bilgisayarların işlem yapabilme kapasitelerini artırır. Aynı şekilde bilgisayarlar farklı cihazlara bağlanıp farklı ortamlar yaratabilirler. Bu nedenle işlem yapabilme kapasitesinin artması veya bağlandığı farklı cihaz sayısının artması bilgisayar ile yapabileceğimiz uygulama, yöntem ve işlem sayısını artırır. Bu özellikleriyle bilgisayarlar diğer eğitim teknolojilerinden farklıdırlar. Günümüz bilgisayarları ise kısaca şöyle belirtilebilir;

• Masaüstü bilgisayarlar (PC-Personal Computer)
• Çalışma istasyonları (Workstations)
• Hepsi bir arada masaüstü cihazları (All in one PC's)
• Diz üstü bilgisayarlar (Notebook, Netbook)
• Tablet bilgisayarlar (Tablet PC)

Amaca yönelik özelleşmiş bilgisayarlar

• Akıllı telefonlar (Smartphones)
• Oyun konsolları (Gaming Consoles).

2. PC, Notebook ve Netbooklar

Masaüstü bilgisayarlar BDE'de en yaygın olarak kullanılan donanımlardır. En çok tercih edilmelerinin nedeni kolayca donanım aygıtlarının yükseltilebilmesidir. Hp, Dell, IBM gibi ünlü bilgisayar üretici firmalarının eğitim ortamlarında kullanılmak üzere ürettiği birçok workstation, pc ve All in One Pc'ler bulunmaktadır. Notebook ve netbooklar bir diğer tercihtir. Taşınabilir olması ve kablosuz ağlara rahatlıkla bağlanabilmesi nedeniyle gerek sınıf ortamlarında gerekse laboratuvar ortamlarında kullanılmaktadır. Bir çok firmanın eğitim amaçlı ürettiği notebook ve netbooklar bulunmaktadır. Birçok donanım üreticisi okulların ekonomik bütçelerine ve genç kuşağın öğrenme ihtiyaçlarını karşılayacak en iyi cihazların netbooklar olduğunu ifade etmekte ve maliyeti düşük netbook üretimi gerçekleştirmektedir (Trotter, 2008). Standart notebooklara göre daha ucuz olmaları okullarda öğrencilerin her bilgisayar başına bir öğrenci idealini gerçekleştirmektedir. Netbooklar hafif, ucuz, küçük olmaları, kablosuz ağlara kolayca bağlanabilmeleri, sağlam plastik kasaları ve kompakt klavye özellikleriyle öne çıkmaktadır. Bu cihazlar ayrıca internete kolaylıkla bağlanabildiğinden "cloud computing" denilen teknolojiler sayesinde yüksek kapasitedeki web sürücülerine bağlanabilmektedirler (Trotter, 2008). Ayrıca birçok otorite netbook ve bu tip cihazların bireyler arasındaki teknoloji uçurumunu azaltacağını düşünmektedir (Hastings, 2010).

3. Tabletler

Tabletler; bde de kullanımı yaygınlaşmaktadır. Tabletler taşınabilme kolaylığı, dokunarak kullanılabilmesi ve kablosuz ağlara kolay bağlanabilmesi özellikleri ile tercih edilmektedir. Geçmiş yıllarda tablet bilgisayarlardaki gelişim dünya çapında birçok eğitimcinin dikkatini çeken bir gelişme olmuştur. Özellikle iPad'in liderliğindeki inanılmaz satış oranı, Samsung ve Sony gibi firmalarında bu piyasaya girmelerine neden olmuş ve bir tabletler büyük bir Pazar haline gelmiştir (New Media Consortium, 2012). Tabletler kullanıcılar tarafından mobil cihazların yeni bir kategorisi olarak görülmemiştir. Tabletler kendi gerçeklerini oluşturmuş cihazlardır. Bu cihazlar;

- Laptopların karmaşık işlem yapabilmelerini,
- Akıllı telefon özellikleri,
- Eski versiyon tabletlerin sürekli internette olabilme özelliklerini,
- Kullanıcıların etkileşim tecrübelerini çeşitlendiren milyonlarca uygulamaya sahip cihazlar olarak görülmektedir.
- Video, içerik, resim, sunum paylaşmak için ideal ortamlardır.
- Kullanımı çok kolaydır.
- Görsel olarak ilgi uyandırmaktadırlar.
- Taşınabilirdirler (Horizon K-12 Project Report, 2012).

4. Cloud Computing

Cloud Computing günümüzde uygulama ve içerikleri bir araya getiren insanların günlük kullandığı cihazlarla erişebileceği uygulamalar oluşturabilen bir platform haline gelmiştir. İnsanlar evde, işte, yolda, sokakta hemen hemen her yerden bu uygulamalara ulaşabilmektedir. Cloud Computing sayesinde eğitimsel kaynaklar ve iletişim daha işbirlikli gerçekleştirilebilir hale gelmiştir. Bu teknolojinin kullanımı yaygınlaştıkça ve belirli standartlar belirlendikçe daha etkin kullanılabilecektir (Horizon Project K-12 Report, 2012).

Intel Education Client Aware Computing (2012) raporuna göre Cloud computing'in öğrenci, öğretmenler, aileler ve diğer çalışanlar için avantajları şunlardır:

- Geniş bir uygulama alanını kapsayan zengin öğrenme ortamları ve servislerine erişimi artırır.
- Ulusal standartlardaki dijital içeriklere erişimi sağlar.
- Öğrencilerin bireysel amaçlarına ve izledikleri yolların değerlendirilmesine ilişkin verilere erişim sağlar.
- Ebeveynlerin çocuklarını izlemesini kolaylaştırır.
- Aygıta bağlı olarak mümkün olan en iyi deneyimi bireylere ulaştırır.
- Maliyeti kontrol altında tutarak, 1 e 1 deneyimleri sanal olarak bireylere iletir.
- İmkanları, güvenliği ve üretkenliği artırır, harcamaları düşürür.
- Bina ve enstitüleri büyütmeden imkânların artırılmasını sağlar.

5. Mobil Teknolojiler ve Smartphone

Bilgisayar ve internet destekli uzaktan eğitim programlarına rağbetin fazla olmasının en önemli nedenlerinden birisi bireyin zaman ve mekan olarak özgür kalmasıdır. Öğrenenin istediği yer ve zamanda öğrenme sürecini başlatıp, istediği anda sürece müdahale edebilmesi gerçekten çok büyük özgürlüktür. Masaüstü bilgisayarlarla, sabit telefon hatlarıyla gerçekleşebilen internet bağlantısı, bir anlamda yer ve zaman bağımsızlığı açısından tam bir özgürlük sunmamaktadır. (Bulun, Gülnar & Güran, 2004: 166). Cep telefonlarının klasik özelliklerinin yanında Smartphone'lar kamera, internete girebilme gibi özellikleriyle küçük bilgisayarlar halini almıştır denilebilir. Masalarında bireysel veya grup halinde çalışan öğrenciler çalışmalarını kolaylıkla fotoğraf çekip eğitmene gönderebilirler. Bu telefonların şüphesiz en önemli özelliği internete girebilme özellikleridir. Bu özellikleri sayesinde Smartphone'lar önemli birer araç ve eğitim teknolojisi haline gelebilir. Özellikle iPhone'lar sahip oldukları birçok özellik sayesinde bireylere birçok imkan sunmaktadır (Yee ve Hargis, 2009). Bir iPhone günümüzde bu bahsedilen uygulamaların hepsini gerçekleştirebilir kapasitededir. Smartphone öğretimleri gittikçe yaygınlaşmaktadır. Bunun en önemli nedenlerinden biri genç neslin geleneksel masaüstü ortamlarından ziyade Smartphone'lar aracılığıyla internete girmeyi tercih etmeleri ve daha heyecan verici bulmalarıdır (White, J. & Turner, 2011). Öğrencilerin Smartphone'ları kullanarak internete erişme oranları son zamanlarda artmıştır ve bununla beraberde bu cihazların eğitimde kullanılması için yapılan araştırmalarda artmaktadır. Smartphone ve mobil cihazlar artık bilgisayarların yerini almaya başlamıştır (Eisele-Dyrli, 2011).

6. Akıllı Tahtalar

Akıllı tahta sistemleri, bir bilgisayar, bir projeksiyon ve bir de beyaz zemine sahip tahtadan oluşmaktadır. Kullanılan bilgisayar bir masaüstü olabileceği gibi bir dizüstü bilgisayar da olabilir. Cihaz dokunmayı algılayabilen özel bir yüzeye sahiptir. Bu yüzey sayesinde üzerine kalemle veya kimi modellerde parmakla yazılan her şeyi algılayabilir ve bilgisayarda çalışan programı sayesinde bilgileri işleme özelliğine sahiptir. Beauchamp ve Parkinson (2005) ise akıllı tahtaların en önemli beş farklı kullanımını şu şekilde özetlemiştir:

- Başka programlardan ya da resimlerden görüntü yakalayabilme;
- Uzun bir metinde önemli noktaların altını çizme ve rengini değiştirme gibi yöntemlerle belirgin hale getirerek önemini vurgulayabilme;
- Çizilenleri saklayıp gerektiğinde yeniden kullanabilme;
- Ek açıklamalar ve değişiklik yapabilme;
- Diğer bir sayfa ya da web sitesine bağlantı kurabilmesi (Akt: Adıgüzel, Gürbulak ve Sarıçayır, 2011: 461).

Murcia (2009) gerçekleştirdiği bir çalışmada akıllı tahtaların bilim okuryazarlığı eğitiminde kullanımını araştırmıştır. Akıllı tahtaların okullardaki bilgi iletişim teknolojileri ile birleştirildiğinde birçok ders anlatımı için tüm sınıfın katılabileceği etkileşimli bir ortam yaratabileceğinden bahsetmiştir.

7. Augmented Reality (Zenginleştirilmiş Gerçeklik)

Bazen kullanılan araçlar yalnızca donanımla ilgili değildir. Bazen araçlar daha uygun bir etkileşim sağlayan yazılım ve aygıtların bir bütünleşmesidir. Yani yazılım ve donanımın bir araya gelmesi bu aracı oluşturur (Ortega Cantero, 2002). Augmented Reality denilen teknoloji de bahsedildiği gibi belirli donanım ve yazılım aygıtlarının bir araya gelmesiyle e-pazarlama, bilgisayar destekli eğitim ve daha birçok alanda kullanılmaya başlanan bir teknolojidir. Augmented Reality kavramı Türkçe 'ye "Zenginleştirilmiş Gerçeklik" ya da "Desteklenmiş Gerçeklik" olarak çevrilmektedir. Bu teknoloji bir kamera ve bir işaret aracılığıyla, 3D dijital objelerin gerçek dünyada pozisyonlandırılmasıdır denebilir. Ortega Cantero'ya (2002) göre insanlar bilgisayarlarla genelde grafik ara yüzler aracılığıyla etkileşime geçerler. Augmented Reality teknolojisi 3 boyutlu gerçeğe çok yakın grafiksel ortamlar sunmaktadır ve özellikle eğitim alanında kullanımının etkili olabileceğini belirtmektedir.

Augmented Reality teknolojisi son zamanlarda özellikle mühendislik ve mimarlık alanında kullanılmaktadır. Bu teknoloji gerek sınıf ortamlarında, gerekse dış mekânlarda gözlük gibi aksesuarlara kullanılabilmektedir (Phan & Choo, 2010). Profesyoneller ve araştırmacılar kimya, matematik, biyoloji, astronomi ve fizik gibi dersleri sınıf ortamında Augmented Reality ile uygulamalı yapabilmek için çaba göstermektedirler. Son zamanlarda Augmented Reality ile bazı kitap geliştirme çalışmaları da vardır. Ancak Shelton (2002) bahsettiği gibi bu teknoloji yüksek maliyetlerinden dolayı akademik ortamlara kolay adapte edilememektedir (Akt: Lee, 2012). Gelecek 5 yıl içerisinde Augmented Reality akademik alanda iki türde kullanılabilir görülmektedir; işaretli ve işaretsiz. İşaretsiz Augmented Reality bir kamera veya akıllı telefon aracılığıyla belirli bir bina veya bölge ile ilgili bilgi verir. İşaretli Augmented Reality bilginin görülmesi için çift yönlü bir barkod kullanır ve bu barkod bir akıllı telefon veya bilgisayar kamerası tarafından görüldüğünde bilgi verir (Pence, 2011).

Günümüzde oyun konsolları bazı aparatları sayesinde Augmented Reality benzeri işlev yapabilmekte ve kullanıcılara farklı oyun ortamları sunabilmektedirler (Örneğin; Wii Motion Plus ve PlayStation 3 Move). Oyun konsolu üreticileri artık eğitsel oyunların güçlü yanlarının farkına varıp eğitsel oyun gelişimine yönelik araştırma yapmaktadırlar (Forrest, 2007). Ayrıca bu teknoloji sayesinde 3 boyutlu sanal sınıfların oluşturulması da mümkün olmaktadır. Özellikle Texas Instruments firması tarafından geliştirilen ve eğitsel alana uyarlanan bu sistem, etkileşimli konu içeriğini bilgisayar desteğiyle birleştirip bir DLP (Digital Light Process) 3 Boyutlu Projeksiyon cihazıyla öğrencilere aktarabilmektedir (AV Rover, 2012).

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BİLGİSAYAR DESTEKLİ EĞİTİMDE İÇERİK HAZIRLAMA VE SCORM PAKETLEME

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Özet

Bilgi ve iletişim teknolojilerinin hızla gelişmesi, bilgisayar destekli eğitimin de gelişmesini ve yaygınlaşmasını sağlamıştır. Bu süreç, bilgisayar destekli eğitim için içerik üretimini beraberinde getirmiştir. İçerik üretiminde, pedagojik boyutun, öğretim tasarımı esaslarının, geliştirilmiş ve genel kabul görmüş standartların göz önünde bulundurulması gerekmektedir. Söz konusu öğelere dikkat edilerek üretilmiş içerik, eğitimde bilgi paylaşımını, üretim maliyetinin düşmesini ve daha etkili bir öğrenmeyi beraberinde getirecektir. Buradan hareketle bu çalışmada, bilgisayar destekli eğitim için içerik üretimi, elektronik ortamlar için üretilmiş içeriklerin temelini oluşturan öğrenme nesneleri, öğrenme nesnelerinin öğrenme boyutu ve genel kabul görmüş SCORM paketleme incelenecektir.

Anahtar Kelimeler: Bilgisayar Destekli Eğitim, Bilgisayar Destekli Eğitimde İçerik Hazırlama, Öğrenme Nesneleri, Scorm, Öğrenme Nesnelerinin Öğrenme Boyutu

1. Giriş

Eğitimde teknolojinin etkinliği büyük önem arz etmekte aynı zamanda da artmaktadır. Bilgisayar destekli eğitimde özellikle bilgi ve iletişim teknolojilerinin gelişmesiyle eğitimde sıklıkla ve yaygınlıkla kullanılmaya başlanmıştır. Gelişen ve yaygınlaşan bilgisayar destekli eğitime uygun içeriklerin hazırlanması durumu söz konusu olmuştur. Mutlu, Avdan ve Yılmaz (2007)' ın çalışmasına bakarak, Bilgisayar destekli eğitimin nasıl hızla yaygınlaştığını, hazırlanan içeriklerin teknolojinin gelişimine paralel olarak nasıl değiştiğini ve öğrenenler üzerindeki etkilerini görebiliriz.

Dönem	Tasarımın Adı	Ortam	Temel Bileşenler	Kullanım
1993	Alıştırma Yazılımları	Laboratuvar ve CD-Rom ortamı	Metin, görüntü, etkileşim	Öğrenci konu özetini ve örnekleri okuyup çok sayıda geri-bildirimli alıştırma sorusu ve test sorusundan yararlanabilmekte
2003	e-Alıştırma	İnternet	Metin, görüntü, etkileşim, sesli anlatım	Öğrenci konu özetini ve örnekleri okuyup-dinleyebilmekte, çok sayıda geri-bildirimli alıştırma sorusu ve test sorusundan dinleyerek yararlanabilmekte
2006	e-Ders	İnternet	Metin, görüntü, etkileşim, sesli anlatım, videolu ders sunumu	Öğrenci bir sunucunun videolu sunumu eşliğinde dersi izlemekte, konu özetini ve örnekleri okuyup-dinleyebilmekte, çok sayıda geri – bildirimli alıştırma sorusu ve test sorusundan dinleyerek yararlanabilmekte

Tablo 1 (Mutlu, Avdan, Yılmaz, 2007)

Tablo 1' i incelediğimizde e-ortam için hazırlanan içeriklerin alıştırma yazılımlarından e-ders tasarımına kadar geliştiğini görmekteyiz. Kullanılan ortama baktığımızda internetin yoğun olarak kullanıldığını görmekteyiz.

Dönem	İnternete dayalı alıştırma yazılımlarında ve e-Öğrenme Portalında ziyaretçilerin ortalama ziyaret süresi
2004	607 sn
2005	944 sn
2006	1027 sn
2007 (Ocak)	1619 sn

Tablo 2 (Mutlu, Avdan, Yılmaz, 2007)

Tablo 2 e-içeriğin kullanıcılar tarafından kullanım sürelerinin yıllara göre değerlendirilmesini göstermektedir. Tabloya baktığımızda öğrencilerin gün geçtikçe e-içerikle daha çok etkileşim halinde olduğu açıkça görülmektedir. Bu verilere dayanarak bilgisayar destekli eğitimle beraber, ortamın, içeriği oluşturan temel bileşenlerin, bireylerin içeriği kullanım şeklinin değiştiğini ve bireylerin bilgisayar destekli eğitim için hazırlanmış içerikle daha uzun süre etkileşim halinde olduğunu görmekteyiz.

Çağımızın hızlı öğrenme ve öğretme ihtiyaçlarına cevap verebilmek, bu bağlamda bilgisayar ve onun beraberinde getirdiği teknolojileri kullanabilmek için yoğun bir çalışma sürdürülmektedir. Her gün, uzaktan öğrenme, e-öğrenme, uygulamaları için yeni teknolojiler ve yeni teknolojiler için yeni öğrenme modelleri çalışılmaktadır. Dünyadaki tüm eğitim ve öğretim harcamalarının 2 trilyon doların üzerinde olduğunu tahmin etmektedir. Bu büyük maliyet içerik üretiminin artmasıyla beraber oluşmuştur (Özkeskin, 2007). Bu denli büyük maliyetler ve çabalar sonucu üretilen içeriğin ne kadar verimli ve etkili olduğu soruları akla gelmektedir. Üretilen içeriğin verimliliği, tekrar kullanım ve farklı ortamlar için uygunluğuna, paylaşılabilir olmasına ve gerektiğinde yeniden düzenlenebilir olmasına büyük oranda bağlıdır. Bu gereksinimleri karşılamak üzere içeriğin hazırlanması ve hazırlanan içeriğin paketlenmesi için bir takım standartlar geliştirilmiştir. Hem içerik üretiminde hem de paketlemede söz konusu standartların yakalanabilmesi ve uygulanabilmesi için öğrenme nesneleri kavramın iyi anlaşılması gerekmektedir. İçerik üretimi ve paketlenmesi sırasında, işi teknik boyutuyla ele almanın yanı sıra öğretme – öğrenme ve tasarım ilkeleriyle uyumluluğu da gözden kaçırılmaması gereken noktalardır.

2. Öğrenme Nesneleri (ÖN)

Öğrenme nesnesi, Web ortamında sunulabilen ve e-öğrenme sistemiyle kullanıcıya ulaştırılan dijital kaynaklardır (Dağ ve Erkan, 2010). Öğrenme nesnesi (learning object) teriminin arkasında yatan temel şey, eğitimcilerin çevrim-içi bir ders oluşturmak üzere evrensel olarak erişilebilir sayısal bilgi parçalarını bileşenler olarak kullanarak bir öğrenim veya eğitim kümesi oluşturmasıdır (Yalvaç ve Bayraktutan, 2004).

2.1. Öğrenme Nesnelerinin Pedagojik Boyutu

Öğrenme Nesnelerinin tasarımında teknik boyutun yanında pedagojik boyutunun da dikkate alınması gerekmektedir. Öğrenme nesnelerinin tanımları göz önünde bulundurulduğunda eğitim öğretim faaliyetlerinin gerçekleştiği eğitim ortamlardır. Bu bağlamda öğrenme nesnelerinin pedagojik boyutu eğitim ortamlarının öğrenmeye etkisi ile doğrudan alakalıdır. Alkan (1979) öğrenmenin kalıcılığının;

- ✓ Okuma ortamlarıyla %10,2
- ✓ İşitsel ortamlarla %20,3
- ✓ Görsel ortamlarla %30,4
- ✓ Görsel - işitsel ortamlarla %50,5
- ✓ Öğrenci tarafından sözlü ifade etme ortamı için %70
- ✓ Öğrenci tarafından sözlü ifade etme ve yapma ortamı için %90

Şeklinde gerçekleştiğini vurgulamaktadır. Buradan anlaşılacağı üzere, bireyle etkileşim ve bireyin yaşantıları, ortamlar aracılığıyla ne kadar çok işe koşulursa o kadar çok olumlu sonuçlar alınacaktır. Birey, öğrenme bağlamı içerisinde sürekli etkileşim halindedir; yani ÖN'nin doğrudan öğrencinin aktif rol üstlenmesinden kaynaklanan özelliği, etkileşim için bir fırsat doğurur. Etkileşim; öğrencilere, kendi belirli ihtiyaç ve yeterliliklerini karşılama noktasında, öğrenme deneyimlerini biçimlendirme imkânı verir (Türel ve Gürol, 2009). Çoklu ortam materyallerinin en önemli özelliklerinden birisi, çeşitli bilişsel araçların tasarımların içine gömülmesine imkân tanımasıdır. Bilişsel araçlar, öğrencinin verilen içerikle daha derinden ilgi kurabilmesi için, girilen bilgilerin (input) etkilerini gözleme ve işleme, keşfetme gibi eylemlere izin veren etkileşimli bazı bileşenleri kapsar (Türel ve Gürol, 2009).

Eğitim ortamları seçiminde öğrenme hedeflerinin büyük rolü olduğu düşünülürse, öğrenme nesneleri de bir eğitim ortamı olarak düşünülebileceğinden, öğrenme nesnelerinin tasarımında da öğrenme hedeflerinin dikkate alınması oldukça yerinde olacaktır. Ayrıca, Alkan (1998) öğrenme hedefleri ve ortam seçimini, bilişsel, duyuşsal ve psikomotor hedefler dikkate alınarak yapılması gerektiğini vurgulamıştır.

2.2. Öğrenme Nesnelerinin Özellikleri ve Tasarım İlkeleri

Polsani (2003, Akt: Tekdal, 2004), Öğrenme Nesnelerinde bulunması gereken üç temel özelliği şöyle sıralamıştır:

- ✓ ***Erişebilirlik:*** Öğrenim nesnesinin veritabanında saklanması ve erişilebilmesi için Metadata (Bilgi hakkında bilgi veya Üst veri) da etiketlenerek saklanmalıdır.

- ✓ ***Tekrar Kullanılabilirlik:*** Öğrenim nesnesi bir defa geliştirildikten sonra, farklı öğretim materyallerinde tekrar kullanılabilmelidir.

- ✓ ***Bağımsızlık:*** Öğrenim nesnesinin çalışması, kullanılan yazılım ve donanımdan bağımsız olmalıdır. Tüm platformlarda çalışabilmelidir.

Öğrenme nesnelerinin ihtiyaca göre yeniden düzenlenebileceğini, ortamdan bağımsız olma özelliği sayesinde farklı öğrenim yönetim sistemleri üzerinde çalışabileceğini ve öğrenme nesnesinin, erişilebilirliğini sağlayan etiket bilgilerine sahip olduğunu görmekteyiz.

Eğitim ortamlarının etkililiğini ve verimliliğini arttırabilmek için, uzun yıllar süren araştırmalar sonucunda bir takım tasarım ilkeleri geliştirilmiştir. Bilgisayar destekli eğitim için hazırlanacak içeriğin temelini oluşturan öğrenme nesnelerinin üretiminde de söz konusu tasarım ilkelerini göz önünde bulundurmak yerinde olacaktır. Yüz yüze ve çevrimiçi öğretim ortamlarında geçerli olan şu ilkelerle özetlemiştir (Mayer, 2003:125, Akt: Türel ve Gürol, 2008):

- ✓ ***Çoklu ortam ilkesi (Multimedia effect):*** Öğrenciler hem geleneksel (book-based) hem de bilgisayar tabanlı (computerbased) öğrenme çevrelerinde yalnız başına kullanılan yazılı kaynaklar yerine resimle zenginleştirilmiş yazılardan daha iyi öğrenir.

- ✓ ***Tutarlılık ilkesi (coherence effect):*** Hem geleneksel hem de bilgisayar tabanlı öğrenme çevrelerinde konu dışı unsurlar (extraneous material) tasarıma dahil edilmediği zaman daha derin bir öğrenme gerçekleşir.

- ✓ ***Uzamsal yakınlık ilkesi (spatial contiguity):*** İlgili metin ve görseller bilgisayar ekranı ya da sayfa üzerinde ayrık olmak yerine birbirine yakın grup/gruplar şeklinde olmalıdır.

- ✓ ***Kişiselleştirme (personalization) ilkesi:*** Öğrenciler, hem yazılı hem de sesli sunumlarda, resmi (formal) bir anlatım yerine günlük konuşma diliyle yapılan bir sohbet tarzında kelimeler kullanıldığında daha derin bir öğrenme sağlarlar.

- ✓ ***Zamansal yakınlık (temporal contiguity) ilkesi:*** Birbiriyle alakalı metin ve görseller birbiri ardına gösterilmek/sunulmak yerine aynı anda (aynı sayfada veya ekranda) gösterilirse daha etkili olur.

- ✓ ***Duyu biçimi (modality) ilkesi:*** Öğrenciler, çoklu ortam mesajlarının yazılı metin yerine sesli metin şeklinde verildiği durumlarda daha iyi öğrenirler.

2.3. Öğrenme Nesnelerinin Oluşma Şekline Göre Sınıflandırılması

Öğrenme Nesnelerinin yeniden düzenlenip düzenlenemeyeceğini, ne oranda yeniden kullanılabilir olduğunu ve hangi amaçlar için kullanılabileceğini daha iyi anlayabilmek için, öğrenme nesnelerinin oluşum şekline göre incelenmesi yararlı olacaktır. Wiley (2000, Akt: Küçükçoban, 2008) bütün ögrenme nesnelerinin belirli bir kaliteye sahip olduğunu ancak aralarındaki kalite farkının ögrenme nesnelerini birbirinden ayırdığını belirtmiş ve öğrenme nesnelerinin içeriğinin daha iyi anlaşılması için ögrenme nesnelerini sınıflandırmıştır. Buna göre öğrenme nesneleri;

- ✓ ***Temel (Fundamental):*** Tek, diğer nesnelerle birleşmemiş dijital kaynaklardır. Örneğin piyanoda elleri akor yapar şekilde oynayan bir JPEG dosyası.

- ✓ ***Kapalı-Birleşik (Combined-Close):*** Az sayıdaki dijital kaynakların bir araya gelmesiyle oluşmuş nesnelerdir. Örneğin piyanoda arpej yaparak müziğe eşlik eden bir ses dosyası olabilir.

- ✓ ***Açık-Birleşik (Combined-Open):*** Çok sayıdaki dijital kaynakların bir araya gelmesiyle oluşturulurlar. Önceki türlerdeki JPEG ve video dosyalarına içeren ve yazılı şarkı sözlerini gösteren dinamik web sayfası olabilir.

- ✓ ***Üretken-Sunum (Generative Presentation):*** Üretken sunum nesneleri ağdan erişilebilecek nesneler yaratabilir ve sunum yapmak için bunları birleştirebilir. Örneğin nota ve anahtarları grafik olarak gösteren ve öğrenciye akor yapmasında yardımcı olan Java appletler.

- ✓ ***Üretken-Eğitsel (Generative instructional):*** Mantık ve yapının birleştiği nesnelerdir. Temel, kapalı- birleşik ve üretken-sunum nesnelerinin birleşimidir. Bu ögrenme nesnesi öğrenci davranışlarını değerlendirebilir.

3. SCORM Paketleme

3.1. SCORM Nedir?

SCORM 1997 yılında Amerika Birleştik devletleri ordusu tarafından geliştirilmiştir. Çeşitli ülkelerdeki ve farklı platformlardaki Amerikan Ordularının eğitimi için ortaya atılmıştır. Başta İngiltere olmak üzere çeşitli ülkelerden ve akademisyenlerden gelen desteğin ardından ADL (Advanced Distributed Learning) adlı şirket ortaya çıkmıştır. ADL'nin çalışmaları doğrultusunda, e-öğrenme alanında geliştirilmiş birçok standart ve tanımlamalar tek bir başvuru modeli çatısı altında toplanmaya başlanmış ve oluşturulan bu modele ise SCORM (Sharable Courseware Object Reference Model) adı verilmiştir (İbili, Bayram, Hakkari, Kantar ve Doğan, 2009). SCORM, öğrenim yönetim sistemlerinde etkililiği ve verimliliği arttırmaya yönelik bazı temel özellikleri içeren bir standartlar bütünüdür. SCORM' un, eğitim yönetim sistemleri, içerik geliştirme araçları, eğitim tasarımcıları ve içerik geliştiricileri ile ağ tabanlı eğitimin hizmeti veren kurumları etkileyen yanları bulunmaktadır (Yıldız, 2004).

3.2. SCORM' un Temel Özellikleri ve Bölümleri

Yıldız (2004) çalışmasında SCORM' un temel özelliklerini aşağıdaki gibi açıklamaktadır.

Paylaşılabilir (Sharable): Amaç eğitim içeriğinin adaptasyon gerektirmeden sanal olarak eğitim topluluğunun tüm üyeleri için kullanılabilir olmasıdır.

Erişilebilirlik (Accessibility): Eğitim içerik ihtiyaçları sadece CD-ROM veya yerel alan ağı olarak değil içeriğine dünyanın her yerinden karşılanabilmelidir.

Birlikte çalışabilirlik (Interoperability): Eğitim içeriği uyumlu her platformda, tarayıcıda ve eğitim yönetim sisteminde çalışabilmelidir. Referans modelinin mevcut sürümlerine uyumlu olarak geliştirilen bileşenler kod üzerinde değişikliğe gerek duyulmadan veya yeniden yazılmaksızın sonraki sürümlerde de çalışabilmelidir.

Yeniden kullanılabilirlik (Reusability): İçerik sadece bir kurs veya ders içinde değil nerede gerekiyorsa kullanılabilmelidir. İçeriği belirli bir kursa veya derse bağlayan hiç bir özel kod veya bağlantı bulunmamalıdır.

Uyarlanabilirlik (Adaptability): Uzun vadeli bir hedef olarak, öğrenme gelişimi veya tercihlere göre eğitim içeriği kendi kendisini uyarlayabilmelidir. Nitelik biraz karmaşık gözükse de bir çok ticari sitenin müşteri davranışlarına göre adapte olabildiği gözlenmelidir. Basit olarak uyarlanabilirlik içeriğin kullanıcı tercihlerine veya yetenek düzeyine göre etiketlenme yöntemidir.

Edinebilirlik (Affordability): Önceki hedeflere ulaşılmasıyla uzaktan eğitim içeriğinin üretim maliyeti düşürülecek ve oldukça düşük maliyetle kaliteli eğitim sağlanabilecektir.

SCORM' un zaman içerisinde ihtiyaca göre çeşitli sürümleri yayınlanmıştır. En güncel sürümü SCORM 3,1 veya SCORM 2004 olarak kullanıma sunulmuştur. SCORM 2004' te önceki sürümlerinden farklı olarak, öğrencinin istek ve performansına uygun olarak içerik sıralama ve dolaşımını da kapsayarak, öğrenme nesnelerinin hazırlanış ve paketlenişini belirleyen ***"İçerik Toplama / Kümeleme Modeli (Content Aggregation Model)"*** ile herhangi bir öğrenim yönetim sisteminde öğrenme nesnesi paketlerinin yükleme, iletişim, sunumu belirleyen ***"Çalışma Ortamı (Run-Time Environment)"*** ve dinamik öğrenme nesnesi paketleri haritasını belirleyen ***"Sıralama ve Dolaşım (Sequencing and Navigating)"*** adında üç ana bölümden meydana gelmektedir (Dods ve Diğerleri, 2004, Akt: Ertürk, 2004).

4. Sonuç ve Öneriler

Elde edilen veriler ışığında, e-öğrenme ortamlarına kullanılabilecek değerlendirme programları; her tür web tarayıcıda çalışabilmeli, kullanıcı dostu bir grafik ara yüzüne sahip olmalı, farklı kullanıcı rollerini destekleyebilmeli, farklı sınav uygulayabilme fırsatları sunabilmeli, hazırlanan soruları depolayabilme imkânı bulunmalı, soru havuzundan rastgele doru seçebilme imkânı olmalı, otomatik düzeltme yapabilmeli, öğrenciye anlık ve etkili geri bildirim sunabilmeli, çoklu ortam desteği sunabilmeli, farklı formattaki testleri çalıştırabilmeli ve/veya diğer programlara uyumlu halde kullanıma sunabilmelidir (Çelik ve Karay, 2011). Günümüzde bilgisayar ortamlı iletişim hem geleneksel hem de uzaktan öğretim veren kurumlar tarafından benimsenmekte ve bu ortamın eğitimde kullanımı tüm dünyada hızla yayılmaktadır. Günümüze kadar bilgisayarın eğitimde alışılagelmiş kullanımı BDE'le sınırlıyken, internet'in sınırları aşan esnekliği konuya yeni bir boyut kazandırmaktadır. Bu durum öğreticileri, yeni öğrenme ve öğretme modelleri geliştirmeye yöneltecektir. (Mendi, Karabıyık ve Toktaş, 2004).

Gerek öğrenme nesnelerinin özelliklerine gerek SCORM' un temel özelliklerine baktığımızda, bu özelliklerin ve genel kabul görmüş bu standartların, hem içerik hazırlayanlara hem de bu içerikle etkileşim halinde olan öğrencilere birçok açıdan büyük yararlar ve kolaylıklar sağladığını görmekteyiz. Ayrıca, ortamdan bağımsız olarak çalışabilmeleri özelliği sayesinde her türlü ortamda rahatlıkla çalışabildiğini görmekteyiz. Bu durum, bilginin paylaşımını kolaylaştıracaktır. Bilgi ve iletişim teknolojilerinin gelişiminin doğal bir sonucu olarak e-içerik hazırlama gereksinimine de duyulan ihtiyaç artmaktadır. Bu durumun da beraberinde ciddi maliyetleri getireceğini görmekteyiz. Öğrenme nesneleri ve SCORM' un en önemli avantajlarından biriside, söz konusu maliyetin çok önemli ölçülerde azaltacak olmasıdır. Sonuç olarak, elektronik ortamlar için hazırlanacak içeriğin, hem teknik açıdan hem de pedagojik açıdan analizinin ve değerlendirilmesinin iyi bir şekilde yapılması, geliştirilmiş ve genel kabul görmüş SCORM standartlarına göre hazırlanması önem arz etmektedir.

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BİLGİSAYAR DESTEKLİ EĞİTİMİN GELECEĞİ

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Abstract

Gelişen teknoloji, diğer bütün alanları olduğu gibi eğitim alanını da etkilemiştir. Bilgisayar teknolojileri, eğitimde kullanılmaya başlanmıştır. Bu, bir süreçtir. Geçmişten günümüze bilgisayarın eğitimde kullanılmasıyla ilgili çeşitli değişimler meydana gelmiştir.
Bu yazıda, eğitimde kullanılan çeşitli bilgisayar teknolojilerinden bahsedilmektedir. Bu teknolojiler, Web 2.0, blog, facebook, eğitsel oyunlar, zeki öğretim sistemleri, Web tabanlı eğitim, mobil öğrenme, 3D teknolojisi, Podcast olarak sıralanabilir.

Eğitsel Oyunlar

Bilgisayar temelli eğitimin kullanımının son on yıldaki artışı, yeni öğretim yaklaşımlarının geliştirilmesinde teşvik edici olmuştur. Son zamanlarda; öğrencileri, keyifli deneyimler yaşatırken aynı zamanda eğitmek için eğitsel oyunlar kullanılmaktadır. Bu oyunlar, teknoloji kullanılan öğrenmelerin sonraki dalgası olarak düşünülmektedir. (Derbali, Chalfoun and Frasson, 2011)

Bir eğitsel oyunda bulunan genel özellikler

- Hedef ve kurallar
- Duyusal algılama
- Motive edici unsurlar

İyi tasarlanmış eğitsel oyunlarda aşağıdaki diyagram izlenir:

Oyunlar → Oyun → Akış → Motivasyon → Öğrenme

(Paras ve Bizzocchi, 2005)

Eğitsel oyunlar, eğlendirirken bir taraftan da öğrenmeyi sağladıkları için, diğer oyunlarından farklıdır.

	Eğitsel Oyun	Eğlence için oynanan oyun
Görev tamamlama gibi deneyimler	Problem çözmeye odaklanılır	Zengin deneyimler tercih konusudur
Odak noktası	Öğrenmenin önemli elemanlarıdır	Eğlencedir
Simülasyonlar	İşe yarar simülasyonlar için tahmin gereklidir	Basitleştirilmiş simülasyon işlemleri vardır
Bağlantı	Standart bağlantı yeterlidir	Mükemmel bağlantı gerekir

(Susi, Johannesson, Backlund, 2007)

Eğitsel Oyunlarda Verimi Arttırmaya Yönelik Bazı Çalışmalar

Derbali, Chalfoun ve Frasson'un Çalışması

Eğitsel oyunlarda, güçlüklerin üstesinden gelindiği esnadaki dikkati fizyolojik yöntemlerle ölçmüşlerdir. Dayandığı model ise, Keller'ın ARCS modelidir.
Deneyde 11'i bayan olmak üzere 33 denek kullanılmıştır. Fakat bu deneklerden 2'si bayan 4 kişi teknik sebeplerden ötürü değerlendirme dışı kalmıştır.
Yapılan çalışmada, terleme (SC) , kalp atışı (HR) ve beyin dalgaları (EEG) verileri kullanılmıştır.
Kullanıcılardan bilgisayarların başına geçmeleri istenmiştir ve SC, HR, EEG alıcıları uygun yerlere yerleştirilmiştir.
Eğitsel oyunun 3. Ve 5. Seviyelerinde yer alan zorluklar temel alınmıştır. Oyun, bir yiyecek yardımı yapma oyunudur ve 3. Seviyede yiyecekleri uçakla dar bir yola bırakma, 5. Seviyede de kamyon ile tehlikeli bir alanda yiyecek dağıtma görevleri yerine getirilecektir.
Yapılan bu deneyin sonucunda, zorluklarla karşılaşıldığı zaman dikkatin arttığı sonucuna varılmıştır.

Keller'ın ARCS Modeli
1987 yılında John Keller motivasyon konusunda yapılan araştırmaları sentezleyerek ARCS modelini ortaya atmıştır. ARCS; Dikkat(Attention), Uygunluk(Relevance), Güven(Confidence) ve Tatmin(Satisfaction) kelimelerinin baş harfleridir.
Qu ve Arkadaşlarının Çalışması
Bu model, öğretmen gözetiminde çevrimiçi öğrenme görevlerini yerine getiren öğrencileri gözleme üzerine oluşturulmuştur. Öğrencilerin göz hareketlerinden ve arayüz hareketlerinden elde verileri birleştirmek için Bayesian modeli kullanılmıştır. (Qu, Wang and Johnson, 2005)
Hwang ve Yang'ın Çalışması
Derslerde dikkat değişkenini inceleyebilmek için, Matlab ve Visual Basic kullanılarak oluşturulan bir yüz ifadesi algılama programı oluşturmuşlardır. Bu programın verilerinin sonuçlarını, bulanık mantık algoritmasına dayandırarak yorumlamışlardır.
Bu sistemin kurulabilmesi için, IPCam ve ilgili yazılım gerekmektedir. Sistemin işleyişi şekildeki gibidir.

Sonuç

Yapılan çalışmalarda elde edilen çıkarımlar, akıllı öğrenme sistemlerinde dikkat değişkenini kontrol altında tutma konusunda kullanılabilir.

Zeki Öğretim Sistemleri

Eğitimde bilgisayarın kullanımını yaygınlaştırmak için daha yenilikçi ve "zeki" yazılımlara ihtiyaç vardır (Önder, 2001).

- Zeki Öğretim Sistemi (ZÖS), BDÖ'in gelişim süreci içinde yer alan özel bir öğretim sistemi yaklaşımıdır. (Dağ,F.,Erkan,K.,2009)

- Zeki Öğretim Sistemleri'nin (ZÖS ya da ZBDÖ) kısa ve açık bir tanımı "neyi öğreteceğini, kime öğreteceğini ve nasıl öğreteceğini bilen, yapay zeka ortak oluşumunda yer alan tekniklerden yararlanarak tasarlanmış bilgisayar programları" şeklinde yapılabilir (Nwana, 1990; Akt:Önder,2001).

Mobil Öğrenme

Mobil teknolojinin ve 3.nesil cihazların gelişim sürecine göre E-Öğrenim'in geleceği Mobil Öğrenimdir. (Çallı, İ., 2002)

Avantajları

- Yaşam boyu öğrenme
- Zaman ve mekandan bağımsız öğrenme
- İstenilen anda öğrenme (Çallı, İ., 2002)

Mobil Öğrenme Araçları

- Cep bilgisayarları
- Tablet bilgisayarlar
- Dizüstü bilgisayarlar
- Ipad

Podcast

Podcasting, iPOD ve broadcasting kelimelerinden türetilmiş olup Mp3 formatında ses ve video dosyalarının mobil ve kişisel cihazlardan RSS'ler ile takibini sağlayan teknolojidir.(Işık,A.H., Özkaraca,O., Güler, İ., 2011)

3D Teknolojisi

Gerçek dünyanın üç boyutlu olması, bilgisayarlarda sanal gerçeklikler oluşturulurken de üç boyut kullanım gereksinimini ortaya çıkarmıştır. Üç boyutlu görüntüler kullanılarak oluşturulan tasarım gerçeğe yakınolduğundan daha fazla ilgi çekmektedir. (Işık, İ.,Işık, A.H., Güler, İ., 2008)

LMS

Öğrenme yönetim sistemi ise adından da anlaşılacağı üzere bir yönetim aracıdır ve eğitim içeriklerinin yönetimine, öğrenenler ve öğretenlerin izlenmesine, öğrenme öğretme süreçlerinin bireyselleştirilebilmesine olanak sağlayan bütünleşik bir sistemdir. ÖYS ve diğer bilgisayar terimlerinin arasındaki temel fark ÖYS'nin bütün eğitim öğretim sürecini doğası gereği sistematik bir yaklaşımla kapsamasıdır.Dünya genelinde ellinin üzerinde açık kaynak kodlu öğrenme yönetim sistemi bulunmaktadır .

BİLGİSAYAR DESTEKLİ EĞİTİMDE EĞİTİMİN GELECEĞİ

WEB 2.0

WEB 2.0 NEDİR?

Web 2.0 kavramı ilk olarak O'Reilly Media tarafından 2004 yılında ortaya atılmıştır. Web 2.0, sosyal ağ siteleri, web tabanlı özgür ansiklopediler, iletişim araçları gibi çevrimiçi araçlar sağlayan; sosyal ağlar ve öğrenme toplulukları ile paylaşıma olanak sağlayan ikinci nesil İnternet tabanlı web servislerine vurgu yapmaktadır. (Şendağ, 2008 :995). İlk akla gelen Web 2.0 tabanlı eğitimde kullanılabilecek siteler; Vikipedi , Youtube , Facebook , Flickr , Bloglar , Dropbox , Tweeter, Rapidshare, vs.

WEB 2.0 VE EĞİTİMİN GELECEĞİ

Günümüzde kullanılan eğitim teknolojisi belki yarın için geçerliliği olmayabilecektir. Yarının eğitim araçlarını kesin olarak belirlememiz mümkün değildir. Bu nedenle insanların yeni nesil teknolojileri kullanabilmeyi öğrenmelerine olanak sağlayan öğrenim becerilerini kazanmaları oldukça önemlidir. (Sinç, 2004: 76)

EĞİTİMDE WEB 2.0'IN KULLANILDIĞI ALANLAR

Alıntı yerine URL adreslerini kullanacağız. Ansiklopedilerin yerine vikipedi'ler yani internet sözlükleri olacak. Kütüphanelerin yerini dijital kütüphaneler alacak. Sınırlı derslik bilgileri yerine zengin içerikli sanal derslikler oluşturulacak. Metinler yerine zengin içerikli ve medya öğeleri ile desteklenmiş bloglar kullanılacaktır. Ders kitapları yerine zenginleştirilmiş e-kitap'lar kullanılacak. Tek bilgi sağlayıcı öğretmen iken gelecekte herkes bilgi üretip paylaşacaktır bu sayede ders kazanımları grup çalışması ile oluşacaktır. Sınıflardaki plastik yer küreler ve haritaların yerine Google Earth gibi programlar alacaktır. (Tuncer, 2007: 7-10)

BLOG

BLOG NEDİR?

"Blog" İngilizce "weblog"un kısaltılmış şeklidir, bu da süregelen bilgilerin devamını sağlamaya çalışan internet sitelerini tanımlamak için kullanılan bir terimdir. Bir blog sık sık güncellenen, günlük tipi anlatımlarla yer veren kişisel siteler ve makalelere link veren siteler ya da diğer internet siteleridir. (Tuncer, 2007: 15)

BLOGLARIN ÖĞRENMEYE ETKİSİ

Öğrenciler, klasik eğitim sisteminde öğretmenin anlattığı kendilerinin dinlediği bir ortamın içerisinde pasif olarak bulunmaktayken bloglarda aktif olarak eğitime katılmaktadırlar. Öğretmeni merkezden çıkartan bloglar öğrenciyi merkeze alıp öğrenciye hitap eden bir yapıya sahiptir. Klasik eğitim sisteminde haftanın beş günü, günde altı ders toplamda otuz ders saatiyle (40-45 dakika) eğitim gören öğrenciler bloglarda yedi gün yirmi dört saat eğitim görebilmektedir. Bloglarda etkili grup çalışmaları yapılabilmektedir. Dört duvardan oluşan okulların yerine tüm dünya sınıf olacaktır. Klasik eğitimde çeşitli dış ve iç etmenler yüzünden okula gidemeyen öğrenci, bloglardaki dersleri istediği zaman takip edebilmektedir.

FACEBOOK

FACEBOOK NEDİR?

Bilinen ilk sosyal ağ, 1997 yılında kurulan SixDegrees'dir. 2003 yılından sonra sosyal ağlar hızla yaygınlaşmış ve kullanıcı sayılarında belirgin artışlar yaşanmıştır. Sosyal iletişim ağlarının dünya üzerindeki büyümesi inanılmaz boyuttadır. Bu ağların içinde en çok kullanılanı da Facebook'tur. (Tiryakioğlu ve Erzurum, 2011: 1031)

Facebook, insanların arkadaşlarıyla iletişim kurmasını ve bilgi alışverişi yapmasını amaçlayan bir sosyal paylaşım web sitesidir. 4 Şubat 2004 tarihinde Harvard Üniversitesi 2006 sınıfı öğrencisi Mark Zuckerberg tarafından kurulan facebook, öncelikle Harvard öğrencileri için kurulmuştu. 11 Eylül 2006 tarihinde ise facebook tüm e-mail adreslerine, bazı yaş sınırlandırmalarıyla açıldı. Kullanıcılar diledikleri ağlara; liseleri, çalışma yerleri ya da yaşadığı yerler itibarıyla katılım gösterebilmektedirler.

EĞİTİM ARACI OLARAK FACEBOOK

Eğitim aracı olarak Facebook'un kullanımının getireceği avantajlara bakacak olursak, ortamın getirdiği etkileşimlilik ve katılımcılık eğitime de yansımalıdır. Facebook'un eğitimde bir araç olarak kullanılmasının getirebileceği avantajlar aşağıdaki gibi sıralanmıştır. (Yamamoto, Demiray, Kesim, 2010, 466-468 Akt: Tiryakioğlu ve Erzurum, 2011: 1036)

Selwyn (2007) araştırmasında Facebook kullanımındaki eğitsel temalardan birinin uygulama ve akademik bilgilerinin paylaşımı olduğu bulgulanmıştır. Saunders (2008) araştırmasında Facebook'un öğretmen adaylarının kişisel ve mesleki kimliklerini ilişkilendirebildikleri ve bir öğretmen ağı oluşturma ve işbirliği yapma amacıyla kullanıldığını ortaya koymuştur. (Aktaran: Horzum, 2010: 614)

EĞİTİMDE FACEBOOKUN AVANTAJLARI

Öğrenciler istedikleri zaman istedikleri yerde okula bağlı olmadan istedikleri şekilde Facebook üzerinden eğitimlerini tamamlayabilirler. Bu sayede kendilerini belli saatler arasında eğitim almak zorunda hissetmedikleri için haftanın her günü günün her saati eğitimlerini alabilirler. Bir öğrenci kendi Facebook sayfasını istediği şekilde tasarlayabileceği için öğrenci eğitimi bireyselleştirebilir. Öğrenci istediği kadar kendi bilgisayarının başında derslerini defalarca tekrar edebilir. Facebook'a eklenilen animasyon, video veya görsel öğeler sayesinde çeşitli öğrenme ortamları tasarlanabilir ve öğrenci kendi seçtiği ve daha kolay anladığı bir öğrenme ortamından eğitimini tamamlayabilir. Facebook içerisinde kurulacak bir sanal laboratuar ile benzetim animasyon ve etkileşimli flash uygulamaları sayesinde öğrencilere daha az maliyetli ve daha tehlikesiz deneyler sunulabilir. Facebook üzerinden yapılan eğitim de öğretmen ve öğrencilerin bilgiye ulaşma, değerlendirme, kullanma ve etkili olarak alıntı yapma becerilerini geliştirebilmektedir.

ÖRNEK FACEBOOK SİTESİ

Virtual Classroom

Hakkında: Yakındoğu Üniversitesi'nde öğretim görevlisi olarak çalışan Uz. Hüseyin BİCEN'in "Eğitimde Sosyal Paylaşım Sitelerinin Kullanımı ve Yönetimi: Facebook ve Wiziq Sanal Sınıf Örneği" konulu Doktora Tezi Uygulaması olarak kullandığı Facebook sayfasıdır. Sayfanın adresi: http://www.facebook.com/sanalders 'dir. Sayfayı 2011'de hayata geçirmiştir.

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BOLOGNA PROCESS AND ANADOLU UNIVERSITY OPEN EDUCATION SYSTEM

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Abstract

In today's world, many significant changes occur in the field of higher education just like in other fields. Increasing the quality of higher education, ensuring the transparency and comparability of sustainable education systems at international level and the attempts to make such systems more practical and easily adaptable are the significant dynamics of such changes. Considered as a mega university in the world with its well-established open and distance education system, Anadolu University provides education services for almost half of the students enrolled in Turkish Higher Education system. Since it is a system providing services for more than 30 years, it is now inevitable to initiate a restructuring process according to these certain changes, for which Bologna Process has been an important trigger. The main scope of this study is to examine the changes observed in Anadolu University open and distance education system in parallel with the attempts to adopt Bologna Process.

Keywords: Open and Distance Education, Bologna Process, Anadolu University Open Education System

Introduction

Today, we are experiencing "information age", in which the role of universities at social and economic level has gained considerable importance. Therefore; it is clear that economic, scientific and technological developments require the initiation of effective restructuring processes in higher education systems. Moreover, the demand for higher education is also increasing during information age, which makes it necessary for higher education systems to develop their own accountable and transparent processes.

As the inevitable effects of all these developments, the higher education systems all over the world are now going through various transformation processes. Many countries have already initiated regional collaboration units in order to compare their own higher education systems with others and to find common solutions. The most comprehensive of all such collaboration attempts is Bologna process initiated in order to create a "Common European Higher Education Area" in Europe. The number of member countries in Bologna Process is currently 47, and Turkey joined the process in 2001. In Turkey, "Council of Higher Education" has the first degree responsibility to apply the process and do the necessary audits.

Anadolu University, which is a higher education institution well equipped with necessary scientific knowledge, academic experience, quality human resources and technical and technological infrastructure conforming to international standards, was entitled to provide open and distance education in Turkey according to the law numbered 41 enacted on July 20th 1982. The worldwide changes in information and communication technology, increasing demand for open and distance education, emergence of learner-centered educational approaches, Bologna Process, the amendments made in legal regulations now require the restructuring of the programs providing centralized open and distance education at Anadolu University. The current study examines this ongoing restructuring process in the faculties providing open and distance education at Anadolu University.

2. Bologna Process and Its Development

The first steps of Bologna Process were taken in 1998 when Sorbonne Declaration was published after the meeting held with the presence of Ministers of Education of France, Italy, Germany and England. This was the first time when the idea of creating a "Common Higher Education Area" in Europe emerged. The Bologna Declaration, signed by the ministers responsible for higher education systems in 29 European countries at the meeting held in Bologna, Italy, in 1999, started the Bologna Process (Erdoğan 2010, 3).

While the Sorbonne Common Declaration dated 1998 was signed by only four countries (Germany, France, United Kingdom and Italy), a total of 29 countries were represented at the meeting held in Bologna in 1999. This number increased to 40 in Berlin Summit held in 2003 and then reached 46 with the addition of five more countries and “European Commission”, which was treated as if it was a participant country. London and Leuven meetings did not receive any applications for participation; however, the total number of member countries became 47 at Bologna member countries’ meetings held in Vienna and Budapest in 2010 (Gümrükçü and Epskamp 2011, 13).

2.1. Action Lines of Bologna Process

The action lines of Bologna Process can be listed as follows (Gümrükçü and Epskamp 2011, 79):

- adopting clear and comparable higher education diploma and degree criteria (developing Diploma Supplement practice to achieve that purpose)
- adopting a three-cycle system in higher education; namely undergraduate, graduate and postgraduate cycles
- adopting European Credit Transfer System (ECTS)
- promoting the mobility of students and academicians across Europe
- applying and promoting quality assurance systems network
- improving European dimension in higher education
- encouraging lifelong learning
- promoting active participation of students and higher education institutions in the process
- promoting the attractiveness of European Higher Education Area
- establishing a strategic cooperation between European Research Area and European Higher Education Area.

Bologna Process is a structured and continuously evaluated one. The first and the highest political level of the process at international level is the meeting of European ministers who are responsible for higher education in their own countries. This meeting is held once in every two years and the current situation is analyzed, new targets are determined and public is informed about the resolutions via declarations and publications. The second political level of the process involves Bologna Follow-up Group, which consists of the delegates responsible for higher education in the countries involved in Bologna Process. The presidency of the group is handed over when EU presidency changes. There are some members who consult this political structure which consists of ministers and Bologna Follow-up Group national delegates. There is a board of directors that prepares and organizes BFUG meetings held twice a year. The members of BFUG are responsible for the development and audit of Bologna Process actions carried out in their own countries and across Europe (Edinsel 2008, 7).

3. Adoption of Bologna Process in Turkish Higher Education

The adoption of Bologna Process at national level means a lot of significant responsibilities to be assumed by many stakeholders, especially higher education institutions. In Turkey, The Council of Higher Education is responsible for the adoption and the audit of the process. The Council considers Bologna Process as an appropriate tool to restructure the higher education system; and therefore, carries out many actions to ensure the recognizability of higher education institutions at international level and increase their quality. Some of these actions are sponsored by European Commission and carried out within the framework of “National Team of Bologna Experts Project” initiated in 2004. The others are carried out by the commissions established by the Council of Higher Education, and the actions aim at involving all higher education institutions in Turkey in the process (Erdoğan 2010, 14).

The main objective of National Team of Bologna Experts Project is to extend and activate Bologna Process at national level in collaboration with other “national teams of experts” established in each country. Every year, the project developed within the framework of annual plans by the authorities responsible for the higher education system of each country and the “team of experts’” chosen to carry out the project are presented to European Commission for approval and later following the approval, the activities determined are initiated. The related project term expires following the submission of conclusion report and a proposal for a new project is submitted to European Commission based on the projected priorities at national level for the next year (Edinsel 2008, 14).

In Bologna Process, it is projected that the developments should be examined across individual countries and Europe through “Trends” and “Stocktaking” reports submitted once in every two years. The first Stocktaking report in Bergen in 2005 was revised in London in 2007 with the inclusion of new topics, and the development levels of countries regarding Bologna Process actions were analyzed. In this respect, the development experienced by Turkey in 2005 and 2007 regarding Bologna activities are displayed in Table 1 (Edinsel 2008, 10).

Table 1. The Development of Turkey regarding Bologna Process Actions

Study Topics	Begen 2005	London 2007
Quality Assurance	**Medium (2.00)**	**Very Good (4.00)**
• National quality system competent with European Higher Education	Medium (2)	Perfect (5)
• The criteria used and external evaluation system	Medium (2)	Very Good (4)
• Student participation	Medium (2)	Very Good (4)
• International participation	Medium (2)	Good (3)
Grading System	**Perfect (4.67)**	**Very Good (4.33)**
• Application of dual system	Perfect (5)	Perfect (5)
• Passing from grade 1 to grade 2	Very Good (4)	Perfect (5)
• The number of students in dual system	Perfect (5)	---
• The framework of national requirements	---	Good (3)
Diploma and Accreditation of Durations of Education	**Very Good (3.67)**	**Very Good (4.33)**
• Diploma Supplement	Very Good (4)	Very Good (4)
• Lisbon Convention (recognition)	Good (3)	Very Good (4)
• Europan Credit Transfer System	Very Good (4)	Perfect (5)
Lifelong Learning		**Good (3.00)**
• Accreditation of Previous Education System		Good (3)
Common Degrees		**Perfect (5.00)**
• Determining common degrees and accreditation		Perfect (5)
GENERAL	Good (3.45)	Very Good (4.13)

The comparison of mean scores of Turkey with those of the countries participating Bologna Process is shown in the figures below (Edinsel 2008, 14).

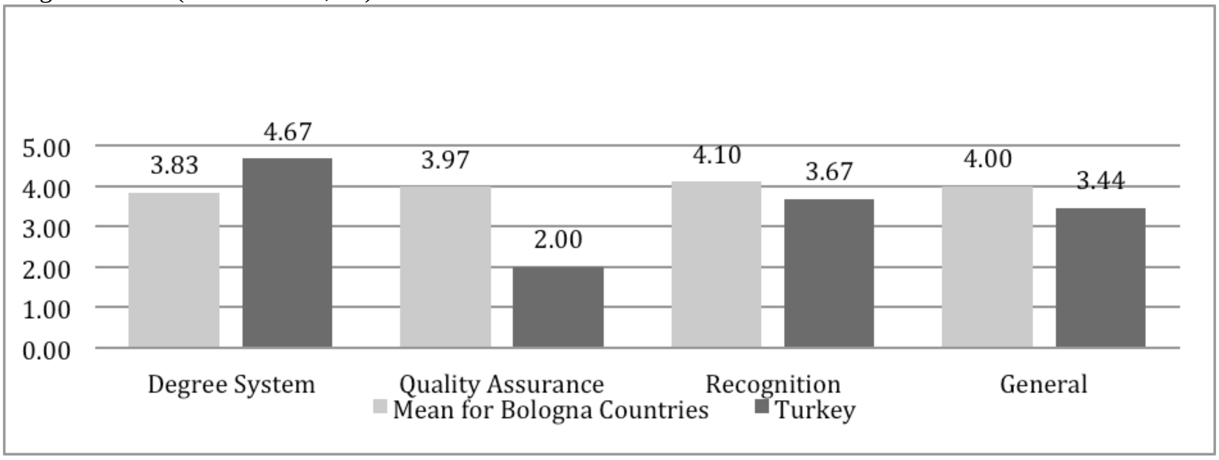

Fig. 1- The comparison of development level of Turkey with Bologna Countries in terms of Bologna Process Actions according to 2005 Bergen Stocktaking Report

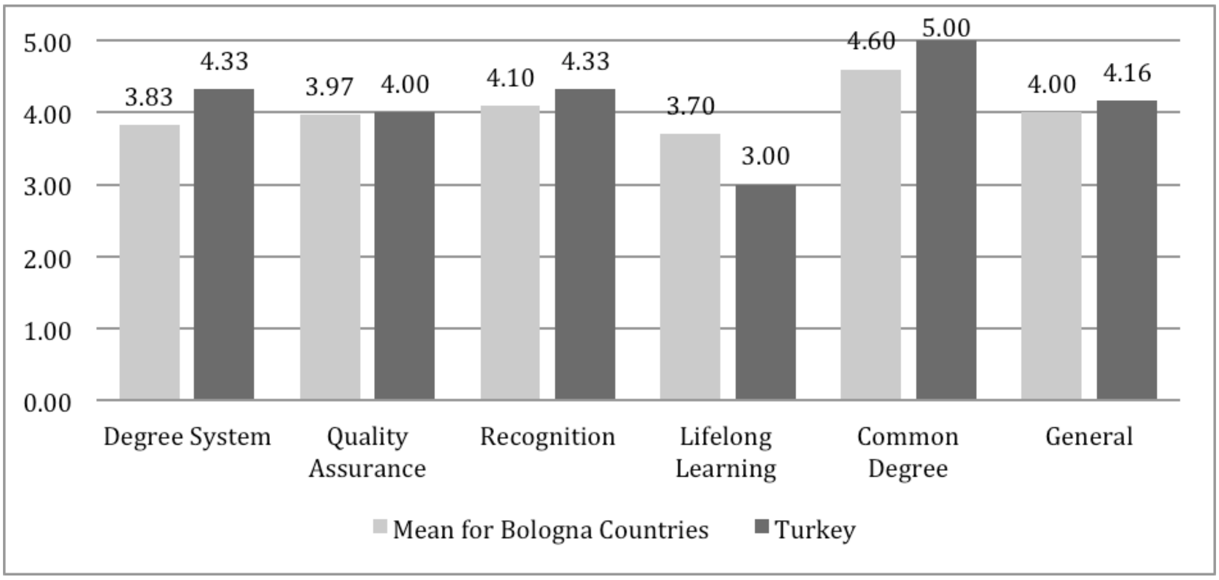

Fig. 2- The comparison of development level of Turkey with Bologna Countries in terms of Bologna Process Actions according to 2007 London Stocktaking Report

4. Open and Distance Education at Anadolu University

Anadolu University, which is well equipped with necessary scientific knowledge, academic experience, quality human resources and technical and technological infrastructure conforming to international standards, was entitled to provide open and distance education in Turkey in 1982 through the related law. Initiated as a part of Communication Sciences Faculty, open and distance education system at Anadolu University now carries out these responsibilities with all its faculties and educational units in collaboration with the academicians from other universities and experts (coursebook writing, scenario writing for TV programs and shooting, academic councelling services) (Curabay and Demiray 2002, 24). In addition, the legal regulation stipulates: “the students and the graduates of open education and formal education of the same departments have the same rights and authorization”

While the demand for higher education in Turkey was 420 000 in 1981, the number of students who were able to obtain the right to enter universities was only 54 000. In other words, the universities of the period were able to meet only 13 % of the existing demand. On the other hand, the advancements in education technology encouraged the idea that education should not be limited to classrooms only; therefore the application of an open and distance education system was necessary. These ideas were put into practice and Anadolu University Open Education Faculty started to provide education as the first faculty in Turkey according to open and distance education system principles in 1982-83 academic year. Aiming the provision of equal education opportunities at high standards in higher education, the faculty had 29.500 students in Economics and Business Administration undergraduate program in its first year, which clearly showed the considerable demand for higher education and open and distance education model.

Between 1982 and 1993, the demand for Open Education offered by Anadolu University considerably increased. In addition to the undergraduate programs in Business Administration and Economics, a protocol was signed with the Ministry of Education giving more than 200 000 teachers the opportunity for associate degree and Undergraduate Degree Completion Program. Morover, the citizens of Turkish Republic of Northern Cyprus were also given the right to register in these programs. Following the protocol signed with Ministry of Health, two-year Nursing, Midwifery and Health Techicianship associate degree Program was established; and Agriculture and Veterinary associate degree Program was opened according to the protocol signed with the Ministry of Agriculture. In 1987, undergraduate and associate degree programs were initiated for Turkish citizens living abroad in different cities of Europe within the framework of the project titled “West Europe Project”.

In 1993, open and distance education system was restructured through a legal regulation according to the changing needs of the period. Economics and Business Administration Programs were upgraded into 4-year

“Economics” and “Business Administration” Faculties. A total of 17 associate degree programs were established at Open Education Faculty between 1993 and 1997.

Organized and carried out by ÖSYM (Student Selection and Placement Center) at the beginning, Open Education Exams started to be held by Anadolu University as of 1996. Another important date in the history of Open Education system in Turkey is 1998, which initiated a new period in which new structures carrying open and distance education beyond its classical functions were put into practice and modern communication technologies – mainly internet - were used due to changing technological conditions and student needs. In 1993-1994 academic year, Undergraduate Degree Completion Program practice started in collaboration with the “Council of Higher Education” in order to ensure the integration of Open Education system to formal (face –to – face) higher education.

A total of 12 new associate degree programs were established at Open Education Faculty between 1998 and 2008.

In 1998, the Faculty’s official webpage http://www.aof.anadolu.edu.tr started to provide various services for students, which is followed by the publishing of “Internet-based practice tests” to prepare students for the exams in 1999. Anadolu University open and distance education system established a video-conferencing environment via satellites and terrestrial broadcasting lines by collaborating with other universities. As of 1999, TV programs titled “Preparing for Exams” are broadcast on the national state-run TV channel prior to midterms, finals and make-up exams; one week live and one week taped programs.

For the purposes of adapting to newly developing conditions in 2001-2002 academic year, “Second University” application was initiated, which provided opportunities to have an alternative education for those already attending a formal education program or having graduated but aspiring to improve himself / herself in various topics.

A total of 22 new programs in various study fields - 5 undergraduate and 17 associate degree were developed in the faculties providing open and distance education in 2009-2010 academic year.

5. Structure of Anadolu University Open and Distance Education System

Anadolu University open and distance education system consists of three faculties; namely “Open Education”, “Economics” and “Business Administration”. There are 48 associate degree programs, 6 undergraduate departments and 3 Undergraduate Degree Completion Programs at “Open Education Faculty”; 5 undergraduate departments at “Faculty of Economics”; and 2 departments offering undergraduate education at “Faculty of Business Administration”.

There are various ways to enroll in the faculties of open and distance education system. Among those are “centralized exam organized by ÖSYM (Student Selection and Placement Center)”; “YÖS (International Student Entrance Exam) administered by the university”, “undergraduate degree completion program”, “transfer from other university” and “second university”. In 2011-2012 academic year, the numbers of students registered in the programs and departments having academic year-based system are as follows for each faculty: Open Education Faculty 77.222; Faculty of Economics 74.410; and Faculty of Business Administration 157.429. The current total numbers of enrolled students at these faculties are as follows for each faculty: “Open Education Faculty” 303.094; “Faculty of Economics” 391.376; and “Faculty of Business Administration” 599.098.

Similarly, the number of students enrolled in semester/credit-based system at the programs and departments of Open Education Faculty in 2011-2012 academic year is 109.784. The total number of currently enrolled students in such programs and departments is 229.340. Accordingly, overall total number of students enrolled in the system or having the right to be enrolled when the tuition fee is paid is 1.941.753.

6. Bologna Process in Anadolu University Open and Distance Education System and Restructuring Process

As mentioned above, Anadolu University open and distance education system has been offering various programs at different faculties for more than 30 years. This system has countinously developed with the addition of new enrollment types and integration of various educational methods. However, when the main features of the system are examined, a restructuring process is inevitable. In the past, education was on academic year-basis, and the assessment required an absolute passing grade, in other words the credits given to courses were not taken into consideration. In addition, there were not any elective courses and the students did not have the option to select the courses they want to take. These weaknesses produced a negative image for Anadolu University open and distance education system as an isolated one from overall higher education system. In short, both internal and external dynamics required an urgent restructuring in the system. Recent legal regulations in Turkish Higher Education system stipulate the adoption of semester and credit –based system. The attempts to integrate Turkish Higher Education System into European Higher Education Area via Bolonga Process constitute the external dynamics of this restructuring process.

The main objectives of restructuring process have been determined as follows:

- Having two semesters in open and distance education system.
- Defining European Credit Transfer System (ECTS) for each individual course.
- Writing educational goals and objectives for the programs, determining learning outcomes, making lesson plans and revising course and program contents
- Adopting an assessment system based on ECTS credit values rather than a system requiring an absolute passing grade

In addition to these main objectives, rewriting of all course books and updating e-learning environments have been planned in parallel with the restructuring process. At the end of this process, a new education model having the following features will be available: focusing on mass education, transparent, accreditable, dynamic, learner-centered, using modern technology, interactive, flexible, meeting the labor force demand of the country, reaching individuals at all ages through its lifelong learning philosophy, and contributing to the recognizibility and popularity of the system and the program.

To achieve this purpose, firstly, a three-year process has been planned for the restructuring of open and distance education. This process is defined as "transformation to semester / credit system" in open and distance education system. Open Education Faculty Teology associate degree program has been chosen for the first program to be transformed and semester / credit system was used in the program for 2010 – 2011 academic year. Later, other 13 programs having different education models (internship, practicum courses, face-to-face education) were transformed into credit system. In the last year of the process, that is 2012-2013 academic year, all the programs and departments – 13 undergarduate, 48 associate degree and 3 undergraduate degree completion programs– at Open Education, Economics and Business Administration Faculties – will be transformed into credit system.

Most of the programs to be transformed have been redesigned according to predetermined basic field requirements, and later learning outcomes of all the courses have been determined in a way to meet the program requirements, and finally, coursebooks and learning materials have been revised or replaced with new ones.

Approximately 500 courses have been transformed into credit system in the departments and programs, course contents have been revised and the number of courses increased to more than 1000 with the addition of new courses to the programs.

All the courses in the programs and departments have been revised by the academicians who are experts in the field. As a result, up-to-date and rich contents have been prepared accordingly.

Adaptation procedures (grade conversions, assigning the students to new courses etc.) of nearly 2 million students enrolled in the system have been completed.

As a requirement of Bologna process, ECTS credits were determined for all courses. In order to achieve accurate results, the students were given questionnaires for all the courses and the credits were determined according to the data obtained from these surveys. Anadolu University was honored with ECTS Label given by European Commission to the higher education institutions that apply ECTS in all undergraduate and graduate programs successfully and accurately. This label increases the prestige and quality of the institution.

As another practice of Bologna Process, "Diploma Supplement" is given by the institutions in addition to diplomas. As a result, the degree obtained from open education system is accrediatable by other institutions and organizations. Diploma supplement helps students to certify the talents and skills they acquired during their education life. Anadolu University has been awarded Diploma Supplement Label Award by European Commission the Education, Audiovisual and Culture Executive Agency – EACEA. This award is given to higher education institutions that can give free of charge Diploma Supplement written in a commonly spoken European language (English) correctly and automatically to their students who complete an undergraduate or graduate program.

7. Conclusion

Anadolu University open and distance education has been playing an important role in meeting social needs and the demands for higher education for 30 years. However; restructuring of the system has been a must due to the changing conditions of today's world. Adoption of Bologna Process has been determined as the ultimate goal in this restructuring process. As mentioned in the action lines of Bologna Process, the objectives of restructuring process are as follows: adopting clear and comparable higher education diploma and degree criteria (developing Diploma Supplement practice to achieve that purpose); determining European Credit Transfer System (ECTS) credits for all the courses in the programs and departments; applying and promoting quality assurance systems network; encouraging lifelong learning; and placing Turkey in European Higher Education Area by meeting all the requirements. Keeping these objectives in mind, the adaptation procedures of nearly 2 million students in all programs and departments to this new structure have been completed. Restructuring of Anadolu University open and distance education system, which can be considered as a mega organization due to considerably high numerical figures, will be an exemplary practice for other higher education institutions as well. The first two years of restructuring process has been completed successfully and is projected to be fully completed in the last year. After the completion of the process, an exemplary open and distance education system will be established which is suitable for the needs of the time and fully integrated to higher education systems at both national and international levels.

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BRIDGING E-GAPS AT PNU BY USING ALTERNATIVE ENERGY

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Abstract

In the last decade eLearning has proven to be a flexible and time-efficient means of studying and achieving continuing professional development. Shift from the traditional instruction paradigm to a learning paradigm is needed in higher education and lifelong learning. These days learning and development professionals are therefore continuously looking for new ways of mobilizing and sharing information and knowledge between colleagues and communities in an online environment. Many Saudi higher education institutions have adopted e-learning in some form as part of their curriculum offering. According to 2011 Webometrics ranking King Saud University ranks first in the Arab world, 21 among all Asian universities and 212 worldwide with regard to Web visibility and impact.

Princess Nora bint Abdulrahman University (PNU) is the first women's university in Saudi Arabia and largest women-only university in the world. Science school at PNU is moving to a new campus next summer, the existing old building and time limit are not suitable for building e-classrooms within the old campus.

However, Mobile learning can form another online learning option overcoming the perceived inadequacies of the existing infrastructure of conventional e-learning. mobile network also provides unique advantages or features such as the position or location of the device and personalization (both user preferences and device capabilities). When wireless or mobile phone networks combined with renewable energy systems such as photo-voltaic solar panels or solar chargers they can be stand alone systems. The exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks enable faculties and students at science school at PNU to construct mobile learning within an old campus.

The purpose of the present work is to design and implement Mobile-classrooms at PNU old campus using renewable energy resources, and then to study the effect mobile learning has on academic student learning achievements.

Keywords: e-gap, m-learning, e-learning, renewable energy, wireless network.

Introduction:

Bridging the e-learning gap is not easy and requires several steps and adjustments. First of all we have to implement a wireless platform for mobile learning. Mobile learning has been described as ‘paradigm-shifting’, particularly when its focus is on learning overcoming the perceived inadequacies of existing e-learning infrastructure. Mobile learning eliminates the need to have special computer rooms and offers teachers full freedom to let students work with online applications whenever and wherever they need to. The second step is to implement a stand-alone photovoltaic PV system. Standalone PV system is used to convert solar energy into electrical energy which is used as an electrical energy source for charging mobile computing device batteries.

Mobile technology is a rapidly evolving mobile communication technology which includes local area wireless networks by Wi-Fi, Third and fourth Generation (3G & 4G) mobile networks, and related mobile computing devices such as mobile phones, pocket PCs, Tablet PCs, and various Personal Data Assistant (PDA) handheld devices. It provides people with “wearable” computing ability to conveniently participate in learning environments at anytime and anywhere.

Several studies found that m-learning did generate strong interest among the students (Rogers et. al, 2010; Venkatesh et. al, 2006; Wang et. al, 2009). In the majority of the studies, students reported having a strong, positive reaction to integrating m-learning into the classroom (Clarke et. al 2008, Al-Fahad, 2009; Wang, 2009; Garrett & Jackson, 2006; Cavus & Uzunboylu, 2009; Uzunboylu et. al, 2009; Manair, 2007; Maag, 2007). Moreover, learners found that learning with mobile devices was enjoyable (Clarke et. al, 2008; Rogers et. al, 2010, Shih et. al, 2010). Students also recognized the potential for future m-learning opportunities as new technologies are integrated into education (Bottentuit Junior, 2008; Uzunboylu, et. al, 2009; Wyatt, et. al, 2010; Wang, et. al, 2009; Maag, 2007) and wanted to use devices in an educational setting in the future (Maag, 2007).

The affordable availability of mobile devices has led to an increased interest in both mobile and informal learning environments. Mobile devices offer the potential to link learning activities inside and outside of formal settings. Our work attempts to utilize that potential by providing students with a consistent environment to explore, comment upon, create, share, and document learning contents using PDAs both inside and outside the classroom.

Mobile-Learning framework

The Mobile learning system development is based on three domains, Mobile usability, wireless technology and e-learning system. Fig.1 presents an overview of different domains in the mobile learning system.

The unique feature of the m- learning system is the mobility, teacher is mobile, learner is mobile, device is mobile and content is mobile. Fig.2 shows mobile learning environment.

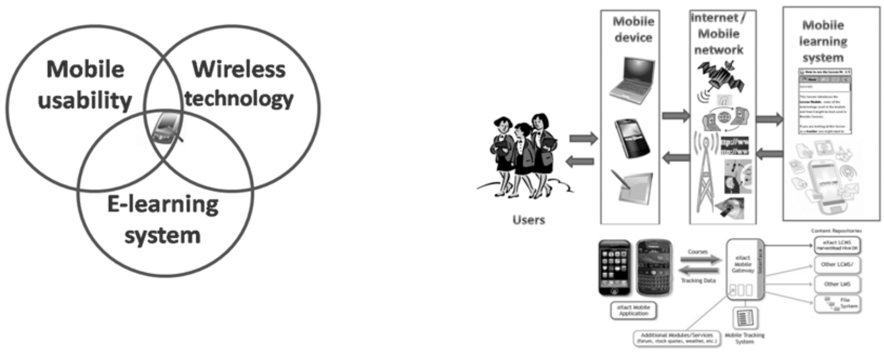

Fig. 1(a) The domain of mobile learning system, (b)m-Learning framework.

Mobile classroom network :

Mobile classroom electronic circuit was built using laptop, PDA(and/or external portable USB hard drive), Broadband modem (and/or wireless router, printer, projector, smart board) as shown in Figure(3). Student laptops can be connected to instructor laptop either by cables or wireless connection such as Ad- Hoc Wi-Fi connection as shown in Fig.(3).

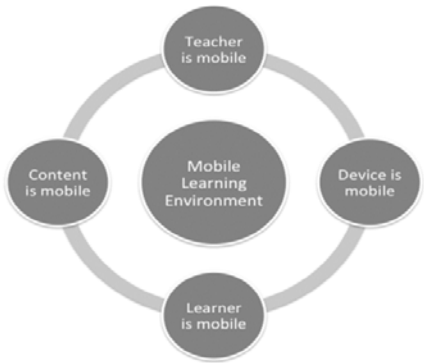

Fig. 2. Mobile learning environment.

Charging systems : *Stand-alone Solar Photovoltaic Charging System*

One of the most popular non conventional energy sources is solar energy. Standalone PV system was used to convert the solar energy into electrical energy. The component of this system is shown in Fig.4(b) . The stand alone system is also known as an off grid system. Fig.4(a) shows schematic diagram of the PV system while Fig, (4-b) shows components of a standalone solar PV system used in this work, its solar panels produce 500 watts in direct sunshine which is enough to run m-classroom circuit.

Solar Gorilla Laptop Charger has also been used to charge student laptop. The Solar Gorilla has clever electronics built in, and its solar panels produce a staggering 10 Watts in direct sunlight, which is enough to run almost any portable electronic device including a laptop, notebook, mobile phone, iPod, and more. Fig(4-c) shows Solar Gorilla Laptop Charger. Students can charge their mobile device batteries either by using a stand-alone PV system or Solar Gorilla Laptop Charger.

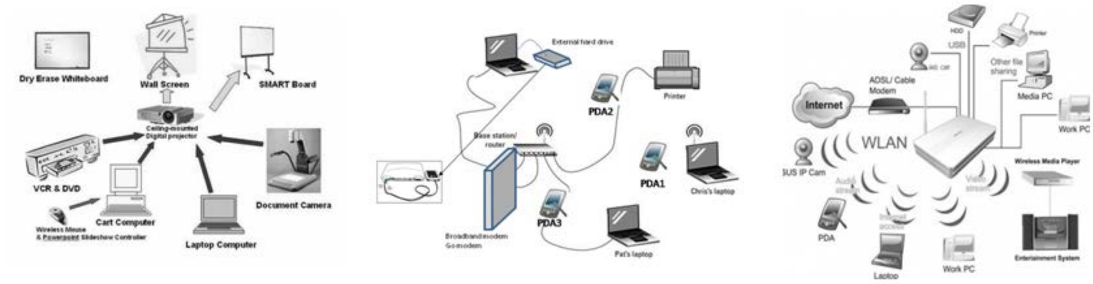

Fig.3. Classroom network.

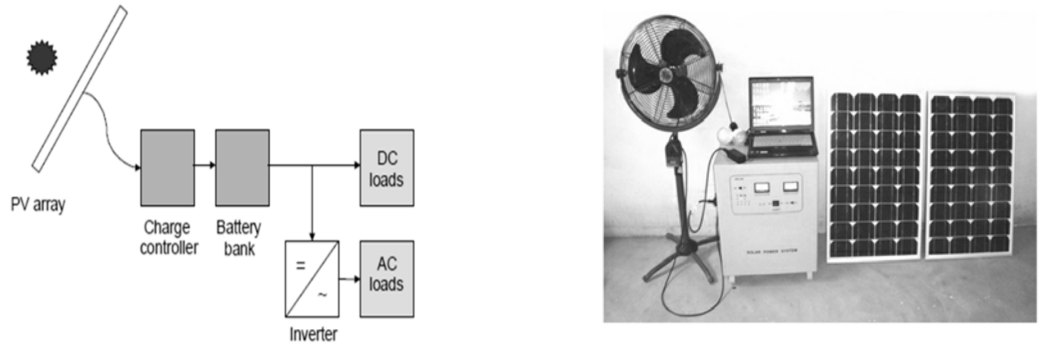

Fig. 4(a) Schematic diagram of a stand-alone PV charging system,(b). Components of a stand-alone solar PV system

Fig.4(c) Shows Solar Gorilla Laptop Charger .

Network Configuration and software: *Moodle as learning management systems: LMS software:*

In this work Moodle was used as a learning management system. Moodle, a popular open source Learning Management System (LMS), has become the central point for learning activities for many schools and organizations. Moodle (abbreviation for Modular Object-Oriented Dynamic Learning Environment) is a free source e-learning software platform, also known as a Course Management System, Learning Management System, or Virtual Learning Environment (VLE). Moodle was originally developed by Martin Dougiamas to help educators create online and offline courses with a focus on interaction and collaborative construction of content, and is in continual evolution.(William H. Rice IV2007). Moodle has several features considered typical of an e-learning platform, plus some original innovations like Moodbile which is a PHP application that plugs into Moodle web-service connectors and adjusts the look of Moodle to fit small screen devices, such as mobile phones. We believe that adding a mobile, location aware component to Moodle could provide teachers with new tools that could increase student engagement and make Moodle more relevant to the increasingly mobile world we all live in. Moodle also provides an “offline” testing and development environment. There are an offline application that could be loaded onto instructor laptop or portable memory , it would be possible for students, even without internet access to engage the content and assignments. Student laptops can be connected to instructor laptop either by cables or wireless connection such as Ad- Hoc Wi-Fi connection. Fig.5(a) Shows offline PNU Moodle homepage while Fig.5(b) Shows online PNU Moodle homepage.

Table 1. Illustrate strategies and learning activities used in this work.

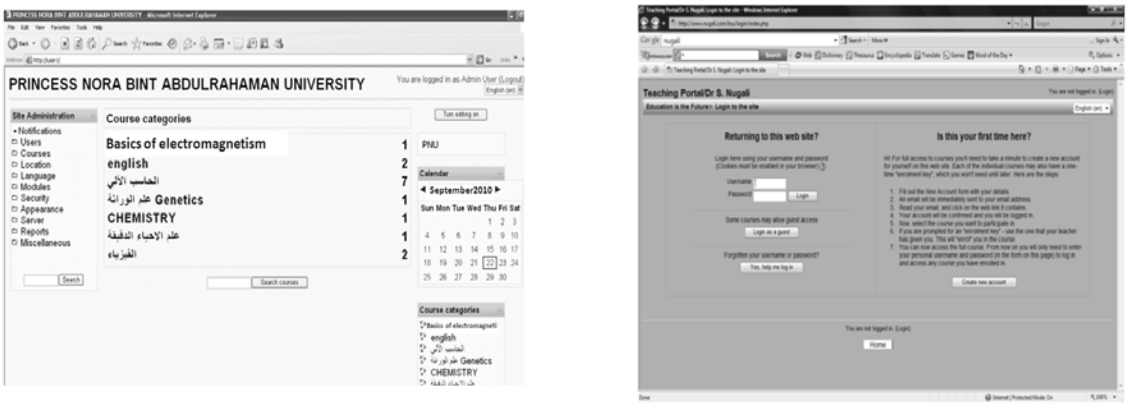

Fig.5 (a) Shows offline Moodle homepage, (b)Shows online Moodle homepage**.**

The Effect of m-learning Approach on Students' Achievement in basics of electromagnetism Course at PNU

The mobile revolution is finally here. Wherever one looks, the evidence of mobile penetration and adoption is irrefutable: cell phones, PDAs (personal digital assistants), MP3 and MP4 players, portable game devices, handhelds, tablets, and laptops abound. From toddlers to seniors, people are increasingly connected and are digitally communicating with each other in ways that would have been impossible to imagine only a few years ago. The heightened interest in mobile possibilities for teaching, learning, and research can be attributed to a number of factors: the continuing expansion of broadband wireless networks; the explosion of power and capacity of the next generation of cellular telephones; and the fact that mobile telephones, a familiar tool for communications, are already fully ingrained in contemporary life as part of our social practice. Various mobile devices have been used in mobile learning, such as wrist-worn devices, mobile phones, handheld computers, web pads, pen tablet computers and laptop computers (Sharples & Beale, 2003). Many studies have reported achievements in the investigation of learning interests and the effectiveness of mobile learning (Rieger & Gay, 1997; Roschelle, 2003; Tatar, Roschelle, Vahey & Penuel, 2003; Zurita & Nussbaum, 2004). For an effective integration of mobile learning into a digital classroom environment, it is important for all students in a group to have their own computing device equipped with wireless communication capability to conduct learning tasks (Chan et al., 2006; Liang et al., 2005; Soloway et al., 2001). This study compared student learning achievement in Phys221 course, which is given to second year physics student at PNU, mobile learning (ML) based class versus a traditional (TT) class. The study was conducted over a two-year period (2009- 2010).

Phys 221 is a basics of electromagnetism course which provide an understanding of the basic principles and applications of electromagnetic fields for physics students. Allen and Tanner (2005) have assembled a set of seven strategies ranging from simple, easily implemented approaches to complex restructurings of the entire course based on student-centered learning (SCL) .Table.1 illustrate strategies and learning activities used in this work.

Students' academic achievement was measured by looking for any significance difference in the mean scores between the pre- and post-intervention tests and student portfolios for the ML class and at any significance difference in mean scores for the post-intervention tests and student portfolios between the ML and the TT classes.

Results and Discussions

There are several impediments to the successful use of information and communication technology (ICT) in education at PNU. Various obstacles are found in implementing e-learning involving electric power infrastructure and limited access to the Internet.

Strategy	Activities , Learner Outcomes and Assessment	**Student's mean score**			
		ML		**TT**	
		Pre%	**Post%**	**Pre %**	**Post%**
Bookend Lectures	**Faculty members insert short interactive sessions (think-pair-share, student writing) after every 10-20 minute lecture session (Bonwell & Eison, 1991; Ruhl et al., 1987). They begin with an advance organizer and finish with a classroom assessment technique, such as a minute paper, they create a bookend lecture (Smith, Sheppard, Johnson, & Johnson, 2005). (Pre/Post concept tests)**	**45**	**65**	**47**	**53**
Immediate Feedback via Classroom Technology	**Various technologies from scratchable scantran sheets (Allen & Tanner, 2005) to personal response systems (Fies & Marshall, 2006) were used to provide students immediate feedback through questions on their preparation for class or concepts that arise during class.(In- class observations via field notes; practical testing; student portfolios)**	**58**	**77**	**60**	**63**
Student Presentations and Projects:	**Faculty members assigned projects and reports to actively engage students in explorations of the course material.(project assessment worksheet)**	**40**	**80**	**45**	**55**
Learning Cycle Instructional Models	**Faculty members used different learning cycles to construct classes that move students through a sequence of questions about the material in a class (Why, What, How, and What if) (Harb, Durrant, & Terry, 1991). See Ebert-May et al (1997) for a model that moves students through engagement, exploration, explanation, elaboration, and evaluation. (In-class observations via field notes; quizzes; student portfolios)**	**39**	**69**	**39**	**51**
Peer-Led Team Learning (PLTL):	**Students facilitated one or more cooperative learning groups in course to guide exploration of problem solving, inquiry, or discovery. (Student portfolios; interviews; tests)**	**40**	**75**	**46**	**66**
Incorporating Inquiry into Courses	**(In-class observations via field notes; practical testing; student portfolios)**	**52**	**87**	**46**	**66**
Problem-Based Learning and Case Studies	Problem-based learning (PBL) is focused experiential learning organized around the investigation and resolution of messy, real-world problems. With case-based teaching, students develop skills in analytical thinking and reflective judgment by reading and discussing complex, real-life scenarios (Midterm and final exams.)	**56**	**78**	**55**	**60**

The field of e-learning is rapidly growing both in acceptance and variety. Within this variety, the technological evolution of wireless/handheld (W/H) computing devices is opening new possibilities in the so called mobile learning (m-learning). M-learning opens new learning opportunities, both in the physical and virtual 'classroom' spaces. It affords various opportunities for teaching and learning,

This work explores both the potential advantages obtained through the m-learning education and the technological challenges faced in the process. In order to illustrate the challenges, we focus our work in three main areas, The first has to do with electric power supply, the second considers those who cannot access their material online (pupils who cannot access the internet) while the third is to do with the way that m-learning affect student academic achievements.

Photovoltaic (PV) solar energy system which is used as an alternative energy source, was used as an energy supply Fig.4 shows a diagram of a typical stand-alone PV system used in this work.

E-learning revolutionized the learning experience by making vital learning material available on-demand via the web and a classroom’s intranet as shown in Fig.5 (a) and (b). Now the same content can be offered using familiar wireless tools, making the learning experience even more convenient and flexible. Unlike so many technologies that are foreign to an IT novice, or require a person to learn new skills to operate, m-learning uses tools that most faculties and students already have in their pocket—mobile phones, PDAs, and Smartphone handhelds. M-learning is a solution that opens new possibilities to already existing technologies. M-learning allows student to benefit from accessing existing online resources including course material they may otherwise ignore. Fig.5 shows online and offline Moodle homepages.

Moodle was used as an LMS for Phys 221 course materials. The results of mean score of academic achievements of mobile learning group (ML) and traditional group (TT) are given in table.1.Table (1) presents a brief summary of the results of this study. First column gives teaching and learning strategies used in this work.

Second column gives activities , learner outcomes and assessment, while third column gives the average mean score of the ML group and TT group (of both pre and post) .

The results show that there were significant differences between ML group and TT group. It is clear that mobile learning can make a positive and significant difference in the outcome performance as measured by average mean score and activity assessments for students using PDAs (ML). The handheld PDAs were used successfully by instructors for personal support with timetabling, records of meetings, observations, students' attendance and grades, images, and just-in-time information from the Internet, thus fulfilling the enabling person-plus vision for information and communications technology (ICT) . Moreover, PDAs were used by students and instructors to find support through;

• Internet access
• taking photos
• class administration
• diary scheduling in particular

Instructor can asks a question about subjects that have yet to be assigned or discussed in class. Students can use the devices at their disposal to access information themselves in a matter of seconds-all without leaving their desk. And, as was the case in this current study, practice material for an exam can be made available so students can truly study, review and prepare for tests using a wide array of delivery options that will allow them to do this virtually anywhere at any time.

Conclusions:

The goal of the present study is to bridge e-gaps, the energy gap and e-learning gap, at PNU old campus. Stand-alone Photovoltaic (PV) system was used as an alternative energy source, while m-learning was used as another online learning option to overcome the perceived inadequacies of the existing infrastructure of conventional e-learning.

We can conclude that m-learning system has good efficiency in learning and improves students' academic achievement using the new technology based on PDA tools.

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ÇEVRİMİÇİ ÖĞRENME TOPLULUKLARI VE ARAŞTIRMA TOPLULUĞU MODELİ

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Özet

İnternet teknolojisinin gelişimiyle beraber oluşturulan etkileşimli ortamların eğitim ortamlarıyla bütünleştirilmesi "Çevrimiçi Öğrenme Toplulukları"nı ortaya çıkarmıştır (Öztürk, 2009). Çevrimiçi öğrenme toplulukları, zaman ve mekândan bağımsız olarak öğrenci-öğrenci, öğrenci-öğretmen ve öğrenci-içerik etkileşiminin olduğu, öğrencilerin farklı bakış açılarını görmelerine, kendi düşüncelerini sınayabilmelerine, sorularının cevaplarını arayabilmelerine olanak tanıyan topluluklardır (Aydın, 2002). Araştırma Topluğu modeli ise yükseköğretimi destekleme amacıyla geliştirilmiş özel bir çevrimiçi öğrenme topluluğudur. Bu çalışmada çevrimiçi öğrenme toplulukları ve araştırma topluluğu modeli üzerine bir araştırma yapılmıştır.

Anahtar Kelimeler: Çevrimiçi Öğrenme Topluluğu, Araştırma Topluluğu Modeli, Toplumsal Buradalık, Bilişsel Buradalık, Öğretimsel Buradalık

Abstract

Integration of interactive environments with training environments, created with the development of internet technology, induced “Online Learning Communities”.(Öztürk, 2009). Online Learning Communities are the communities where there is interaction as the student-student, student-teacher and student-content, regardless of time and place, and allows the students to see different perspectives, test their own thoughts and to find answers to their questions (Aydın, 2002). On the other hand, Model of community of inquiry is a special online learning community developed to support higher education. I this study, a research has been done on Online Learning Communities and Model of community of inquiry.

Key Words: Online Learning Communities, community of inquiry, social presence, cognitive presence and teaching presence

Giriş

Öğrenmeyi toplumsal bir etkinlik biçiminde tanımlama eğilimi özellikle toplumsal öğrenme yaklaşımlarının da desteği ile öğrenme toplulukları anlayışının ve uygulamasının gelişmesine yol açmıştır. Öğrenme topluluğu, tüm üyelerinin incelenen olguyu ya da nesneyi anlamak için bütünleşik bir çaba gösterdiği bir topluluktur. Öte yandan, yeni iletişim teknolojileri özellikle Internet insanların bir araya gelmelerine olanak sağlayarak farklı gereksinimlerini gidermelerine yardımcı olmuştur. Öğrenme toplulukları da bu iletişim olanağından yararlanarak çevrimiçi öğrenme toplulukları ya da sanal öğrenme toplulukları adını almışlardır (Palloff ve Pratt, 1999).

Çevrimiçi öğrenme topluluğu, üyelerinin öğrenme gereksinimlerini karşılamak amacı ile internet üzerinde oluşturulan ileriye dönük ve işbirliğine dayalı ortak bir alandır (Barab ve Duffy, 2000). Diğer bir tanıma göre ise çevrimiçi öğrenme topluluğu, sorunları etkili bir biçimde tanımlamak, sorunun çözümüne karar vermek ve çözümü gerçekleştirmek için grup etkileşimi yoluyla etkinlikte bulunan bireylerin, içinde öğrendiği toplumsal bir alan olarak tanımlamaktadırlar (Tu ve Corry, 2002). Araştırma topluluğu modeli ise bilişsel, toplumsal ve öğretimsel buradalık öğeleri ile işbirliğine dayalı ve yapılandırmacı derin anlamların oluşturulabilmesi için çevrimiçi öğrenme ortamlarına rehberlik eden etkili bir modeldir (Zydney, Noyelles ve Seo, 2012).

Çevrimiçi Öğrenme Topluluğu

Çevrimiçi öğrenme toplulukları, zaman ve mekândan bağımsız olarak öğrenci-öğrenci, öğrenci-öğretmen ve öğrenci-içerik etkileşiminin olduğu, öğrencilerin farklı bakış açılarını görmelerine, kendi düşüncelerini sınayabilmelerine, sorularının cevaplarını arayabilmelerine olanak tanıyan topluluklardır (Aydın, 2002).

Çevrimiçi öğrenme ortamlarında, eğitim ve öğretim bilgi ve iletişim teknolojilerinin internete dayalı kullanımı ile gerçekleşmektedir (Pearson ve Trinidad, 2005). Yeni iletişim teknolojileri -özellikle İnternet- öğrenme topluluklarının çevrimiçi ortama taşınmasını sağlayarak öğrenciler arasındaki zaman ve mekan sınırlılıklarını kaldırıp sanal sınıflar oluşturarak öğrencilere tartışma ve görüş alışverişi için daha esnek ve uygun bir ortam sunmaktadır (Garrison ve diğerleri, 2000; Rovai ve Barnum, 2003; Hew ve diğerleri, 2009). Bu nedenle çevrimiçi ve yüz yüze etkinliklerin harmanlandığı derslerin çoğunda öğrencilerin, çevrimiçi tartışmalar yoluyla deneyimlerini paylaşmaları, anlamları görüşüp tartışmaları ve bir konudaki ana düşünceyi karşılıklı olarak geliştirmeleri beklenmektedir (Bober ve Dennen, 2001; Garrison ve diğerleri, 2001). Bu topluluklar, problemleri tanımlamak, problemin çözümüne karar vermek ve çözümü gerçekleştirmek için grupla etkileşimde bulunan bireylerin içinde öğrendiği toplumsal bir alandır (Tu ve Corry, 2002).

Çevrimiçi iletişim ve etkileşim, metin tabanlı ve toplumsal bağlam işaretlerinden yoksun olması ile geleneksel olanlarından ayrılmaktadır. Bu nedenle Bilgisayar Aracılı İletişim aracılığı ile oluşturulan çevrimiçi öğrenme toplulukları farklı iletişim türlerini gerektirmektedir. Bunlar, etkileşim, toplumsal bağlam ve çevrimiçi teknolojiler olarak üç önemli başlık altında toplanmakta ve bu üç yapı birbirleri ile harmanlanıp örtüşmekte, biri diğer ikisi olmadan uygulanamamaktadır (Tu ve Corry, 2002). Dahası bu üç yapının ve işbirliğine dayalı çevrimiçi öğrenmenin işlevsel olarak yürütülebilmesinde anahtar unsur olan topluluk hissi önemli gerekliliklerindendir (Rovai, 2003; Tu ve Corry, 2003). 1987-1988 yıllarında San Francisco'da oluşturulan ilk çevrimiçi topluluk olan WELL sistemi ile kullanıcıları üzerinde bir çalışma yaban Rheingold, çevrimiçi öğrenme topluluğunun oluşmasının ve sürekliliğini devam ettirmesinin teknolojik alt yapının yanı sıra katılımcılar ve sosyal etkileşim desteği öğelerine bağlı olduğu ortaya çıkmıştır (Bardakçı, 2010).

Çevrimiçi eğitimde gerçekleşen öğrenmelerin nitelikli olması oldukça önemlidir. Bu nedenle öğrenme süreçleri tasarlanırken bu sürece etki eden birçok unsur birlikte düşünülmelidir (Tuncer ve Taşpınar, 2008). Alan uzmanları başarılı bir çevrimiçi öğrenme topluluğu oluşturmada ve devamlılığını sağlamada dikkat edilmesi gereken ilkeleri ortaya koymuşladır. Bu ilkeler aşağıdaki gibi sıralanabilir (Aydın, 2002):

- Sık iletişim kurmak
- Açık etkileşime geçmek
- Sınıf dışı etkileşim için alan yaratmak
- Etkileşimi kolaylaştıracak araçlar kullanmak
- Etkileşimi yandan yönlendirmek
- Yapıcı öğrenme yaklaşımları izlemek
- Destek sistemlerini düşünmek

Tüm bu ilkelerle yaratılmaya çalışılan, öğrenenlere anlamlı gelecek, kendilerini rahat ve önemli hissedecekleri etkileşim olanaklarıdır. Bu tür olanakların yaratılması akademik ve toplumsal becerilerin gelişmesinde önemli rol oynamaktadır (Aydın, 2002)

Araştırma Topluluğu Modeli

Toplumsal işbirliği ve deneyimlerin kişisel olarak yeniden yapılandırılması ve bütünleştirilmesinin amaçlandığı "Araştırma Topluluğu Modeli" çevrimiçi öğrenme topluluklarının özel bir türüdür. Araştırma topluluğu modeli yükseköğretimi desteklemek amacıyla Garrison, Anderson ve Archer (2000) tarafından yapılandırmacı öğrenme kuramının ilkelerine göre geliştirilmiştir. Modele göre bir topluluk, bilişsel bağımsızlaşmayı ve toplumsal olarak karşılıklı dayanışmayı güçlendirirse, bir araştırma topluluğu olabilir. Model, çevrimiçi derslerin etkin birer öğrenme çevresi olabilmesinin, topluluklardaki öğretmen ve öğrenciler arasındaki düşünce, görüş ve bilgilerin paylaşımına bağlı olduğunu ileri sürmektedir (Garrison ve diğerleri, 2000; Romiszowski ve Mason, 2004).

Yükseköğretimi desteklemek amacıyla geliştirilen "Araştırma Topluluğu Modeli"ne göre çevrimiçi bir topluluk, bilişsel bağımsızlaşmayı ve toplumsal olarak karşılıklı dayanışmayı güçlendirirse, bir 'araştırma topluluğu' olabilmektedir (Romiszowski ve Mason, 2004). Çevrimiçi eğitimciler, bireyselliği ve toplumsallığı buluşturmak amacıyla bilişsel buradalık, toplumsal buradalık ve öğretimsel buradalık boyutlarıyla tümleşik bir öğrenme topluluğu yaratma sorumluluğunu taşımaktadırlar(Garrison ve diğerleri, 2001).

Şekil 1. Araştırma Topluluğu Modeli İletişim Ortamı (Garrison, Anderson ve Archer, 2000)

Şekil 1'de görüldüğü gibi araştırma topluluğu modeli toplumsal buradalık, bilişsel buradalık ve öğretimsel buradalık adlı üç öğeden oluşmaktadır.
Toplumsal buradalık**,** bir öğrenme topluluğundaki katılımcıların çevrimiçi tartışma ortamına kendi kişisel özelliklerini yansıtılabilme ve diğerleriyle iletişim kurabilme yeteneğini ifade etmektedir. Aynı zamanda kişisel ve duygusal bağlantı noktası olan toplumsal buradalık, her bir çevrimiçi öğrenme topluluğunun da temelidir. Araştırma topluluğu modelinde, duygusal, etkileşimli ve bağlılık oluşturan durumları içeren bu yapı, öğrencilerin kendi kişisel özelliklerini grup üyelerine ve sınıf arkadaşlarına yansıtabilme yeteneği olarak tanımlanmaktadır (Rourke, Anderson, Garrison ve Archer, 2001). Son yıllarda ise toplumsal buradalık, sosyo-duygusal merkezli bir bakış açısıyla ele alınarak bir araştırma topluluğundaki katılımcının toplulukla birlikte kendini tanıtabilme, güvenilir bir çevrede amaçlı olarak iletişim kurabilme ve kendi kişisel özelliklerini yansıtarak kişiler arası ilişkiler geliştirebilme yeteneği biçiminde tanımlanmaktadır (Arbaugh ve diğerleri, 2008).

Araştırmalar, güçlü bir toplumsallık (toplumsal buradalık) duygusunun, öğrencilerin çevrimiçi programlara devamlılıklarını sağlamakla kalmayıp aynı zamanda bilginin yayılımı, öğrenme desteği, grup bağlılığı ve işbirliği sağlayarak öğrenme memnuniyetini arttırdığını da göstermektedir (Dede, 1996, Akt. Ubon ve Kimble, 2005). Buna karşın toplumsallık duygusundan yoksun öğrencilerin, kendilerini gergin hissedip sürekli savunmada kalarak öğrenme risklerini göze almakta gönülsüz davrandıklarını da ortaya koymaktadır (Wegerif, 1998, Akt. Ubon ve Kimble, 2005).

Bilişsel buradalık, araştırma ve öğrenme topluluğundaki öğrencilerin ortaklaşa araştırma yoluyla bilgiyi yapılandırma sürecidir. Bilişsel buradalık, bir öğrenme topluluğunun zihinsel havasını yansıtır. Bu boyut, tartışma ve eleştirel yansıtmaların kolaylaştırılması ile ilgilidir. Araştırma topluluğu modeline göre başarılı bir yükseköğretimin merkezinde bilişsel buradalık yer alır. Bilişsel buradalık öğrenenlerin eleştirel araştırma topluluğundaki tartışmalarla desteklenen anlamı, güçlendirme ve yapılandırma yeterliğinin ölçüsüdür. Bu kavram, araştırma topluluğundaki her bir katılımcının, topluluktaki iletişim sayesinde anlamları yapılandırabilme yeteneğini vurgular (Garrison ve diğerleri, 2000).

Bu modelin üçüncü öğesi olan öğretimsel buradalık ise yapılandırmacı, işbirliğine dayalı ve destek sağlayıcı bir niteliği olan öğretim yöntemlerinin rehberliği ve bu yöntemlerin etkililiğinin bütünleştirmesi anlamına gelen bir diğer boyuttur. Öğretimsel buradalık, eğitimsel bir topluluğu yaratıp topluluğun sürekliliğini sağlar. Ancak unutulmaması gereken en temel ilke, çevrimiçi öğrenme topluluklarındaki etkili öğrenmenin, bu üç temel öğe arasındaki uygun bütünleşme ve dengeye bağlı olduğudur (Garrison ve diğerleri, 2000; Garrison, 2006).

İşbirliğine dayalı araştırma topluluğunun "öğretimsel buradalık" boyutu tasarlanırken ve araştırma topluluğundaki iletişim ortamı oluşturulurken bilişsel ve toplumsal buradalık ögeleri, öğretimsel buradalığın alt boyutları olan tasarım, destekleme ve yönetim ögesiyle Tablo 1'de belirtildiği gibi ilişkilendirilmelidir. (Garrison, 2006)

Tablo 1. Çevrimiçi Araştırma Topluluğu Oluşturmadaki İlkeler ve Yönergeler (Garrison,2006)

	Tasarım	**Kolaylaştırma**	**Yönetim**
Toplumsal buradalıkla ilgili ilke	Bir araştırma topluluğu kurabilecek bir atmosfer yaratınız.	Grup bağlılığı söylemi aracılığı ile gruba destek sağlayınız.	Öğrencilerin kendi öğrenmelerinin sorumluluğunu almış oldukları varsayımından hareketle ortaklaşa ilişkileri geliştiriniz ve evrimleştiriniz.
Bilişsel buradalıkla ilgili ilke	Sistematik araştırmayı destekleyecek eleştirel tartışmalar düzenleyiniz.	Çözüm için grubun ilerlemesini destekleyiniz ve grubu cesaretlendiriniz.	Üst bilişsel düşünme becerilerinin gelişmesini ve var olan çözümü güvence altına alınız.

Öğretimsel buradalığın etkili bir biçimde bilişsel ve toplumsal buradalığı desteklemesi ve çevrimiçi tartışmaların kolaylaştırılması için araştırma ve kuramsal alanyazının bir sentezini yapmayı amaçlamayan araştırmacılar bazı tasarım ilkeleri önermektedirler (Garrison ve diğerleri, 2003).

Bu araştırmalara göre bir çevrimiçi dersin başında öğrencilerin, güdülenmesi ve üretken tartışmaların gerçekleştirilmesi için öğrencilerden neyin beklendiğinin açıkça belirtildiği ve tartışma ölçütlerinin yer aldığı değerlendirme cetvellerinin (rubric) hazırlanması, önemli bir tasarım unsurudur. Ayrıca ders öğretmeninin, tartışmaların etkin yürütülmesinde önemli bir yeri olan toplumsal buradalığı sağlamak için öğrenci- öğrenci etkileşimini ön planda tutarak tartışmaların odağı olmaktan kaçınması gerektiği önerilmektedir (Öztürk, 2012).

Sonuç

Gelişen iletişim teknolojileriyle birlikle çevrimiçi öğrenme önemli bir öğe haline gelmiştir. Öğrenme toplulukları çevrimiçi öğrenme toplulukları haline dönüşmüştür. Çevrimiçi öğrenme toplulukları ise üyelerinin öğrenme gereksinimlerini karşılamak amacı ile internet üzerinde oluşturulan ileriye dönük ve işbirliğine dayalı ortak bir alandır (Barab ve Duffy, 2000). Araştırma topluluğu modeli ise yüksek öğretimi desteklemek amacıyla geliştirilmiş bir çevrimiçi öğrenme topluluğudur. Araştırma topluluğu modeli üç öğeden oluşmaktadır. Bu öğeler; öğretimsel buradalık, toplumsal buradalık ve bilişsel buradalıktır. Çevrimiçi öğrenme topluluklarında ve araştırma topluluğu modelinde etkili bir öğrenmenin gerçekleşmesi bu üç öğenin bütünleşmesine ve dengesine bağlıdır.

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COMPARISON OF THE PROGRAMMING KNOWLEDGE OF SLOVAKIAN AND HUNGARIAN STUDENTS

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Abstract

An analysis of programming knowledge of Hungarian and Slovakian students was made using a web based Informatics Test. After the evaluation of the test results were found some significant differences in programming knowledge of the students from different countries, but does not depend on the different way of teaching. In the following statistical analysis Levene's test, T-test and Z-test was used. The monitoring was held on the p=5% significancy level throughout the analysis. Underlying causes are discussed. Survey results are traced back to differences in the educational systems of the two countries.

Keywords: comparative analysis, measuring, comparison, programming knowledge, Hungary, Slovakia

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Introduction

The aim of this research is to analyze the efficiency of different teaching methods in Computer Science education in Slovakia and Hungary. Some research was done comparing the Schoolsystems (Döbert et al, 2002) and the role of Information and Communication Technology in the education of some European countries (Hüsing and Korte, 2006; Dagienè and Mittermeier, 2006; SFIB, 2004). The goal of this research is an analysis of the programming knowledge of students from different countries.

The National Basic Curriculum of Hungary describes the learning material grade by grade, subject by subject to teachers.

The National Educational Program of Slovakia does not assign precisely what teachers have to teach in the various grades but announces the standards to be reached at the end of the senior section; the aim is to reach preset school leaving standards.

The Education System (Eurydice, 2009/2010). and the Information Technology education in Slovakia bears a close resemblance to that of in Hungary from the point of view how various topics are discussed. Theoretical knowledge, word processing, spreadsheet calculation, database management and programming are parts of the curriculum in both countries.

The topics are the same, but the way they are taught is different. This research is analysing whether differences in the programming knowledge of students depends on the methods they are taught with or not.

In order to compare students' programming knowledge in different countries, a detailed analysis was needed: checking the various curricula of different grades, the number of weekly Informatics classes and whether Information Technology was compulsory or only optional subject. Still, this was not enough to carry out the examination.

It was also needed to check the students' knowledge in various grades in both countries. To make comparisons a uniform questionnaire was built with questions on different subject matters of Information Technology. Only after sending the questionnaire to the students of both countries could the survey be carried out on the basis of their answers.

In Table 1. the number of weekly Informatics classes are shown in different grades of the respective countries. Note that Informatics is a selectable course only in the last two years of secondary school in Hungary.

Table 1. Number of Information Technology lessons in the different classes

Country	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Hungary	0,5	0,5	0,5	0,5	2	2	2	2	2	2	3*	3*
Slovakia	0	1	1	1	0,5	0,5	0,5	0,5	0,5	0,5*	0,5*	0,5*

* selectable

Before making any comparison the first starting hypothesis was that Hungarian students choosing Information Technology as an optional subject have better programming skills than their Slovakian peers, because the accent is on programming in this level in Hungary.

Information Technology Teaching in Hungary

IT education is based on a national curriculum in Hungary (Ministry, E. H, 2003). According to the National Basic Curriculum (NBC) of Hungary the use of IT is to be demonstrated in the first four school grades since 2003 (e.g. search on the Internet, painting with computers etc.) and is taught in 1 class weekly. According to the Information Technology curriculum the following subjects are taught from the 5^{th} grade to the 12^{th} grade at the schools of Hungary in 2 classes weekly:

Word processing
Spreadsheet calculation
Presentation
Algorithm and programming
Database management

Generally the Microsoft Office packet is taught and it can be seen that teaching Word processing takes 4 years in Hungary (Table 2.). Basic algorithms or rather programming appears in Information Technology sooner, but recursion, list and tree data structures are only selectable part of the curriculum. Database management begins in the 9th grade. In grades 11-12 CS is just selectable. At basic level it is taught 2 hours weekly, on a higher level 3 hours weekly and a final exam can be taken.

Table 2. The subjects of IT by grades in Hungary

Subject	Grade							
	5	6	7	8	9	10	11	12
Word processing		✔	✔	✔	✔			
Spreadsheet calculation				✔	✔			
Presentation						✔		
Algorithm and programming			✔	✔	✔			
Database management					✔			

Teaching Information Technology in Slovakia

The subject Informatics has been compulsory from the 2nd grade since the school year of 2008/2009, (the introduction of the school reform) but it also appears in the 1st grade as well as in the nursery school curriculum though not as a compulsory subject. One Informatics class weekly is compulsory in the junior section and 1/2 class weekly in the senior section which can be raised by the schools' own program. Some schools took the opportunity and increased it to 1 class weekly. The National Educational Program does not assign precisely what teachers have to teach in the various grades but announces the standards to be reached at the end of the senior section. So it does not matter if programming is taught in the 6th grade in one school while in the 8th grade in another; the aim is to reach the school leaving standards. It is part of the own educational program of each school how students should reach these standards, how many classes they should have weekly and at what pace they learn the material; this program is accepted by the management and the teachers of the school together.

The National Educational Program divides Informatics into 5 topics (not specifying the number of classes):
Information around us
Communication by the means of the ICT
Problem solving, thinking with the help of algorithms
Basic principles of the operation of ICT tools
IS society

These 5 topics are then to be fitted into the school leaving standards.

Research methods

It is possible to compare the Hungarian and Romanian Information Technology education examining the students' knowledge. Since it is quite difficult to send out questionnaires physically to the various schools and the order of the questions can not be changed in that case, and also because students sitting close to each other in the classroom can see the other's answers, so the most effective solution seemed to be a web-based Informatics test.

Some research was done making test to standardize the IT education in Switzerland (Bucher and Wirthensohn, 2004) and Austria (Micheuz, 2005).

Questions of various difficulty were formed in the main topics of Information Technology in this research. The topics chosen were part of Informatics education in almost every country: theoretical knowledge, word processing, spreadsheet calculation, database management and programming. There can be significant deviations in the curricula of some countries; therefore the test was expanded with questions on cryptographical knowledge as well as formal languages and automats since in certain German provinces these are also part of the Information Technology curriculum (Kiss, 2008).

The database structure for the test had to be planned in a suitable way so that the data could be obtained and used later on. The personal data of the students filling in the test were put in a separate table as well as their answers to the questions.

When filling in the test the students first had to give their actual grade and some other data (Fig 1.). If students gave the username of their teacher then the teacher also could see how they succeeded and would get a feedback on their progress. *Grade* was important because he/she would get a question sheet depending on the grade given. Students could mark topics not taught to them (except basic information technology and office packages). If they marked one, the system would not ask questions dealing with the topic but saved it with the answer „I have never learned that". With this option students got fewer questions and answers would flow in at a quicker pace. Next, students could begin to fill in the test.

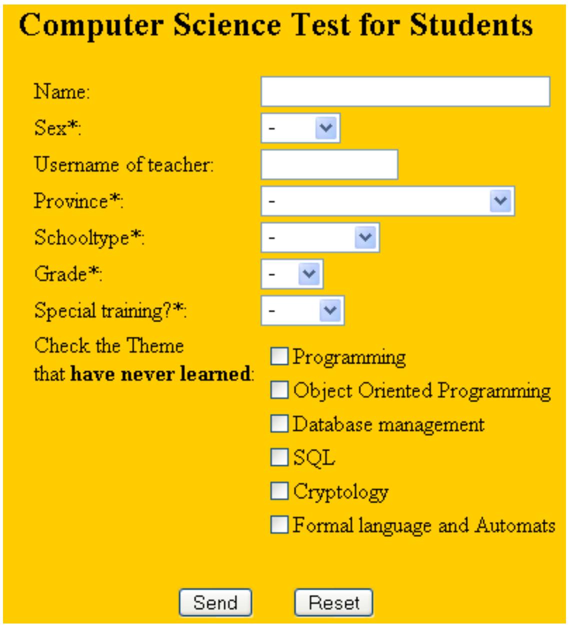

Fig 1. Student's registration entries

Every test question has 6 possible answers, only one of which is correct, 3 of them bad, and the 5th choice is: „I have never learned that", the 6th: „I have forgotten it". The answers „I have never learned that" and „I have forgotten it" show which part of the curriculum the students have not learned in that grade and if they could remember it or not.

Every question has two time limits given in seconds. The first is the minimum time to read, understand and answer the question, the second is the maximum answering time. The software saves the total time used by the student. These time limits are not seen or known by the students. These are used during the evaluation so a correct answer is accepted only if it arrives in the available time interval.

Finishing with the last question of the test a student can see his/her own results, i.e. how many correct and incorrect answers he/she gave and how many were marked as „I have never learned that", or „I have forgotten it".

Teachers can register on this site too if they are willing to give some of their data. The system is protected by registration code, and registered teachers can log in with their username and password. If a student filling in the test gives the username of the teacher too, than the teacher can later see his/her answers and the results. Some reports can be generated helping the work of teachers. It is recorded whether the students have given them the right to inspect. It is also indicated if they have marked a question as not learned or if the topic of the question is familiar to them but they have forgotten the right answer.

The evaluation of the answers is only possible after processing the saved data. The first step is to check whether the students of the given country have learned the given topic. If they have not, the comparison with the data of the students of other countries is impossible to make.

If the students knew the topic because they had learned it, the program checked if the time spent answering the questions was within the limits given. If so, the answer could be accepted as right.

The mean and the standard deviation of the right answers had to be calculated by the different school types and various grades in Hungary and other participating countries while making comparisons with the help of statistical means. In order to be able to do this, enough students filling in the test were needed in each grade. When comparing the IT skills of students in two countries, the Independent Samples T-test of SPSS was taken with p=5% significancy level.

Number of participants

The web-test on Informatics was filled in by altogether 729 students from 22 Slovak cities. Examining the number of filled in tests it looked possible to compare the computer literacy of the Hungarian students specialized in Informatics and Slovakian students in the 11th grade (Table 3.).

Table 3. Number of participants

Grade	Hungarian	Slovakian
	Informatics course	Basic education
5.	0	126
6.	0	114
7.	0	108
8.	0	50
9.	0	111
10.	0	97
11.	69	102
12.	91	21

Comparing the knowledge of Informatics of regular Slovakian students with those of Hungarians specialized in Informatics Result by subject

The following table shows the results of the proper answers of the Slovakian students and Hungarian students having chosen Informatics as an optional subject in the 11th grade on the basis of topics (Table 4.).

Table 4. The mean and the standard deviation of the right answers of the Hungarian students having chosen Informatics as an optional subject and Slovakians in the 11th grade

Subject	Nationality of students	Mean (%)	Std. Deviation (%)
Theoretical knowledge	Hungarian	29,21%	16,54%
	Slovakian	24,41%	10,17%
Word processing	Hungarian	39,13%	23,57%
	Slovakian	24,49%	15,36%
Spreadsheet calculation	Hungarian	16,63%	9,89%
	Slovakian	21,95%	12,21%
Database management	Hungarian	17,15%	12,72%
	Slovakian	6,35%	12,94%
SQL	Hungarian	5,62%	11,07%
	Slovakian	0,00%	0,00%
Programming	Hungarian	27,26%	17,96%
	Slovakian	18,02%	14,92%

Looking at table 4. you see that Hungarian students specialized in Informatics have better skills in database management and programming taught in the 11th grade than Slovakian students, while Slovakian students achieve better results in spreadsheet calculation. But the results given in percentage are not enough; to examine the difference in skills of students from different countries a deeper analysis is needed.

The next step in the analysis was to inspect whether the means by subject would differ if using the Independent samples test. The null hypothesis was that no significant difference would exist between the means of all subjects by countries. Because of having two independent samples it was possible to use the T-test to decide whether the hypothesis was true or not (Table V.). If the analysis of the results (*Levene test*) showed the variance of the two groups different (*p<0,05*) (Levene, 1960), in this case the means could be compared with *Welch's t test* (*p<0,05*) (Welch, 1947), else the means could be compared with *T-test* (*p<0,05*) (Nahalka, 1993).

Analysis of the mean by subjects

The following table shows the results of the Independent Samples T-test of the Slovakian students and Hungarian students specialized in Informatics in the 11th grade on the basis of topics (Table 5.)

Table 5. Independent sample test of the Slovakian students and Hungarian students specialized in Informatics in the 11th grade

Grade	Subject	Levene's test for Equality of variances		T-test for equality of means		means are different
		F	Sig.	t	Sig. (2-tailed	
11	Theoretical knowledge	3,61	0,06	1,57	0,12	no
11	Word processing	6,66	0,01	3,33	0,00	yes
11	Spreadsheet calculation	0,00	0,95	-2,12	0,04	yes
11	Database management	4,18	0,04	3,66	0,00	yes
11	SQL	12,50	0,00	1,71	0,02	yes
11	Programming	0,44	0,51	2,62	0,01	yes

This table shows that the statements made on the basis of the previous percentile values are confirmed; the differences are also verified by the statistical examination.

Hungarian students specialized in Informatics do better in the 11th grade in database management than the Slovakian students just like the students getting only basic education. This is not surprising since these students have gained very similar basic knowledge in the first half of secondary education.

The Slovakian students achieve better results in spreadsheet calculation as we have also seen in the case of students learning basic Informatics. SQL is still a neglected area; Hungarian students can hardly give any proper answers, but since Slovakian students do not learn it at all, the difference between the two countries can easily be detected.

It is in the field of programming that we can see the advantages of being on an Informatics course compared to getting a basic Informatics education. Here teachers obviously have the time to get the students know this area. That is why the Hungarian students have scored higher points than their Slovakian peers.

Comparing Programming Knowledge of regular Slovakian Students with that of Hungarian Students specialized in Informatics

Hungarian students do not learn programming in a basic Informatics course (Kiss, 2011a, Kiss, 2011b). This means only scores of those students can be analyzed who have chosen Informatics as an optional subject and learn Informatics in the last two years of secondary school (Kiss, 2010a).. Since Slovakian students in the 11th grade were the ones who filled in the test in adequate numbers, only this grade could be considered in the following analysis.

Differences by nationality in programming

It seems clear from this survey that the results of the independent sample test of regular Slovakian students as well as their Hungarian counterparts specialized in Informatics in the 11th grade show different means of programming marks (Table 5.). Hungarian students scored more correct answers (~27%) than their Slovakian peers (~18%) (Table 4.). A deeper analysis of the different programming topics was needed to make a decision about the second hypothesis as it was in the case when knowledge by genders was discussed in Hungarian grammar schools (Kiss, 2010b) and higher education (Kiss, 2010c).

The following table is a break-down by programming topics showing what percent of students in this grade answered correctly the questions put to them (Table 6.).

In order to know whether the means by Programming topic are equal, a Z-test (Korpás, 2002) was accomplished.

The null hypothesis of Z-test was that no significant difference existed between the means by nationality. The monitoring was held on the p=5% significancy level. The critical value of Z-test was between -1,96 and 1,96 at p=5% significancy level. If the calculated value of Z-test was in this range, the null hypothesis could be kept. The table shows the calculated values of the Z-test by nationality and the decision on keeping the null hypothesis or not.

Table 6. How many percent of students answered successfully the questions - grouping by nationality

	Hungarian		Slovakian			
Programming topic	**%**	**Std. dev.**	**%**	**Std. dev.**	**Value of Z-test**	**Decision**
Flowchart	35,2%	0,48	28,6%	0,46	-2,74	The means are not equal
Structogram	22,0%	0,42	11,4%	0,32	-1,42	The means are equal
FOR cycle	43,4%	0,50	27,1%	0,45	-2,67	The means are not equal
Repeat-Until cycle	19,2%	0,40	14,3%	0,35	-1,78	The means are equal
Do-While cycle	26,4%	0,44	12,9%	0,34	-1,49	The means are equal
Parameter passing	16,5%	0,37	15,7%	0,37	-1,97	The means are not equal
Sort algorithm	14,3%	0,37	24,3%	0,43	-2,80	The means are not equal
Array management	9,9%	0,30	17,1%	0,38	-2,25	The means are not equal
Subroutine	42,9%	0,50	23,8%	0,43	-2,24	The means are not equal
Stack management	12,1%	0,33	14,3%	0,36	-1,94	The means are equal
Binary three knowledge	6,0%	0,24	17,1%	0,44	-2,13	The means are not equal
List knowledge	19,2%	0,40	27,5%	0,41	-3,19	The means are not equal
Recursion	15,0%	0,48	8,6%	0,28	-1,09	The means are equal
Binary search algorithm	11,0%	0,31	20,0%	0,41	-2,52	The means are not equal
The Eight Queens Problem	25,0%	0,28	14,3%	0,36	-2,07	The means are not equal

According to the table it could be asserted at p=5% significancy level that Hungarian and Slovakian students were not on the same knowledge level regarding different programming topics in the 11^{th} grade (Table 6.).

Hungarian students answered the FOR cycle question more successfully, but no difference could be found in answers dealing with Repeat-Until and Do-While cycles. The questions of the Sort and the binary search algorithm proved easier to answer for Slovakian students in connection with array management. On the other hand, Hungarian students were more experienced in subroutine and backtracking algorithms.

More Slovakian students gave correct answers than Hungarians in the topics related to dynamic memory management (binary trees, lists). It looks like Hungarian and Slovakian students learn the programming part of Information Technology in a different way. Slovakian teachers spend more time to teach array management, sort, search algorithm and dynamic memory management. The emphasis is on subroutine and backtracking algorithms in Hungary. While Slovakian students aquire a well-founded basic knowledge, Hungarian counterparts rather learn high level programming topics (like backtracking algorithms). My opinion is that a deeper basic knowledge for Hungarian students should have a priority over high level programming topics (which can be taught later anyhow).

Conclusion

The starting hypothesis was that the Hungarian students specialized in Information Technology would reach higher scores in programming than Slovakian students. This assumption turned out to be correct in the 11^{th} grade. Students choosing this are getting to know the beauties of programming and produce higher scores than the Slovakians. Hungarian students were more experienced in subroutine and backtracking algorithms, but more Slovakian students gave correct answers in the topics related to dynamic memory management.

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COMPUTER SELF-EFFICACY, COMPETITIVE ANXIETY AND FLOW STATE: ESCAPING FROM FIRING ONLINE GAME

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Abstract

Flow state in game playing affected by computer self-efficacy and game competitive anxiety was studied. In order to examine the effect of those constructs with high competition, this study select "Escaping from firing online game" which require college students to escape from fire and rescue people and eliminate the fire damage along the way of running. 101 students participated the game and filled up the questionnaires, after they tried 20 minutes. Confirmatory research method was adapted to examine three hypotheses of this study and the results indicated computer self-efficacy and game competitive anxiety had a positively association with flow state, but computer self-efficacy had a negative association to game competitive anxiety.

Keywords: Computer self-efficacy; competitive anxiety; flow state

Introduction

The emergence and success of new technology sectors in both new and established educational settings is inextricably linked with individuals able to recognize new opportunities and lead their exploitation. New technology use is advanced by those with self-efficacy, with confidence in their abilities to perform the learning tasks. Computer self-efficacy (CSE) was derived from the social–psychological concept of self-efficacy which postulates that an individuals' perception of his/her abilities affects his/her actual performance (Bandura, 1994). As applied to the field of computer usage, CSE is believed to influence an individual affect, persistence, motivation (Deng, Doll, Truong, 2004), to use that device. CES has been found to influence an individual's willingness to learn and use a computer (Wilfong, 2006).

Parayitam et al. (2010) assumes that computer anxiety is a kind of emotional and cognitive reaction that occurs while the individual is working and interacting with computer and it happens as a consequence of the lack of awareness and the individual's attitude towards the computer as a threatening object. While some studies focus on computer attitudes and utilization (Al-Khaldi & Al-Jabri, 1998), others stressed on testing the effects of self-efficacy and competence on computer anxiety and computer use (Shih, 2006). However, increasing CSE can lower computer anxiety thus improving performance and willingness to learn (Konerding, 1998; Thatcher et al., 2007).

Csikszentmihalyi's (1975) *flow theory* described the experience of the intrinsically motivated; individuals who engage in an activity because they enjoy it, find it interesting or challenging, and perceive they have the necessary skills to accomplish it. Flow occurs when someone perceives the challenge of an activity to be balanced with his or her skills. Schweinle, Meyer, and Turner (2006) pointed out that flow affect is an important factor in students' perceived learning skills and that challenge can pose a threat to students' self-efficacy. As such, this study used "Fire Escape" game which is situational problem solving in firing and the play time for each run is limited to 3 minutes and 30 seconds that would cause supposedly different flow state and computer anxiety by individual players with different computer self-efficacy. Therefore, the purposes of this study are to examine the correlation between computer self-efficacy and flow state, and game competitive anxiety; and game competitive anxiety and flow state.

Research Contents and Hypotheses

According to self-efficacy theory, an individual's behavior is predicted by the beliefs they hold about their capabilities, rather than their actual capabilities. Bandura argues that individual's level of 'motivation, affective states, and actions are based more on what they believe than on what is objectively true' (Bandura, 1997, p. 2). Self-efficacy judgments with respect to some specific tasks such as anxiety may elicit some emotional reactions in terms of their ability to perform such tasks, which in turn, influence their emotional states.

Computer use and Computer self-efficacy should be directly related since we are more likely to attempt and persist in behaviors that we feel capable of performing. Confidence or autonomy competence in self-efficacy is considered as one important factor that enhances the flow of intrinsic motivation because learners are given a sense of control over choices they may take in learning (Ryan & Deci, 2000). Quinn (2005) argues that flow is the merging of action and awareness and the other dimensions form the antecedents and consequences of the engagement experience. In this sense, the computer self-efficacy might positively affect the flow experience, then, the research hypothesis is:

H1: *Computer self-efficacy will be positively related to flow state*

Psychologists have classified general anxiety into two areas. One domain is trait anxiety, and the other is state anxiety (Biggs & Moore, 1993). Trait anxiety can be described as "a general readiness to react with anxiety in many situations" (Biggs & Moore, 1993, p. 243). State anxiety refers to "anxiety actually experienced in a particular situation" (Biggs & Moore, 1993, p. 243). Competitive anxiety was viewed as negative and predicted to have debilitative consequences for performance (Jones, 1995). In game-playing, players have a tendency to perceive competitive situations as threatening will respond to these situations with competitive state anxiety (Scanlan, 1978).

H2: *Game competitive anxiety will be positively related to and affect the flow state*

Individuals experienced an increase in anxiety when attempting to perform behaviors they didn't feel confident performing (Stumpf, Brief, & Hartman, 1989). That is, as anxiety increased, efficacy beliefs decreased due to self-doubt and emotional arousal when performing the behavior (Oliver & Shapiro, 1993). In the sense, the present context this means that Computer self-efficacy should be positively related to the anxiety and the flow state

H3: *Computer self-efficacy will be positively related to game competitive anxiety*

Design of game

Hong et al., (2009) classified the educational games into five categories: drill & practice, simple combat, stable contest, evolutionary and contextual games. The study takes contextual game as the educational purpose to design "Fire Escape" for players to select the role to involve fire escape action. Through Flash technology, the game creates 2.5D scenes and simulates the objects of house, department store, commercial office building (see figure 2). With cognition of disaster prevention knowledge through learning by playing, players have to possess several important concepts at a site on fire, including turning off the gas, carrying wet towel, and have to rescue people along the way to get out from the building.

Fig. 2. Game design

Research Design

Confirmatory factor analysis is used for the present study to examine all constructs with reliability and validity, and pathway analysis.

3.1. Research instrument

3.1.1 Computer Self Efficacy

Various scales have been developed to measure this computer self-efficacy, the Cassidy and Eachus scale are expressing the belief that they feel competent and confident about using computer systems; they expect to encounter few difficulties and believe they will be successful in what they are trying to achieve (Cassidy & Eachus, 2002).This study utilized their version, with the following 7 items: I think computer is easy to learn, I think computer is easy to use, It is not difficult to operate a computer, It is easy to do things with computer, I am confident that I can learn computer skills, I can learn to use computer well without guidance, and I can solve computer problems with operating instructions.

3.1.2 Competitive anxiety

The competitive anxiety is measured through the continuum of “not worried” to “very worried”. This study referred Cox, Russell and Robb (1999) Anxiety Rating Scale (ARS) which is for assessing competitive state anxiety during and immediately prior to competition, and developed 4 items includes: Playing the game, I am worried that I can’t pass, Playing the game, I feel my heartbeat, Playing the game, I am worried that I will not get a high score, Having difficulties during the game, and I feel very nervous.

3.1.3 Flow Scale

The Work related Flow scale (WOLF), (Bakker, 2005) has been popularly used in quantitative measure. This study utilized his conceptualization of the flow experience with the three dimensions of absorption, work enjoyment and intrinsic work motivation, items included: I can handle game, I can concentrate on the game, I enjoy the game, I can’t feel happened around while playing the game, I like this game, I fell the time is too fast while playing the game, and after playing the games, I still want to continue

Data collection and analysis

The study took online game as the research situation. The sampling target used the only account and password to sign in the fire escape online game and playing it for 20 minutes. Then the player was asked to fill out the online questionnaire, which was edited through the free office suite, Google Docs. The group of players of the online game was mainly students. Therefore, the study carried out convenience sampling of the students of national and private colleges and universities, and invited them to do the online questionnaire survey. The questionnaire survey took place during the period from Nov. 28, 2011 to Jan. 1, 2012.

After collection of the returned questionnaires, the samples suspected of being filled out carelessly were deleted. With the remaining valid samples, descriptive statistics, reliability analysis and correlation analysis were carried out by SPSS.

Research results

The present study used SPSS and LISREL software to perform confirmatory research including reliability analysis, factor analysis, structural equation modelling (SEM), and other research tests on the data.

4.1. Analysis of samples

There were 111 online questionnaires collected, with 101 questionnaires being valid samples, achieving a validity rate of 90.99%. In the aspect of gender, the proportion of female participants (56.4%) is higher than the proportion of male participants (43.6%). In the aspect of distribution of faculties, most of the participants study at Faculty of Management (46.5%), and the next ones are Faculty of Humanities and Social Science (20.8%) and Faculty of Design (or Tourism Design) (15.8%). The total number of participants from these three faculties occupies almost 70% of all samples. In the aspect of college and university type, 42.6% of the participants study at public university of science and technology, and 57.4% of participants study at private university of science and technology.

4.2. Descriptive statistics and reliability analysis

According to the research situation of online game and operational definition of the idea, most suitable questions were designed for the questionnaire. Regarding content validity of the questionnaire, the study reviewed the quality of the questionnaire by means of item analysis. Item analysis mainly takes each item of scale or each question of the test questions as the target, and gradually analyzes its usability. Reliability and validity are the major features of a test. These two features have to be determined by the quality of questions, which can be enhanced through item analysis. The study carried out item analysis of the questionnaire by firstly calculating the total scores of the participants. After that, the participants were rearranged according to the descending order of their scores. 27% of the total participants counting down from the one with highest score and 27% of the total participants counting up from the one with lowest score were selected to be high score group and low score group respectively. T-test was taken for the results of these 54% of total participants. The questions with significance level reaching .001 were selected. As shown in Table 1, each of the questions reaching significance level is retained.

Table 1. Summary of item analysis

Construct	Question No.	t-test		To be deleted or retained
		t value	Significance (two-tailed)	
Computer self-efficacy (total 7 questions)	1	5.289	.000	Retained
	2	6.171	.000	Retained
	3	4.747	.000	Retained
	4	4.829	.000	Retained

	5	5.277	.000	Retained
	6	6.308	.000	Retained
	7	6.252	.000	Retained
Game competitive anxiety (total 4 questions)	1	4.605	.000	Retained
	2	5.851	.000	Retained
	3	5.936	.000	Retained
	4	5.011	.000	Retained
Flow experience (total 7 questions)	1	3.023	.000	Retained
	2	8.276	.000	Retained
	3	9.774	.000	Retained
	4	6.089	.000	Retained
	5	5.043	.000	Retained
	6	7.880	.000	Retained
	7	7.174	.000	Retained

From Table 2, a descriptive statistical analysis of the various research constructs is known. The one with the greatest standard deviation, being 0.921, is the subjective norm; and the one with the smallest standard deviation is 0.694, showing that the degree of variation among the various constructs is small. In the test of internal consistency analysis on reliability, a coefficient factor, Cornbach's α is taken to measure the consistency degree of the detailed items inside in order to ensure the correctness and preciseness of measurement procedure with computer self-efficacy (α= .905); game competitive anxiety (α=.857); flow state (α=.795); and total construct (α=.816). These results show that the questionnaire of the study has good reliability.

Table 2. Descriptive statistical analysis of the various constructs

Construct	Mean	Standard deviation	No. of questions	Cronbach's α
Total scale	3.35	.498	18	.816
Computer self-efficacy	3.58	.741	7	.905
Game competitive anxiety	3.08	.921	4	.857
Flow state	3.28	.694	7	.795

4.3. Correlation analysis

As known from Table 3, the degree of correlation between two constructs, game competitive anxiety and flow state, shows a positive correlation, with correlation coefficient being (r=.503, p<.05). Between computer self-efficacy and game competitive anxiety, the correlation is negative but not significant, being **(**r=-.176, p>.05). Between computer self-efficacy and flow state, the degree of correlation appears to be nil (r=.100, p>.05).

Table 3. Matrix of product-moment correlation coefficient

Construct	Computer self-efficacy	Game competitive anxiety	Flow state
Computer self-efficacy	1		
Game competitive anxiety	-.176	1	
Flow state	.100	.503**	1

4.4. Path analysis

As known from the research model chart shown in Figure 2, computer self-efficacy has direct positive relationship with flow state; game competitive anxiety has direct positive relationship with flow state; and computer self-efficacy has direct negative relationship with game competitive anxiety.

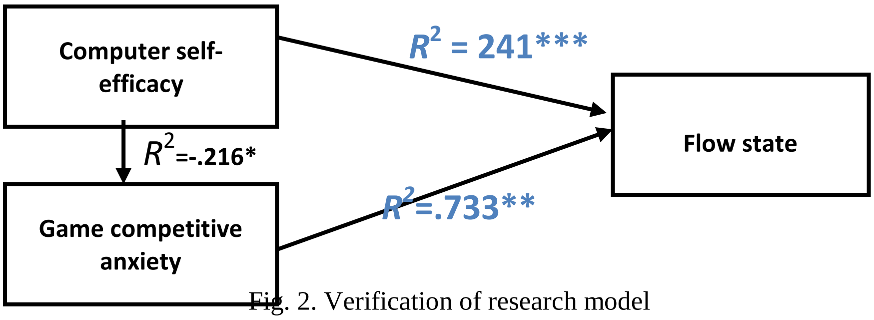

Fig. 2. Verification of research model

The study uses path analysis to explore the maximum likelihood path coefficients among different variables in the research structure, attempting to verify their cause-effect relationship and direction. The significance and overall situation of different path coefficients can be seen from the direct effect value.

As known from Table 3, the direct effect value of computer self-efficacy on game competitive anxiety is -216; the direct effect value of computer self-efficacy on customer satisfaction is .241; and the direct effect value of game competitive anxiety on flow state is .733. Viewing at the square (R^2) of multiple correlation coefficients, the explained variance of computer self-efficacy on game competitive anxiety is 4.7%; and the explained variance of computer self-efficacy and game competitive anxiety on flow state is 51.9%.

Table 3. Direct effect value

Construct	Computer self-efficacy	Game competitive anxiety
Game competitive anxiety	-216	.000
Flow state	.241	.733

5. Discussion

Using the factor constructs of computer self-efficacy, game competitive anxiety and flow state, the study explores whether different individuals of college students have different flow states during learning from game.Regarding research hypothesis1: Computer self-efficacy will be positively related to flow state, the findings of the study are: (1) The study's Hypothesis 1, supposing that computer self-efficacy has significant positive relationship with flow experience, has been supported. It implies that when college students have stronger feeling of computer self-efficacy, their flow experience will be raised. This conclusion is consistent with the viewpoint of the abovementioned scholars, proving the significance of computer self-efficacy to the entry to flow state. According to Ryan and Deci (2000) assertion, self-efficacy is a kind of intrinsic motivation while engaging in a game, one will have positive flow state The result is also supported by Zhao and her colleagues' (2011) study on the relation between the internet self-efficacy and flow experience, and found they have positively association.

Regarding research hypothesis 2: Game competitive anxiety will be positively related to flow state, the results of this study indicated that Game competitive anxiety has significant positive relationship with flow state. It implies that when game competitive anxiety is raised, flow state will rise accordingly. The result is consisted to Jones's (1995) suggestion which indicated that competitive anxiety was viewed as negative and predicted to have debilitative consequences for performance. Csikszentmihalyi (2002) assesses the influence of personality in situation characteristics, such competitive anxiety, and the interaction on flow, and find that situation characteristics would enhance individual flow state.

Regarding research hypothesis 3: Computer self-efficacy will be positively related to game competitive anxiety, the findings of this study suggests that computer self-efficacy has significant negative relationship with game competitive anxiety. It implies that when computer self-efficacy is higher, the game competitive anxiety produced will be lower. In the current study we focus on if computer self-efficacy affect to competitive anxiety. The result is supported by Caprara et al. (2008) which refers to an individual's self-efficacy to be regulated by stressful or anxiety.

6. Future Studies

There are three episodes to play, in order to understand the game behaviour, the future study may focus on if the cognitive style affect the interest of play. Another study may focus on playing more times to examine their anxiety and flow curve with inverted U hypotheses to realize the tendencies of game playing.。

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COMPUTER-BASED VS PAPER-BASED EXAMINATIONS: PERCEPTIONS OF UNIVERSITY TEACHERS

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Abstract

This research reported teachers' perceptions about computer-based (CB) vs. paper-based (PB) examinations. Teachers were divided into 7 major categories i.e., gender, departments, designations, qualifications, teaching experiences, computer training certifications and CB examination experiences, which were the key factors to be observed and analyzed to perceive teachers' attitude regarding CB or PB examinations. It was concluded from the results that overall sampled teachers' attitudes were positive towards CB examination systems but in some situations they preferred PB as well. Comparatively female, highly ranked, highly qualified, less experienced, teachers who have computer training certificate or degree, and teachers who have CB examination experiences were more positive towards CB examinations.

Keyword: CB Examinations; PB Examinations; mode of examinations; higher education

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Introduction

It is generally recognized that examinations determine the extent to which educational objectives have been achieved as well as the extent to which educational institutions have served the needs of community and society (Shah, 2002). Examinations are not limited to measure educational or societal objectives and needs but incorporate in a way of coping with the educational system (Havens, 2002). Rehmani (2003) briefly described that 'examinations play a significant role in determining what goes on in the classroom in terms of what, and how teachers teach and students learn and can have impact on both teaching and learning'. Wikipedia used test or examinations as alternative terms of assessment and defined it as: 'test or an examination (or exam) is an assessment indeed to measure a test-takers knowledge, skill, aptitude, physical, fitness or classification in many other topics'.

Various examination methods used in higher education institutions to assess academic progress, for example, paper-pencil-based examinations, assignments, presentations, and etc.,. Sim, Holifield, & Brown (2004) identified more than fifty varied techniques used within higher education for assessment purposes; the most commonly used are examinations. The rapid advancement of Information and Communication Technologies (ICT) in teaching and learning has shifted the paradigm (Uysal & Kuzu, 2009) from paper-pencil-based to computer-based system of examinations which are usually termed as Computer Assisted Testing, Computerized Assessment, Computer Based Testing (CBT), Computer Aided Assessment (CAA), Computer Based Assessment (CBA), Online Assessment, E-Assessment and Web-Based assessment (Bull (1999), Haslington, Jupp (2000), Mckenna (2001), Elliot (2003), Maddison (1983), Winship (2003), JISC (2008) and many others). Computer – based examinations are the form of assessment in which the computer is an integral part of question papers' delivery, response storage, marking of response or reporting of results from a test or exercise (Whittington, Bull & Danson, 2000). Conole and Warburton (2005) defined CAA as 'the use of computers for assessing students' learning'.

Due to the inclusion of ICTs in education, it is required to re-consider and rethink, modify or change the traditional examination methods. Electronic assessment tools had reduced the burden of teachers and facilitate to conduct examinations purposefully. Computer-based examinations can be used to promote more effective learning by testing a range of skills, knowledge and understanding. Accessing and managing of information and managing and developing communication skills are possible to assess online which cannot be assessed in regular essay based examinations (Brown, Race, & Bull, 1999). JISC (2008) quoted Weaver (2003) that '… diversity decreases the dependency on the traditional formal examination, a method that does not suit the learning styles of many students. The key factor in determining whether an assessment program is good depends on whether the assessment tasks are relevant to the aims and intended learning outcomes for the course, not forgetting the attitudes and skills that are to be tested'.

Computer and related technologies provide powerful tools to meet the new challenges of designing and implementing assessments methods that go beyond the conventional practices and facilitate to record a broader repertoire of cognitive skills and knowledge. According to Bodmann and Robinson (2004) computer-based tests offers several advantages over traditional paper-and-pencil or paper-based tests. Technology based assessment provide opportunities to measure complex form of knowledge and reasoning that is not possible to engage and assess through traditional methods. The link between observation and interpretation through computer based technologies makes it possible to score and interpret multiple aspects of student performance on a wide range of tasks chosen for cognitive features and compare the results against profiles that have interpretive value (Pellegrino, Chudowsky, and Glaser, 2001). Computer based assessment technique is becoming more and more common in HEIs because of its relevance and direct approach towards CAI. According to Conole and Warburton (2005): "CAT items are written to test particular levels of ability they have the potential to deliver more accurate and reliable results than traditional tests". Traditional methods of assessment are being replaced by automated assessment in all over the world gradually but it is not clear yet to up to what extent these changes will be fruitful to the academicians and administrators of HEIs (McAlpine, 2004).

Therefore, it was significantly important to perceive university teachers' approaches towards Computer-Based (CB) and/or Paper-Based (PB) examinations. It was observed through literature that little attention was paid to understand teachers' thoughts about how they differentiate between CB and PB examinations in terms of their effects on teaching and learning. Authors of this research, therefore, analyzed teachers' attitude in new and different dimensions or categories i.e., not only limited to gender-based attitudinal differences but also discipline-wise, designations-wise, qualifications-wise, teaching experiences-wise, Computer Skilled (trained) and non-skilled (untrained) teachers and the teachers who EXPERIENCED to conduct CB examinations versus to those who NEVER experienced. Following is a brief literature review that summarizes the studies of those authors who experimented or surveyed CB examinations versus PB examinations at higher educational institutions.

Literature Review

According to Fluck, Pullen & Harper (2009) '… educators must consider which assessment techniques permit students to utilize the affordances of new technology'. The authors conducted an eExamination for the students of 4-year Bachelor of Education Program at the University of Tasmania. Students' (N=270) achievement was assessed through two equally weighted activities: first was a home assignment in which students explored learning content through the use of ICT and the second activity was a 2 hour test comprised of 14 questions based on all the material in the unit. At the end of the test, a single page survey with five questions was offered to students. Survey indicated that 38% of the survey respondents had previously taken a CB exam, 78% had used the practice CD before eExamination and 71% had found it very or moderately useful. The valid responses (N=230) indicated that 94.5% preferred CBT. The prior exposure to CBT was a highly significant factor for preferring the computer medium.

Karadeniz (2009) studied the impact of paper based, web based and mobile based assessment on students' achievement. A group of 38 students were experimented for 3 weeks. Significant differences were found between the scores achieved by the students in second week, but not in first week. It was perceived by the authors that students had positive attitude towards web based and mobile based assessment due to ease of use, comprehensive and instant feedback. Moreover, most favoured tests were web based and the least favoured were paper based.

The National University of Singapore introduced computer-based testing (CBT) in 2004. Lim, et al (2006) examined medical students' attitude about CB VS PB testing. Through an online survey 213 (53.5%) final-year MBBS students were tested out of which 91 (79.8%) preferred CBT, 11 (9.6%) preferred paper-and-pencil (PNP) format and 12 (10.5%) were un-sure. Authors further explained that 42 indicated that 42 liked CBT because of good quality of images and independent of assigned seating positions; 22 liked because they could proceed at their own pace; one stated that CBT examinations was fun; 4 enjoyed the convenience of CBT and 6 cited "equality" as the reason they preferred CBT over PNP testing.

Bodmann and Robinson (2004) conducted an experimental study to compare speed and performances differences among computer-based (CBTs) and paper-pencil tests (PPTs). In experiment fifty-five undergraduate students enrolled in the subject of educational psychology, participated in the studies which were already familiar with computer-based tests. Both CBTs and PPTs contained 30 MCQs items with 35 minute of time limit. Approximately half class (28 students) took the first test on the computer and rest preferred first test on paper. Procedures shifted for the second tests, with the first group receive PPTs and second group CBTs with a gape of two weeks. It was concluded that undergraduates completed the CBT faster than PBT with no difference in scores.

Koppel and Hollister conducted a study to examine the impact on student performance of a computer-based assessment (CBA) as compared to a traditional testing method. Three different research tool were used in the study to collect and interpret results i.e., questionnaires completed by students to express their CBA experiences; faculty interviews who had administered computer-based test to determine students' perceptions of using this medium of testing and analysis of students test scores in both conventional paper-based tests (PBT) and CBA. Total 133 students out of which 91 have no prior experience of CBA and remaining 42 had experienced the same in their previous courses. The Excel CBA was comprised of 25 items was constructed. Students' scores on CBA were automatically recorded which included overall scores achieved. Grades on CBA were based on students' ability to complete a specific skill-based operation in the application of MS Excel. CBA was administered in one class period, at the end of the exam students reviewed their results. PBT was administered in the next class period. The PBT were examined manually by viewing the printout and actual Excel file containing the completed examinations. Results of PBT were recorded physically by noting the required information in an Excel sheet. Grades on the PBT were based on the final product submitted by each student as opposed to how each task was performed. On the question of ease of use, majority of the students (59%) found the software to be easy, 29% found it to be moderate and 12% the software to be somewhat difficult to use. Interpreting the range of skills, 76% responded that CBA was more effective test. Evaluating the difficult of question paper 65%

responded that question paper were moderated, 34% of the students felt the automatic grading system was fair while 39% didn't find the grading fair. Only 19% felt that CBA negatively impacted their performance. Only 14% students found CBA easier while 49% found it difficult or more difficult. Total 58% preferred CBA and 42% preferred PBT. Faculty perceived to be more positive towards CBA in terms of less time writing exams, reduce grading time, simple method of record keeping of grades and improved validity of test validity through post-test statistical analysis.

Calarina and Wallace (2002) investigated to confirm several key factors in computer-based versus paper-based assessment. Factors of the study were content familiarity, computer familiarity, competitiveness, and gender. The study used a post-test only designed with one factor, test mode (Computer-based and paper-based). Students' score on 100-item multiple choice items and students' self-report on a distance learning survey were treated as dependent variables. Four sections of Computer Fundamental Course consisting of 105 students were selected as sample of the investigations. Results showed that computer-based test delivery impacted positively on students' scores as compared to paper-based test. From the abstract of the study, it was found that ANOVA of test data showed that the computer-based test group outperformed the paper-based test group. Gender, competiveness, and computer familiarity were not related to this performance difference, though content familiarity was.

Research Methodology

3.1. Instrumentation: A survey was designed for which all items of the instrument were couched and included after the literature review. The instrument was comprised of three parts. Part – 1 was related to teachers' demographic information i.e., department name, gender, designation (i.e., job tile) and professional qualifications. Two variables regarding the information for computer training certificate or diploma and experience of conducting CB examination were also included in the same part. 5 – Point attitude scale comprised of 21 items was included in the questionnaire as Part – 2 (Table 1) to explore teachers' attitude towards CB examinations on the basis of their personal experiences. And Part –3 contained 19 statements (Table 2), which were designed to depict teachers' perceptions by comparing PB versus CB examinations, same on the bases of their personal experiences. This part helped the researchers to understand teachers' belief on PB or CB examinations.

3.2. Instrument Validity: To assess the validity, the instrument was piloted among 5 randomly selected teachers of 3 different departments i.e., Education, Physics and Business & Administration. Responses, views, and difficulties to complete the questionnaire from 30 teachers including 18 male and 12 females, were collected and recorded instantly by the researchers themselves and then thoroughly discussed with the experts. Changes were made accordingly and the final draft of the questionnaire was sent to the six different experts in the field of Education and Assessment for validating the instructions and necessary amendments.

3.3. Sampling: In 2008 there were 111 (i.e., 60 Public Sector and 53 Private Sector) universities in Pakistan (Higher Education Commission, Pakistan, 2008) out of which 36 (i.e., 20 Public Sector and 16 Private Sector) universities from Punjab Province were delimited for the study. Out of 20 Public Sector Universities, 8 (40%) were included in the sample randomly. Private Sector Universities were dropped because of the limited number of students, and the variety of different and technical disciplines offered by different universities. All male and female teachers from all teaching departments of different disciplines of sampled universities during session 2008 – 2010 constitute the population of this study. After the selection of the universities, different teaching departments of Pure Sciences, Social Sciences and Professionals were included in the study on the basis of random sampling technique. However, teachers of each department were selected on the basis of 'availability' in their offices. Permission was sought from the head of departments in each university in advance for said purpose. In all, 410 teachers were asked to complete the questionnaire. Out of which 314 (77%) questionnaires were recollected successfully after completion. Therefore, the resultant sample consisted of 314 teachers.

3.4. Response Rate & Data Analysis: To analyze data purposefully, demographic data of university teachers were categorized as (gender, discipline, designation, qualifications, teaching experience, computer literate/trained and experience of conducting CB examinations). Disciplines included following sub-groups: Pure Sciences (i.e., Bio, Chemistry, Physics, and Mathematics), Social Sciences (i.e., Economics, Education, and Psychology) and IT Professionals (i.e., MBA IT, Computer & Information Technology, and E-Commerce). Designations-wise distributed teachers were: Low Ranked (i.e., Lecturers and Assistant Professors) and High Ranked (i.e., Associate Professors and Professors). Qualifications-wise categories were: Less Qualified (i.e., M.

A./M. Sc./M. Ed., and M. Phil) and Highly Qualified (i.e., Ph. Ds and Post Docs.). First category of teaching experience was from 1-9 years (Less Experienced) and second from 10 or more than 10 years (High Experienced). And the responses of last two groups were in the form of YES or NO. Moreover, simple percentages and Chi Square tests techniques were used to analyze data statistically. The data were interpreted on the bases of overwhelming majority (85% and above), good majority (70% to 84%) and simple majority (55% to 69%) with respect to all categories given in questionnaire.

Results & Discussions of Part – II of the Questionnaire

The attitudinal differences of each sampled group of teachers were analyzed in terms of overwhelming, good majority, and simple majority responses.

From the given table it was depicted that overwhelming majority of sampled teachers; male & female teachers; teachers from natural and social sciences; low ranked teachers; less qualified teachers; less experienced & more experienced teachers; teachers who have & haven't CB examination experiences were strongly agreed that HEC Pakistan should plan to train university teachers for conducting CB examinations to enable them to assess large group of students in less time.

It was portrayed from the results that good majority of sampled teachers (i.e., overall sampled teachers, male teachers, low & high ranked teachers, less & highly qualified teachers, less & more experienced teachers, teachers who have no computer training certificate, and teachers who have & have no experience of CB examinations) were agreed with the authors of the research that CB examinations are demanded due to the semester system which facilitate all stakeholders i.e., teachers, students and administrators.

It was illustrated from the same data that simple majority of sampled teachers (i.e., overall sampled teachers, female teachers, low ranked teachers, less & highly qualified teachers, less & more experienced teachers, teachers who have & have no computer training certificate, and teachers who have no experience of CB examinations) were agreed that CB examinations saves time and also facilitate the students to improve their understanding which ultimately improve their GPA therefore a country-wide policy should be prepared at university level regarding CB examinations.

Results in the column of Overwhelming Majority Responses facilitate the researchers to compare responses within the groups with respect to the percentages. It was found that female teachers, teachers from social sciences departments, highly ranked teachers, highly qualified teachers, less experienced teachers, teachers who have computer training certificate or degree, and teachers who have CB examination experiences were comparatively more positive towards CB examinations.

Percentages in the column of Good Majority Responses demonstrated that male teachers, teachers from natural sciences departments, highly ranked teachers, highly qualified teachers, less experienced teachers, teachers who have computer training certificate or degree, and teachers who have no CB examination experiences were comparatively more positive towards CB examinations.

Overall percentages in the column of Simple Majority Responses pointed out those teachers from IT, low ranked teachers, highly qualified teachers, more experienced teachers, teachers who have not computer training certificate or degree, and teachers who have no experience of CB examinations were more interested in CB system of examinations. While no major differences were found in the percentages of male and female teachers.

Significant differences ($\chi^2 = 11.698 > 5.966$, $\alpha=0.05$, Sig.=0.003) were found between the attitudes of male and female teachers in 15th statement of the questionnaire. Percentages of the statement showed that 33% female and 42% male were agreed while 43% female and 49% male were disagreed. Due to the minor differences in percentages, it was not possible to declare whether male or female were more inclined towards CB examinations.

Significant differences were found between the attitudes of teachers from different departments in statements 6th ($\chi^2 = 10.502 > 9.49$, $\alpha=0.05$, Sig.=0.033), 8th ($\chi^2 = 13.729 > 9.49$, $\alpha=0.05$, Sig.=0.008), and 13th ($\chi^2 = 11.287 > 9.49$, $\alpha=0.05$, Sig.=0.024). In statement 6, it was clear from percentages that good majority (70%) of social science teachers, simple majority of IT professionals (65%) while 51% from natural sciences disciplines disagreed with the statement that CB testing is a worst tool of assessment. Same in statements 8 and 13, drastic difference were found between the calculated percentages.

Significant differences were found between the attitudes of low ranked and high ranked teachers in statement 20 (χ^2 = 8.132>5.99, α=0.05, Sig.=0.017). From calculated values it was clear that both groups recommended preparing a master plan to introduce CB examinations at national level. But overwhelming majority (88%) of low ranked teachers and good majority (73%) of high ranked teachers showed major attitudinal difference among the same groups.

Significant differences were found between the attitudes of teachers from different level of qualifications in statements 3rd (χ^2 = 7.867>5.99, α=0.05, Sig.=0.020), 6th (χ^2 = 8.651>5.99, α=0.05, Sig.=0.013), and 9th (χ^2 = 6.883>5.99, α=0.05, Sig.=0.032). From calculated values of statement 3, it was clear that both groups were agreed that computer facilitated in minimizing clerical mistakes. But percentages (i.e., 88% highly qualified and 78% less qualified) showed major attitudinal difference among the same groups. Same in statements 6 and 9, sweeping difference were found between the calculated percentages.

Significant differences were found between the attitudes of teachers from different level of teaching experiences in statements 3rd (χ^2 = 7.282>5.99, α=0.05, Sig.=0.026) and 11th (χ^2 = 8.651>5.99, α=0.05, Sig.=0.016). From calculated percentages of statement 11, it was clear that an overwhelming majority of both groups were agreed that CB examinations facilitate to assess more students in less time. But percentages (i.e., 86% highly experienced and 99% less experienced) showed less experienced teachers were more in CB examinations with respect to the given statement.

Results & Discussions of Part – III of the Questionnaire

The results of each sampled group of teachers were analyzed in terms of overwhelming, good majority, and simple majority responses.

An overwhelming majority of overall sampled teachers, female teachers, teachers from the group of social sciences & IT professionals, high ranked, less qualified teachers less experienced teachers and those teachers who have any type of computer training certificate or degree were strongly agreed with the statement that CB examinations seems to be very interesting technique of assessment but even then it’s difficult for teachers to construct objective type question papers for the same system of examinations. While same majority of all other groups of sampled teachers were highly anxious about the difficulty of constructing items for CB examinations.

Good majority of overall sampled teachers, female & male teachers, teachers from IT profession, low ranked teachers, less experienced, teachers who have computer training certificate or degree and teachers who haven’t CB examinations experiences expressed that CB examination system is risky because of system failure or light failure problems during examinations even then it’s an interesting technique of examinations for students. Not only this, they also believe that CB examinations can affect the entire educational system positively in terms of innovation and modern changes in teaching and learning methods.

Simple majority of overall sampled teachers, female & male teachers, low ranked teachers, less qualified teachers who have & have not computer certificate or degree teachers who have & have not CB examinations experiences articulated that CB examination systems could have flaws in terms of constructing different form of test items i.e., fill in the blanks, MCQs, matching items, or short answers but even then they agreed that they could frequently assess their students during session through this technique of assessment.

Not a single responded item of the questionnaire was found in the column of overwhelming majority of PB examinations. This concluded that they were highly inclined towards CB examinations. This was verified by good majority of sampled teachers from all groups except female teachers, teachers from the group of IT profession, more experienced and teachers who have no computer training certificate or degree expressed that administrators of their institutions are trying hard to bring change in PB examinations systems.

Simple majority of overall sampled teachers, female & male teachers, teachers from social, natural sciences, low ranked teachers, teachers who have and have not certificate or degree and teachers who have no experience of CB examinations expressed that PB examinations systems is beneficial and easy to manage because results are more accurate in same system of examinations.

By comparing the overall results, it was concluded that overall sampled teachers were in favor of CB examinations, female teachers, teachers from social science group, highly ranked teachers, highly qualified teachers, more experienced teachers, and teachers who have CB examination experiences were found to be more interested in CB system of examinations as compared to other peered groups.

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Appendices

Table – 1: List of Statements/Items included in Part – II of the Questionnaire

S. No. *	Statements
1.	CB examinations save time.
2.	Online self-assessments help students to improve their understanding and GPA.
3.	Using computer in preparing and declaring results minimizes clerical mistakes.
4.	CB examinations are insecure technique of assessment.
5.	Results of CB examinations are always invalid.
6.	Computer-based testing is a worst tool of assessment.
7.	CB examinations are demanded due to semester system.
8.	Using computers in examinations does not have any effect on students.
9.	Teachers should be trained for using computer in examination.
10.	New technological-based assessment methods should be used to analyze students’ progress.
11.	CB examinations facilitate to assess more students in short time.
12.	Online examination technique should be limited to classroom tests.
13.	CB examinations facilitates all e.g., administrators, teachers and students.
14.	Computer-based papers reduce cheating by a difficult shuffle of questions available for each student.
15.	Paper free environment slashes cost.
16.	Computer negatively effect on thinking potential of students’ during paper.
17.	A country-wide policy should be prepared for CB exams at university level.
18.	Both systems of examinations should be kept parallel.
19.	It is not possible in Pakistan to apply CB system of exams in its real form i.e., construction, administration, delivery and marking via computer, in all universities.
20.	HEC Pakistan should make a master plan to introduce CB examination at national level.
21.	In order to implement CB examinations, all institutions are required to improve their teaching techniques.

Table – 2: List of Statements/Items included in Part – III of the Questionnaire

S. No.*	Statements	CB	PB
1.	Students could be assessed more frequently in		
2.	Students could loose confidence in:		
3.	Which system could be more effective to create competition among students?		
4.	Which system seems to be more interesting technique?		
5.	Which system of examination could be more interesting for students?		
6.	Which system of examination could have more flaws?		
7.	Which system of examination is easy to manage?		
8.	Which system of examination is more expensive?		
9.	Which system of examination could produce more accurate results?		
10.	Which system of examination is more beneficial in all respects?		
11.	Educational institutions may work more smoothly under which system of examination?		
12.	Which system of examination is more risky?		
13.	Which system of examination could reduce teachers’ work load?		
14.	Which system of examination supports to construct test items in different forms?		
15.	Which system of examination could be more relaxing for students?		
16.	Which system of examination affects the entire educational system more positively?		
17.	Administrators of my institution are trying hard to change for:		
18.	It could be difficult for teachers to construct test items for:		
19.	Which system of examination could be more supportive to achieve educational		

S. No.*	Statements	CB	PB
	objectives positively?		

CONSTRUCTING AN ADAPTIVE MOBILE LEARNING SYSTEM FOR THE SUPPORT OF PERSONALIZED LEARNING AND DEVICE ADAPTATION

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Abstract

This paper presents an adaptive mobile learning system (AMLS) that provides learners with adaptive content according to their knowledge levels, learning styles, and heterogeneous learning devices. The aim of the proposed work is to provide learners with an adaptive learning environment according to learner's individual capability and the learning device used. The proposed system exploits Bayesian networks and content adaptation technologies to support both learner adaptation and device adaptation, which allows each learner to construct a personalized and adaptive learning environment.

Keywords: Adaptive learning; Content adaptation; Bayesian networks; Learning styles; Mobile learning.

Introduction

Mobile learning has received a lot of attention in education with the emergence of an increasing number of new types of mobile devices, such as notebooks, personal digital assistants (PDAs), and smart phones. Learners often wish to use various types of learning devices to access the same content without sacrificing usability and accessibility. However, most of the content in Web-based educational systems is typically designed and optimized for desktop computers, which make it unsuitable for use with other types of learning devices to view the content. Even though some of the Web-based educational systems support mobile learning, they may offer content only on specific types of devices. Because content adaptation is one of the technologies that support adaptive versions of content for heterogeneous devices, there is an increasing demand for content adaptation for a Web-based learning environment. In addition to the discrepancies of learning devices, learners may have different abilities, preferences, motivations, and knowledge. Some Web-based systems are devoted to develop the techniques of content adaptation for the problem of device heterogeneities (Laakko & Hiltunen, 2005). However, learner profiles (e.g., learning styles and knowledge levels) should be considered for the design of personalized learning assistance. From a learner's point of view, adaptation results not only should satisfy individual demands (i.e., learner adaptation) but should also solve the problem of device discrepancies (i.e., device adaptation). Therefore, it is both important and challenging to adapt content so that it satisfies individual demands and fits the requirements of learning devices in a mobile learning environment.

In summary, learner adaption and device adaption are considered as two important factors to facilitate mobile learning environments for learners with various abilities and learning styles. This paper presents an adaptive mobile learning system (AMLS) that exploits both learner adaptation and device adaptation to construct a personalized learning environment according to the individual characteristics and abilities. The adaption technology used in AMLS is not new but this study proposed a novel approach which combines both learner adaption and device adaptation for the support of personalized mobile learning environment. Learner adaptation is defined as matching content to the abilities and preferences of individual learners. Device adaptation is defined as automatically adapting content to the capacities of heterogeneous learning devices. In this paper, learner

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adaptation refers to individual differences in both knowledge levels and learning styles, and device adaptation refers to the heterogeneities of learning device specifications.

Related Works

Different AES have been developed for various purposes of education. Adaptive Hypermedia Architecture (AHA) is a Web-based adaptive hypermedia system, which can support on-line courses with different adaptive features, such as conditional explanations and links (De Bra et al., 2003). The learner model in Adaptive Hypermedia Architecture (AHA) is based on concept knowledge obtained and evaluated by Web-based courses and testing (De Bra, Aroyo, & Cristea, 2004). Karampiperis and Sampson (2005) proposed an adaptive educational hypermedia system, which supports adaptive learning resource sequencing based on a decision model that chooses an adaptive learning resources by evaluating learner's abilities. Henze and Nejdl (2004) introduced a logical characterization for the definition of adaptive educational hypermedia systems (AEHS) as a quadruple (DOCS, UM, OBS, AC): DOCS (Document Space) describes documents and knowledge topics; UM (User Model) stores, describes, and infers individual user's information, knowledge, preferences; OBS (Observations) observes individual user's knowledge state and interactions with the system for updating UM; AC (Adaptation Component) contains rules for the describing the adaptive functionality of the system.

ANDES used BN (Bayesian Network) technologies to model learners' knowledge in Physics (Gertner & VanLehn, 2000). If a BN model diagnoses a learner who did not understand a knowledge concept, the learning assistance for that concept would automatically appear on the screen to help the learner. BITS, a Web-based Bayesian intelligent tutoring system, uses BN to model problem domains in programming languages and creates adaptive learning sequences for learners according to their knowledge levels (Butz, Hua, & Maguire, 2006). All of the above proposed systems have used BNs or probability computing technologies to assist learners in mastering content, but none of them has considered both learner adaptation and device adaptation.

Content adaptation solves the problems of adapting content to heterogeneous device capabilities and supporting individual user preferences (Canali, Cardellini, Colajanni, Lancellotti, & Yu, 2003). Odyssey Systems (Noble, 2000) used static adaptation technologies to create pre-adapted content versions for specific learning devices. The advantage of static adaptation approach is that content transformation causes no delay in content delivery. One serious problem of this approach, however, is that it requires a new version of the content new type of learning device accessing the system. The more heterogeneous learning devices that the static adaptation approach must support, the more expensive and time-consuming it becomes to create different versions of the same content. On the other hand, dynamic adaptation dynamically generates the desired content based on the specifications of heterogeneous devices. Multiple pre-adapted versions of the content need not be created or stored, but a transcoding mechanism is required for dynamic content transformation (Liang et al., 2006). The major advantages of the dynamic adaptation approach are that it offers great flexibility in the support of heterogeneous learning devices and avoids the inconsistent content almost certain to appear in multiple versions made for different devices. Kim and Lee (2006) proposed a content adaptation architecture that integrates Composite Capabilities/Preference Profiles (CC/PP) files and annotation mechanisms to dynamically construct Web pages by annotating and reconstructing the structure of Web elements for mobile devices. They also developed a navigation map to decide which elements should be contained in the adapted content.

System Overview

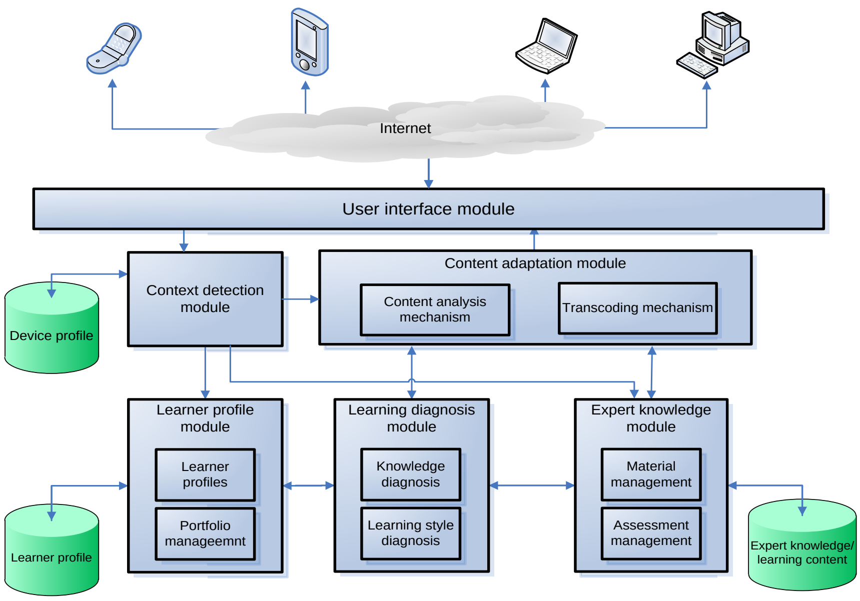
System architecture

The architecture of the AMLS consists of six modules (see Fig. 1):
The user interface module is a graphic interaction interface between AMLS and the device on the client side.
The context detection module is responsible for detecting context information, which includes the monitoring of a learner's progress and behavior and the detection of learning devices.
The learner profile module manages information related to an individual learner's demographic details, such as learning preferences and learning styles. It also manages a learner's states obtained from both the context detection module and the learning diagnosis module.
The learning diagnosis module is composed of a knowledge-diagnosis mechanism and a style-diagnosis mechanism. The knowledge-diagnosis mechanism evaluates learner's knowledge levels by comparing learner's knowledge in the learner model against the expert knowledge in the knowledge model. The style-diagnosis

mechanism identifies individual learning styles based on the information obtained from the learner profile module.

The expert knowledge module stores the expert knowledge in the knowledge database to support knowledge diagnosis. This module also contains the learning materials and relevant pedagogical strategies to assist individual learners.

The content adaptation module is responsible for presenting the adapted learning content. The adaptation process



includes learner adaptation and device adaptation.

Fig. 1. System architecture

Learner adaptation

Leaner adaptation employs a learner model, which contains learner's individual characteristics including demographic information, knowledge levels, and learning preferences. In the present study, a learning diagnosis consists of a knowledge diagnosis and a learning-style diagnosis that enables an evaluation of an individual's learning preferences and their knowledge levels.

Knowledge diagnosis

In AMLS, knowledge diagnosis evaluates learner's knowledge levels and discovers probable misconceptions by tracing back the nodes of the network graphs in BN models. To discover what probable misconception causes misunderstanding of a certain concept; it then provides adaptive learning assistance tailored to the individual. Knowledge level is used to evaluate a learner's knowledge state about a knowledge topic or concept. A knowledge concept is identified as the misconception variable if the value of the knowledge level for the concept is low (i.e., $MK_j < 0.6$). When the AMLS has identified all the variables of the misconception (e.g., MK_1, MK_2,…, MK_{i-1}) in a test, a diagnosis process will automatically make a probabilistic inference of the probable misconception (e.g., MK_i) by referring to the conditional probability tables (CPTs) in the BN model. The joint probability distribution of the inference mechanism, P(MK_1, MK_2,…, MK_n), is expressed as follows:

$$P(MK_1, MK_2, ..., MK_n) = \prod_{i=1}^{n} P(MK_i | pa(MK_i)) \quad (1)$$

In Equation 1, $pa(MK_i)$ is a set of misconception variables. It is also the parent set of the variables MK_i. The assignment of values to the observed variables $pa(MK_i)$ is called evidence. In a knowledge diagnosis, the evidence is obtained from the result of the knowledge evaluation. For example, three concepts modeled in the BN model are as follows: "Loop" (L), "While loop" (W), and "For loop" (R). The probabilistic model *P*(L|R= 'T', W= 'F') represents a BN diagnosis process that calculates the probability of understanding the concept "Loop" (L) when someone understands the concept "For" (R) but misunderstands the concept "While loop" (W). Based on the information of the CPT, the diagnosis mechanism will diagnose that the learner should not understand the concept "Loop". Therefore, our knowledge diagnosis mechanism can identify the misconceptions first and then deduce the probable misconceptions using the BN inference mechanism.

Learning style diagnosis

Learning style is the individual preferred behavior in which a learner observes and interacts with the learning environment to obtain knowledge and skills. Learning styles help learners understand their own strengths for more efficient learning (Papanikolaou, Andrew, Bull, & Grigoriadou, 2006). Soloman and Felder (2003) proposed the Index of Learning Style (ILS) questionnaire for evaluating learning styles. The Felder-Silverman theory classifies learning styles into four dimensions: (1) perception: sensitive/intuitive dimension, (2) input: visual/verbal dimension, (3) processing: active/reflective dimension, and (4) understanding: sequential/global dimension (Felder, 1993; Felder & Silverman, 1988). This study adopted the Felder-Silverman learning-style model to develop a learning-style diagnosis approach in a Web-based learning environment.

For learning-style diagnosis, another BN model was constructed to identify individual learning styles by detecting Web-based learning behavior, independent learning activity on the Web. This behavior may be a learning-related manner or event, such as reading emails, reading content, and discussing content with peer groups. To identify individual learning styles, key features of the individual's Web-based learning behavior (e.g., the frequency of reading emails) are collected and represented as BN variables for analysis. Fig. 2 shows a brief example of the learning style in the BN model. The evaluated features of the processing dimension include the numbers of emails and questions responded to, and the frequency with which forums were accessed. The evaluated features of the perception dimension (sensing/intuitive) include the number of Web pages visited, the number of questions posted, and the number of assignments submitted. The evaluated features of the input dimension include the types of Web pages and the number of demonstration page visited. Finally, the evaluated features of the understanding dimension include the sequence ratio of Web pages visited, learning performance, and the mean time spent per Web page.

After the learning-detection mechanism has collected the required information from learners' behavior, the learning-diagnosis module will calculate the values of all evaluated features (i.e., the random variables in BN models) for each dimension. If the value of the random variable is greater than the threshold value, a true value is assigned to the random variable in the BN model; otherwise, a false value is assigned. In the beginning, the threshold value of individual variable is assumed as the mean value of all the individually evaluated features. When the values of all random variables (true or false) have been obtained, the inference mechanism for learning styles is activated. Learning style (LS) consisting of m dimensions (namely D_i) can be expressed as $\prod_{i=1}^{m} D_i \subseteq LS$. The expression of learning style dimension D_i is as follows:

$$D_i = P(X_1, X_2, ..., X_j, D_i) = \prod_{j=1}^{n} p(D_i \mid X_1, X_2, ..., X_j)) \qquad (2)$$

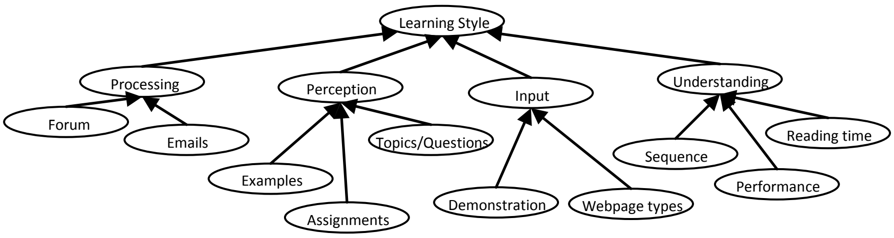


Fig. 2. A brief BN model for learning-style models

For each learning style dimension D_i, there exist some attributes (i.e., behavior features) $X_1,\ldots, X_j$, such that D_i and $\{X_1,\ldots, X_j\}$ are conditionally independent given $\{X_1,\ldots, X_j\}$. The diagnosis result in each dimension Di can be false or true (i.e., mild or strong preference). As a result, 16 combinations of learning styles can be generated based on the four learning-style dimensions (see Table 1). For a new or unidentified learner, AMLS will offer a learning-style stereotype for system access. This stereotype is a general style template that contains the most popular learning style for viewing the content. Although learners with unidentified styles are offered the same learning-style options in the beginning, individual styles will be identified after the learners have created their own profiles in AMLS.

Table 1. The combinations of learning styles

{A, S, V, Q}	{A, I, V, Q}	{R, S, V, Q}	{R, I, V, Q}
{A, S, V, G}	{A, I, V, G}	{R, S, V, G}	{R, I, V, G}
{A, S, B, Q}	{A, I, B, Q}	{R, S, B, Q}	{R, I, B, Q}
{A, S, B, G}	{A, I, B, G}	{R, S, B, G}	{R, I, B, G}

A/R: active/reflective, S/I: sensing/intuitive, V/B: visual/verbal, Q/G: sequential/global

Content adaptation

The content adaptation mechanism contains a Java-based transformation engine that transforms required content into tailored content. The transformation engine uses device profile information to guide content transformation that supports heterogeneous learning devices. It can meet the capabilities of individual learning devices, enabling device-specific delivery of content in real time. New devices are supported simply by adding device profiles into the device profile database. When the adaptive mobile learning system receives a request from a learning device, the device detection mechanism accesses the database to identify the device's specifications. If the content does not match the specifications, the device detection mechanism finds a best-match version of the content in the device profile.

Content adaptation is based on the two elements of the Web content: texts and graphs. The content adaptation mechanism analyzes content elements (a text element or a graph element) and then consults the device profile to decide the content adaptation approach. Two different technologies were employed for content adaptation: the page splitting approach for solving the issue of text content adaptation and the transcoding approach for the problem of graph content adaptation. Page splitting is a technique for dividing a long text into a series of smaller fragments (i.e., sub-pages) that can be properly displayed on the small client screen. The page splitting approach was used to solve the issue of text content adaptation for mobile learning devices. If a Web page contains more than one sub-section, an index page that contains hyperlinks to its sub-pages will be generated after all the sub-pages have been created (see Fig. 3). With the page splitting approach, the learner can click on any link to access the corresponding sub-page while browsing the index page.

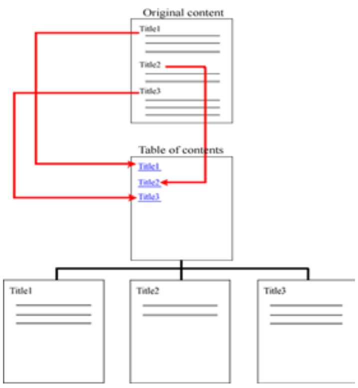


Fig. 3. The page-splitting approach for hypertext partitions

For graph transformation, CC/PP specifications, such as Model, BitsPerPixel, ColorCapable, ScreenSize, ImageCapable, and CcppAccept, have been implemented in the device profile database. A color JPEG in the server can be transcoded into a small, grayscale image in the mobile learning device to comply with low network bandwidth or display resolutions in the device. For example, if a mobile learning device supports only an 8-bit per pixel image and the screen size is 200 × 200, then AMLS will transform the original image (e.g., a 1024 × 768 image with 24 bits per pixel) to a 200 × 200 pixel in an 8-bit grayscale image. Fig. 4 shows an example of a bar graph about the weight ratio of the concepts in a knowledge evaluation in the mobile learning device.

Fig. 4. Content adaptation in mobile devices

Learning content is constructed and stored in XML format in the learning content database. However, an XML file shown as a single page on a desktop computer might not be suitable to present in a mobile learning device due to the limitation of the display screen size or device's capabilities. The content adaptation mechanism invokes the content transformation engine that will dynamically generate adapted content for mobile learners. When a content page contains both text and graphs, AMLS identifies the properties of both types of frames and then transforms both into the appropriate format for user's device.

To transform the content for different devices, the content transformation engine also uses XSL (eXtensible Stylesheet Language) and XSLT (XSL Transformations) to display or transform XML documents in a Web browser. For example, if a learning device cannot support XML format, AMLS will automatically transform XML-based Web pages to other compatible formats of Web pages (e.g., WML, HTML, or XHTML). To use transcoding technology in content adaptation, a content exchange protocol is required to build a communication mechanism between learning devices and content servers. Composite Capabilities/Preference Profiles (CC/PP) is one of the most popular exchange protocols. CC/PP is a proposed standard by the W3C for describing device capabilities and user preferences for a wide variety of mobile learning devices, such as smart phones and PDAs. A CC/PP profile is based on a Resource Description Framework (RDF) model written in XML (eXtensible Mark-up Language) with a two-level structure. A CC/PP profile created by a learning device is transmitted to an adaptation server and the server uses the profile to create and deliver appropriate content to the learning device.

Experiment and results

Participants

Thirty undergraduate students majoring in information management volunteered to participate in the system usage questionnaire. Each participant could use mobile devices, such as smart phones or PDAs, to read learning content during the experimental period. Twenty-five participants had finished the experimental procedure and completed the system-usage questionnaires after system operation.

Experimental designs

After a one-week experimental tried, the participants were designed a system-usage questionnaire to evaluate the AMLS. The questionnaire contained 5 questions that asked about their satisfaction with mobile learning. The purpose of the questionnaires was explained to the participants, and they were asked to anonymously complete and return them in order to ensure confidentiality and increase the return rate. Both questionnaires used a 5-point Likert scale for responses (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). It took approximately 3-5 minutes to complete the questionnaire.

Results

The questionnaire data were analyzed via SPSS software using descriptive analysis (percentage, mean, and standard deviation). The mean score (see Table 2) for all participants on the entire survey (5 items) was 4.18 (SD = 0.62). For Item 1, 25 (100%) participants agreed that the learning content was easy to access using mobile learning devices. Two aspects of content adaptation were asked in the survey: the adapted presentation of the text and of image frames in mobile learning devices. For Item 2, 22 (88%) participants were satisfied with the adapted content in mobile learning devices. Twenty (80%) participants agreed that the resized images fit well on the screen of their mobile learning devices (Item 3). This showed that the image transformation function and presentation (i.e., screen size and display resolution) met the requirements of most (20; 80%) participants when using different mobile learning devices. It also showed that content adaptation indeed increased the presentation flexibility of content on mobile learning devices. For Item 4, 21 (84%) participants agreed that it was easy for them to locate the target content using the navigation function in the system. Finally, for Item 5, 22 (88%) participants felt generally positive about the system for mobile learning.

Table 2. Questionnaire result for participants (n=25)

No	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean (SD)
1	It is easy to access the learning content on my mobile device.	11 (44%)	14 (56%)	0 (0%)	0 (0%)	0 (0%)	4.44 (0.51)
2	I am satisfied with the arrangement of learning content on my mobile devices.	6 (24%)	16 (64%)	3 (12%)	0 (0%)	0 (0%)	4.12 (0.60)
3	The learning content images fit well on my mobile screen.	6 (24%)	14 (56%)	5 (20%)	0 (0%)	0 (0%)	4.04 (0.68)
4	I can quickly locate the learning content using the navigation function.	8 (32%)	13 (52%)	4 (16%)	0 (0%)	0 (0%)	4.16 (0.69)
5	Overall, I am satisfied with my learning experience when using mobile devices.	6 (24%)	16 (64%)	3 (12%)	0 (0%)	0 (0%)	4.12 (0.60)

Conclusions

The support of heterogeneous mobile devices is important for increasing learning convenience and efficiency in a mobile learning environment. By identifying individual device capabilities, content adaptation provides a solution to the heterogeneity of devices for learners. In an adaptive educational system, content adaptation offers appropriate learning content suited both to the device's specifications and to the learner's abilities. Therefore, learning diagnosis is an important procedure for identifying the preferences and knowledge levels. This study proposes an adaptive mobile learning system that uses adaptation to both the learner and the learning device to create a personalized and adaptive learning environment suited to the learners' abilities and the device's specifications. A learning diagnosis mechanism was constructed to diagnose each learner's knowledge levels and identify each learner's learning styles. In addition, content adaptation technologies were also used to automatically adjust content to match the specifications of learning devices. Further research is encouraged to improve the inference capability when managing a learning context and arranging content in heterogeneous learning devices.

Acknowledgements

This work was supported in part by National Science Council (NSC), Taiwan, under the Grants NSC100-2511-S-151-001-MY2.

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CONSTRUCTING KNOWLEDGE: AN EXPERIENCE OF ACTIVE AND COLLABORATIVE LEARNING IN ICT CLASSROOMS

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Abstract

This paper reports on the impact of the implementation of active and collaborative practices in ICT (information and communication technologies) classrooms. Both of these approaches convey a lot of responsibility from the teacher to the students and the hoping, as backed up by the literature, is to promote deeper learning and reasoning skills at a higher level. The question is: how do you do all that? This research describes a specific environment that makes use of collaborative tools, like wikis and forums within an e-learning platform and of specific CRM (customer relationship management) software. In order to analyse how this learning environment gets learners actively involved in learning and working together in productive ways, students were surveyed by responding to questionnaires. Several cause-effect relations underlying the teaching-learning methodology and the students' performance are discussed.

Keywords. collaborative learning; active learning; teaching; ICT; e-learning

Introduction

Active and collaborative learning are well known as alternative strategies to conventional teaching models (e.g.Kaufman, Sutow & Dunn, 1997; Prince, 2004). In particular, active and collaborative practices in ICT (information and communication technologies) classrooms are an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers. The pedagogical and socio-economic forces that have driven the higher learning institutions to adopt and incorporate ICT in teaching and learning are already changing the organization and delivery of higher education (Sife, Lwoga & Sanga, 2007). However, like Silva *et al.* (2002) say, there is still much to be done within the culture of the universities, to overcome the individualistic matrix to a culture of collaborative learning.

In the present study we highlight a specific environment that makes use of collaborative technological tools, like wikis and forums within an e-learning platform. Against the background of this problematic, the general goal of this paper is to contribute for the theoretical discussion on how active and collaborative experiences in ICT classrooms play a role on the construction of knowledge in higher education institutions (HEIs). We did, however, limit our field of study to the context of the curricular unit of CRM (Customer Relationship Management) Systems, included in the last semester of the last year of the study plan of the first cycle of studies of the Marketing course available at the ISCA-UA (Higher Institute of Accounting and Administration of the University of Aveiro), Portugal. Based on the pointed outlines and within the curricular case presented, we intend to: (1) understand how collaborative learning environments get students actively involved in the learning process; (2) perspective the role of collaborative tools at the level of group work and (3) find out how students assess their performance within a working group.

This article is organized into five key points. After the introduction we try to contextualize the use of ICT at the level of active and collaborative methodologies in the teaching and learning processes in higher education. The next section focuses on the methodological aspects of the study, including the context of the case study used in the research and techniques for collecting and processing data. The fourth section is devoted to present and discuss the results obtained. The paper ends with the main conclusions of the study.

Challenges in learning and teaching in higher education

Trying to ensure that every student who enters the work market bears a set of personal attributions acknowledged as essential, challenges HEIs with the need to activate new ways to produce and disseminate knowledge. Bearing this context in mind, it is possible to realize a society which generates challenges over a set of not only professional competences, but also of personal and social ones.

The changing paradigm

In the report made for UNESCO by the (International Commission on Education for the Twenty-first Century, 1996) a complementary mission for education is immediately referred: that of fructifying the creative talents and potentialities of all individuals. In that very same report, the need for a lifelong learning process is strengthened, as one of the keys to access education. More, the adequacy of the higher education system to the teaching-learning model sustained by the Bologna Process, did also jeopardize a profound change of paradigm: in order to achieve the European student profile, HEIs should emphasize horizontal competences which render students responsible for their learning processes, thus leaving the teachers with the task to facilitate and orient those processes. The implementation of these guidelines does inevitably create the need to re-evaluate the pedagogical activities at the level of goal definition and assessment, as well as, particularly, at the level of execution and follow-up of the methodological processes. Also, the new demands regarding students' skills have generated profound implications in the change of the pedagogical paradigm to student-centered methodologies, which make the student an active element in learning, properly guided by tutorial support. These set of problems induce some authors (e.g. Silén & Juhlin, 2008) to declare that conventional methods of instruction are inadequate for what needs to be known and so, there seems to be more and more agreement that higher education methodologies have to be rethought. The arguments involved in such methodologies are multidimensional and diversified.

Active and collaborative learning in higher education

Active learning has received considerable attention over the past several years. Often presented as a radical change from traditional instruction, active learning has appealed strong advocates among those looking for alternatives to traditional teaching methods, while disbelieving ones regard active learning as another fashion trend (Prince, 2004). It is not possible to provide unanimously accepted definitions for all of the vocabulary of active learning since different authors have different interpretations. Still, it is possible to provide some generally accepted definitions and to highlight distinctions in how common terms are used (Prince, 2004).

Generally defined as any instructional method that engages students in the learning process, the core elements of active learning are student activity and engagement in the learning process. While, on the one hand, Kaufman *et al.* (1997) define collaborative learning as a spectrum of instruction that involves small groups of students who have assigned an academic goal, on the other hand, Prince (2004) defines cooperative learning as a structured form of group work where students pursue common goals while being assessed individually. Although some authors (e.g.Kaufman *et al.*, 1997) distinguish between collaborative and cooperative learning as having distinct historical developments, this study will assume the perspective of Panitz (1996) and Prince (2004) that collaborative learning encompasses cooperative learning as, in either interpretation, the core element is the emphasis on student interactions rather than on learning as a solitary activity.

Despite the empirical support for active learning is extensive, not all is compelling. In fact, while several authors (e.g.Bonwell & Eison, 1991) conclude that it leads to better student attitudes and improvements in students' thinking and writing, motivating students for further study and developing thinking skills, others (e.g.McKeachie, 1972) admit that the improvement of active learning over lectures seem to be small. But, as Prince (2004) suggests, the variety of instructional methods labeled as active learning muddles the issue. In the analysis that the very same author does of the two core elements of active learning (introducing activities into the traditional lecture and promoting students' engagement) some conclusions arise. First, that simple periodically pauses procedures during classes, provide a baseline that can improve the effectiveness of lectures, as it has to do with student attention span. But, simply introducing activity into the classroom may fail to capture the students' attention if the activities are not designed around important learning outcomes. So, second, it is central to promote thoughtful engagement on the part of the student which is one of the most important predictors of success in college.

Using ICT to promote active and collaborative practices

A possibility to promote active and collaborative practices is that of fostering the change of a traditional teaching system to adopt and incorporate ICT in teaching and learning. The importance of computer supported learning is an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers. But, as Stahl, Koschmann & Suthers (2006) claim, the interplay of learning with technology has problematized the very notion of learning and called into question prevailing assumptions about how to study it. Namely, about understanding the actions and activities mediated by ICT or about knowing in which fields and to what extent there are obstacles or facilitators, and the risks in using ICT in teaching and learning at university level (Ludvigsen & Morch, 2007; Vajargah, Jahani & Azadmanesh, 2010).

It is not possible to ignore the potential of ICT and, specially, the internet and its expansion through the development of computer networks. The thrilling potential of the internet to connect people in innovative ways provided a stimulus for computer supported collaborative learning research. As ICT developed, unpredicted barriers to design, disseminate and effectively take advantage of innovative educational software became more and more apparent (Stahl *et al.*, 2006). As mentioned in the report made by the International Commission on Education for the Twenty-first Century (1996), this technological revolution obviously constitutes an essential element in the understanding of our modernity, as it creates new forms of socialization and, even, new definitions of individual and collective identity. For example, when presenting the theoretical rationale for a pedagogical and technological scaffolding of a computer supported collaborative learning environment, Ludvigsen & Morch (2007) argued that it emerged in response to skills that were previously associated with deep learning, which are important in a knowledge-based society. In the perspective of Lehtinen (2003), the arguments for the use of ICT in education are characteristically based on various self-evident benefits of information and communication technology: the possibility for a beneficial relationship between the system and the learner; the possibility to facilitate the understanding of the phenomena under study; the possibility of advantages in simulating real-life situations; or the possibility of a useful tool for synchronous and asynchronous communication between the teacher and students and among students. But the opinions are not consensual. The very same author, (Lehtinen, 2003), as well as others (e.g.Ludvigsen & Morch, 2007) warns to several paradigms in the use of ICT: the assumption that learning is seen as the process of change in social relations in which the learner is imperatively situated; the problem of mutual understanding in ICT applications; or the insight concerning which conditions one can expect students to develop deep knowledge using ICT. These can give an idea of how ICT have been played a significant role in the development of new theoretical approaches on teaching and learning and how important it is to understand technology-based environments that can provide learners with new opportunities for activities which are beneficial for knowledge construction.

Previous research has been done on student collaboration using wikis (Judd, Kennedy & Cropper, 2010). Widely promoted as collaborative writing tools, wikis are gaining in popularity in educational settings. However, while wikis include features that are designed to facilitate collaboration, the few empirical studies that have considered this issue report that their use do not necessarily ensure or even encourage collaborative learning behavior (Judd *et al.*, 2010). Two important aspects denoted by Judd *et al.* (2010) show evidence that the majority of students' contributions were made late in the activity, which made the possibility of extensive collaboration unlikely; and that students made little use of the wiki's commenting feature - a critical tool for contextualizing and coordinating their contributions for and with others - which also made the possibility of extensive collaboration unlikely.

Online discussion forums are an increasingly common use of new information and communication technologies in education. As proposed by Judd *et al.* (2010), the common conception of the online discussion forum is that it is a virtual learning environment in which students are likely to learn as much from one another as from course materials or lectures. This point of view emphasizes that what students learn can be seen as a creative cognitive process of offering up ideas, having them criticized or expanded on, and being able to reshape ideas in the light of peer discussions. In other words, the rationale on forums shows evidence that, by reflecting on peers' contributions in online discussions and articulating emergent understanding, students engage in higher-order processing of information and are led towards the construction of personal meaning which is not individualistic, but rather a product of the students' interaction and collaboration. Judd *et al.* (2010) refer to some studies that point in the same direction: forums increase participation and collaborative thinking through the provision of asynchronous, nonhierarchical and reciprocal communication environments, as well as the academic discourse promotes increased student engagement, critical analysis and reflection, and the social construction of knowledge. Also, the findings of Yukselturk (2010) emphasized that students' workload and responsibilities as well as the planning of instructional activities in discussion forum, should be taken into account in designing online discussions.

Methodology

The curricular unit of CRM Systems was planned not only to allow the maxim participation of the students, but also to be centered on promotion of deep learning and reasoning skills by the students. To allow this, the curricular plan was designed to involve different methodologies to each specific learning outcome. To accomplish this, students were organized into groups according to some specific guidelines. The groups were mainly constituted of four students with homogeneous characteristics: similar grade average on a specific set of units of curricular plan, compatibility of time to work in group, and same registration system in the course. This information was previously identified through a simple questionnaire available on the university's e-learning platform. In a rotative mode (by activity), each group chose a student to be coordinator. Beyond the accomplishment as a group member, the coordinator has the added responsibility of ensuring the observation of a set of working rules, of reading and correcting all documents produced to ensure consistency among the work done, and of promoting cooperation and mutual aid between members. At the end of each activity, each student assesses not only his own performance but also the one of each of his colleagues.

Framed by the goals presented, four main learning outcomes can be defined. First, a successful learner from this curricular unit has to be able to identify the major phases that support customer relationship. In order to demonstrate that this specific learning outcome has been achieved, students are encouraged to prepare and present a lesson about each phase of the process. Therefore, after teacher has introduced the topic and encouraged students with questions for reflection (two lessons), students are invited to prepare and present their own lessons on the phases of customer relationship management. Finally, this topic is closed with another class where the professor presents and discusses with the students some important metrics to determine the implementation degree of each phase of the managing customer relationships process.

In what respects to the second learning outcome, on successful completion of the course, students have to be able to recognize the various levels of a CRM system and how they are integrated and related to the organizational objectives of relationship marketing. To demonstrate that this second learning outcome has been attained, students are encouraged to research about case studies describing, totally or partially, experiences on implementation of a CRM system. In this case, in each class and after teacher has presented the background of a CRM module system and has explained the functionalities that should support it in an organizational context, a brief contact with the CRM software is enhanced. In the second part of each class, one group presents the case study and the results of their analysis according to a formatting model previously set by the teacher. In particular, students are oriented to identify the type of situation portrayed, the main theme, the problem outlined and the decisions taken, the qualitative and the quantitative aspects highlighted, the technological solutions used and the functionalities that aim to support them.

While in the third learning outcome, students have to identify, distinguish and use the various features of each module of a CRM system and recognize how the modules are intertwined, in the fourth leaning outcome, students have to design and monitor a program of implementation of a CRM system (including the definition of the business plan, the analysis and the selection of a technological tool according with the business' objectives), and to manage the several projects that can be integrated in the process. The validation of these two learning outcomes is organized in two complementary parts, with students working in groups. On the one hand, students are asked to develop a summary report that conceptually characterizes the CRM systems. This is done using a wiki collaborative tool available on an e-learning platform. On the other hand, students are encouraged to simulate a business environment and the management of customers relationships using a complete open source software available on the market (VTigerCRM). This software allows the use in collaborative mode. In the end of course, the groups of students presented their business in class and deliver to the professor the portfolio describing the main results of their experience with the software. All these activities are also supported by discussion forums restricted between each group, and available through the e-learning platform.

Finally and in the last class, students are encouraged to answer one more questionnaire to register their opinion about the teaching-learning methodology used. It is important to notice that, in this case, the answers are pre-oriented on a Likert scale with 6 points, forcing the respondent to take a negative or positive position about his own perceptions. This is the unique anonymous questionnaire. A total of 28 students that attended the curricular unit in continuous assessment were included in the study. Data was collected through questionnaires available on the e-learning platform Moodle. Descriptive statistical techniques were used to analyze quantitative data.

Results and Discussion

Within the methodology previously defined, nine groups were found; three with 4 members, four with 3 members and two with 2 members.

Self-assessment and hetero-assessment of groups' activities

Data analysis concerning self and hetero-assessment of the groups' activities was organized around the four main learning outcomes previously defined: presentation of a lesson (Table 1), analysis and presentation of a case study (Table 2), and simulation of a business environment (Table 3).

Table 1. Results of self- assessment and hetero-assessment by groups concerning the presentation of a lesson

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members) (h)	Deviation between coordinator and other members (h)	Grade of self-assessment (coordinator)	Average grade of self-/hetero-assessment (group)
A	4	4	6	8,3	-2,3	4	4,4
B	4	3	7	4,0	3,0	4	4,0
C	3	3	22	20,0	2,0	4	4,7
D	4	4	37	26,3	10,7	4	4,8
E	2	2	10	10,0	0,0	5	5,0
F	3	3	12	12,5	-0,5	4	4,0
G	3	3	15	9,5	5,5	5	4,7
H	3	3	10	10,0	0,0	5	4,3
I	2	2	10	7,0	3,0	4	3,5

In what concerns the presentation of a lesson, the results of self- assessment and hetero-assessment by groups show that 27 out of 28 (96%) students did answer the questionnaire (Table 1). Noteworthy is the fact that the majority of the groups present a positive deviation between the time spent by the coordinator and the average time spent by other members, which seems to indicate that the coordinator did responsible shoulder his role. In fact, we can assume that if it was not like that, all the group work would have been compromised and the necessary time to fulfill the task proposed (prepare the presentation of the lesson) would be longer. However, the substantially different results between the groups relatively to the average time spent in the activity, makes us wonder about the relative merits of the work done. However this aspect does not seem to have occurred since all groups self-assessed with a 4 or even a 5 grade (good or very good performance). So, maybe the collaborative task did really get students actively involved in the learning process.

Table 2. Results of self- assessment and hetero-assessment by groups concerning the analysis and presentation of a case study

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members) (h)	Deviation between coordinator and other members (h)	Grade of self-assessment (coordinator)	Average grade of self-assessment (group)
A	4	4	4	3,7	0,3	4	4,3
B	4	3	3	4,0	-1,0	5	4,3
C	3	3	6	5,5	0,5	4	3,7
D	4	3	8	7,5	0,5	4	4,3
E	2	2	10	11,0	-1,0	5	5,0
F	3	3	20	7,5	12,5	4	4,0
G	3	1	-	3,0	-	-	4,0
H	3	3	10	11,5	-1,5	4	4,0
I	2	2	5	4,0	1,0	4	4,0

As regards to the analysis and presentation of a case study, Table 2 shows that 24 out of 28 (86%) students did answer the questionnaire. In this situation there are more cases of discrepancy between the time spent by the coordinator and the average time spent by other members. In fact, in three situations the deviation is negative. One more time, most groups self-assessed their performance as grade 4 or 5. Eventually, one can assume that the empirical nature of this task is much more appropriate to group discussion than the presentation of a lesson assumed to be much more in compliance with theoretical concepts and, consequently, easier to prepare.

Table 3. Results of self- assessment and hetero-assessment by groups concerning the use of a wiki tool and the simulation of a business environment

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members) (h)	Deviation between coordinator and other members (h)	Grade of self-assessment (coordinator)	Average grade of self-assessment (group)
A	4	2	25	12,0	13,0	5	4,5
B	4	3	-	9,7	-	-	4,3
C	3	3	20	32,5	-12,5	5	4,6
D	4	3	24	24,0	0,0	4	4,3
E	2	2	40	35,0	5,0	5	5,0
F	3	2	-	30,0	-	-	4,0
G	3	3	20	7,0	13,0	5	5,0
H	3	3	8	50,0	-42,0	4	3,9
I	2	2	6	48,0	-42,0	3	3,5

The Table 3 shows that the rate of respondents concerning to the last activity (use of wikis and CRM software) was of 82%, answering 23 students. In this case, the discrepancy between the time spent by the coordinator and the average time spent by other members is much higher and is verified in most groups. The performance is in most case classified as 4 or 5. The verified decrease of respondents in consecutive surveys could be explained either by saturation with consecutive requests to fill out questionnaires, or because the last questionnaire was completed by the end of the semester. Nevertheless, this isn't significant. Similarly to the previous results, and also probably, the complexity of the task (simulation of a business environment) seems to justify the greater involvement of the students and, consequently, the more time required to complete the mission. Another important conclusion is the possibility to perspective the role of collaborative tools at the level of working groups: less pragmatic tasks are more likely to be easily prepared by groups while more practical ones not only need more time but, more important, need the discussion inside the group.

Noteworthy is the fact that, in some groups, there is a big and negative deviation between the time spent by the coordinator and the average time spent by other members. We think that, maybe, this can be a symptom that, in these groups and consecutively, the same student performs a more role active even in activities where he isn't the coordinator. That conclusion seems even more important as this situation occurs in small groups of 2 or 3 elements members. Finally, it seems that data reflects the level of effort expected for each activity: the use of a wiki tool and the simulation of a business environment take more time than the presentation of a lesson and this, in turn, takes more time than the analysis and presentation of a case study.

Self-assessment of the teaching-learning methodologies used in class

In order to realize students' opinions on the teaching and learning methodologies used in the class, students were invited to answer a last and anonymous questionnaire available on the Moodle platform. In this questionnaire answered nineteen students aged between 20 and 39 years, eight males and eleven females. More, eleven students reclaim to be registered in "ordinary" scheme, seven as "student employee" scheme, and one as "leader associative". Concerning to their ability to write or communicate orally, in Portuguese language, all the students reported to have a satisfactory level, with the great majority assuming a good or very good ability. However, and in what concerns the ability to understand written and oral English, roughly a quarter of students reported that their ability was not satisfactory, Roughly half of the students rated their ability as "satisfies well" or "satisfies very well" (see Table 4). This is an important issue, because all the activities proposed implied to read and analyze literature, in English language, and consequent oral exposition, in Portuguese language, in class.

Table 4. Ability of expression/understanding of portuguese/english languages

	Number of students			
Scale	Ability to write (in Portuguese)	Ability to communicate orally (in Portuguese)	Ability to understand written English	Ability to understand oral English
Satisfies very well	6	10	3	4
Satisfies well	11	7	8	8
Satisfies	2	2	4	2
Satisfies little	0	0	2	3
Satisfies very little	0	0	0	1
No satisfies	0	0	2	1

Finally, we tried to understand the perceptions of the students about the resources and teaching and learning methodologies used in the class. As we can confirm in Table 5, the central tendency metrics show that students considered the use of collaborative tools very useful (average and mode 4). Considering each specific activity, we can conclude that the students considered the methodology used in the activity "simulation of a business" as the most suitable, followed by the "presentation of a lesson", and in last, "analysis and presentation of a case study".

Table 5. Resources and methodologies used in support of teaching-learning process

Resources and methodologies	Average	Mode
Use of collaborative tools (e.g. forums, wikis, etc.)	3,8	4
Presentation of a lesson	4,1	5
Analysis and presentation of a case study	3,5	4
Simulation of a business	4,6	6

It is important to notice that all the activities proposed had a component in the final grade on the CRM systems curricular unit. In fact, 40% from assessment on the evaluation test about the first learning outcome, 40% from assessment on the evaluation test about the second, third and fourth learning outcomes altogether, and 20% on the classification obtained in the following three items: activity of presentation a lesson, activity of analysis and presentation of a case study, and attitude in class during the semester (weights 50%, 20% and 30%, respectively). Also, we enhance that this class had the particularity to include students aged from 20 to 50 years, and obviously with different availabilities of time, given that many of them were employed. Furthermore, as the majority of the students were in the last year of the course, they were also doing their internship programs in different companies.

Despite the heterogeneity of the class and the constraints expressed in the preceding paragraph, students were receptive and motivated to carry out the proposed activities. Nevertheless, the two aspects denoted by Judd *et al.* (2010) of that the majority of students' contributions were made late in the activity, which made the possibility of extensive collaboration unlikely; and that students made little use of the wiki's commenting feature - a critical tool for contextualizing and coordinating their contributions for and with others - which also made the possibility of extensive collaboration unlikely, was completely verified in this case. In general, and as specified in literature by Judd *et al.* (2010), students delayed their contributions to the activities (especially in the last one) and ended up making little use of the potential for content development collaboratively via wiki tool, given the backward state of work in most groups.

Conclusions

More than a few authors (e.g. Neo & Neo, 2004) give emphasis to the infusion of the multimedia technology into the education arena. Particularly, traditional educational materials are been translated into interactive electronic forms through the use of multimedia tools, with the purpose of convening the message in an interactive learning environment. So, the conventional chalk-and-talk method is moving away to one which uses multimedia platform in teaching and learning. And, as the present generation becomes more familiar with computers and the internet, they are going to expect information in the classrooms to be delivered in the same design. Within the research questions proposed, one can say that the study, although it did not embrace a huge number of participants, points toward some understanding of how a collaborative learning environment seems to get students actively involved in the learning process mainly if the tasks to be perform have an empirical component. More, one can say that the study also has shown that students seem to identify themselves with the need to be involved in simulations of their future professional activity, as well as with the need to regulate their own learning (preparation and presentation of lessons) and to promote discussion not only between peers but also with the teacher.

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DESIGN AND DEVELOPMENT OF MULTIMEDIA PRONUNCIATION LEARNING MANAGEMENT SYSTEM FOR NON-NATIVE ENGLISH SPEAKERS

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Abstract

Pronunciation continues to grow in importance because of its central roles in speech communication and speaker identity. However, correct pronunciation has been the concern among non-native English speakers as they tend to carry the intonation, phonological processes and pronunciation rules from their mother tongue into the pronunciation of English language. To address the issues of mispronunciation, this study designs and develops the Multimedia Pronunciation Learning Management System (MPLMS) by digitising the universally agreed system of phonetic symbols with full face motions or mouth movements. This paper discusses the design and development of the MPLMS based upon Alessi and Trollip's instructional system design model.

Keywords: Multimedia Pronunciation Learning Management System; design; development; Alessi and Trollip model

Introduction

Pronunciation continues to grow in importance because of its central roles in speech communication and speaker identity. Being able to communicate in English is relatively indispensable in today's world in the light of the increased people's mobility, joint study programmes, commercial networks, information technology, medicine, diplomacy, and many more. Moreover, the relationship between pronunciation and social power cannot be dismissed (Mishra & Sharma, 2005). People with proficient pronunciation are commonly regarded as more professional and they are respected by given higher social status.

On the contrary, mispronunciation leads to embarrassment, misunderstanding and communication breakdown. The globalised business networks and commercial industries particularly require the people to communicate with their counterparts across borders in English. Miscommunication may thus cause unpleasant social relationships and the loss of investment.

In specific cases, non-native English speakers have the tendency of carrying the intonation, phonological processes and pronunciation rules from their mother tongue into the pronunciation of English language which causes incorrect pronunciation. For instance,

- Lack: Japanese language does not have the two sounds /l/ and /r/ as contrasting phonemes, and hence Japanese learners mistakenly produce "right" /raɪt/ as /laɪt/ (Aoyama, Flege, Guion, Akahane-Yamada, & Yamada, 2004).
- Substitution: Learners of Malay descent substitute /θ/ with /t/, such as "thin" / θɪn/ is replaced with /tɪn/ because /θ/ does not occur in Malay language (Cambridge University Press, 2002).
- Epenthesis: "Some" / sʌm / is mispronounced as / sʌmʊ/ by learners in China. As there is no consonant, vowel, consonant (CVC) structure in Chinese ordinary speech, therefore, learners may insert one vowel to the last letter of words and CVC becomes CVCV (consonant, vowel, consonant, vowel) (Jenkins, 2000; Lai, Tsai, & Yu, 2009; Wang, 2003).
- Simplification: Thai learners reduce final clusters to a single manageable final consonant, such as "pump" /pʌmp/ is simplified as /pʌm/ (Cambridge University Press, 2002).

To address the issues of mispronunciation across all cultures, this study designs and develops the Multimedia Pronunciation Learning Management System (MPLMS) by using the universally agreed system of phonetic

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symbols, the International Phonetic Alphabet (IPA) throughout the whole repository. The phonetic symbols are digitised with clickable sounds accompanying full face motions or mouth movements (see Figure 1 and Figure 2 below) , which will make a profound impact on the new curriculum of teaching and learning of English pronunciation. As known, the phonetic symbols are widely accessible in dictionaries and they serve as a guide for standard English pronunciation. With the MPLMS of optimising the strengths of phonetic symbols, the learners are to be retrained for correct pronunciation understood by all (Por & Fong, 2011b).

Figure 1. MPLMS with Full Face Motions

Figure 2. MPLMS with Mouth Movements

The conventional method of face-to-face teaching is constrained by the limitations of accessibility, such as time, space and number of learners. Furthermore, a teacher can only repeat the pronunciation of a word for limited times and with varied quality each time. These limitations are to be overcome through the MPLMS which allows infinite repetition drills and practices with sustainable quality inputs but without the loss of patience and depletion of energy. An excellent teacher of pronunciation may only be able to teach 200 learners effectively at most, but the MPLMS is able to extensively reach out to millions and billions of learners. Hence, it is cost effective and is affordable by the real bottom billions in underdeveloped countries. In addition, the MPLMS provides individualized instruction and automatic visual support that demonstrates to learners how closely their own pronunciation approximates model utterances.

The MPLMS is to be realized through the synergy of educational technology, computer science, linguistics, and curriculum. It is not about replacing the classroom setting, but to enhance it and to take advantage of new content and delivery technologies to enable continuous learning of correct pronunciation.

Design and Development of MPLMS

The MPLMS, as its name suggests, is a web-based multimedia pronunciation content management system designed for non-native English speakers to improve their pronunciation accuracy. The MPLMS is a dynamic website with database management system and web application. Database is a collection of one or more data files or tables stored in a structured manner. In such manner, the interrelationships exist between different items or sets of data can be utilised by the data management system for manipulation and retrieval (Isrd Group, 2006). The data files in this study include audio files of phonetic symbols, syllables, sample words, minimal pairs; video files of full face motions and mouth movements; animations of 24 consonant phonemes, texts and graphics. Looking at the dynamic features of MPLMS, the online data can be maintained, customized and upgraded easily according to the current needs. Learners will always have the latest information. On the contrary, static websites which commonly found on the Internet are basic with stagnant content and the pages are limited to approximately 20. Moreover, the data can only be updated by programmer with knowledge of website development, whenever a change is needed the html (HyperText Markup Language) file needs to be re-opened, edited and saved. HTML is the basic coding protocol to display web pages and other information in a web browser.

The MPLMS turns the web to a dynamic user-centric collection of consistent and timely information (Strauss, 2002) in the learning of correct pronunciation. It is accessible through the Internet anytime, anywhere by unlimited number of people all over the world synchronously and asynchronously for quality sustainable learning. This is a digital evolution compared to the pronunciation learning software in the market where the learning contents and interactive practices are presented in CD format or in static websites in which information is hardly revised and the progress of individual user is difficult to be tracked in detail.

The three-phase Alessi and Trollip Instructional System Design (ISD) model – Planning, Design, Development – is adopted in the development of the MPLMS in view of its detailed and comprehensive development scheme from paper work to the actual end product. Alessi and Trollip stressed the importance of sequencing events and recommended the use of storyboarding to facilitate pilot testing on learners (Hunter & Ellis, 2000). This model is driven by principles of cognitive psychology, including perception and attention, encoding, memory, comprehension, active learning and individual differences (Alessi & Trollip, 2001). It is based on considering instruction from the perspective of the learners, unlike traditional educational approaches which stem from the perspective of the content. The Alessi and Trollip ISD model is illustrated in Figure 3 below.

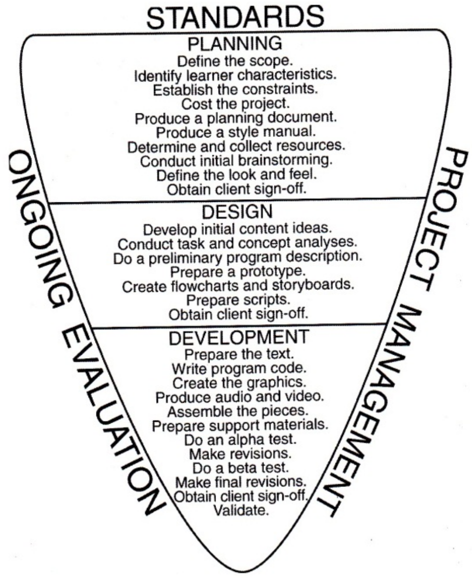

Figure 3. The Alessi and Trollip Instructional System Design (ISD) Model

In the Alessi and Trollip ISD model of developing the interactive MPLMS, there are three attributes which are always present – Standards, Ongoing Evaluation, and Project Management. They are the principles that applied to the whole process of design and development, and they form the good foundation. By clearly setting the standards, the development of the MPLMS is monitored to operate within the benchmark. Besides, ongoing evaluation is done at each stage whereby a continual iterative approach is employed until all functionalities have been achieved. The development is flexible with each step depends on the result of the previous step. Project management is another emphasis in this model to ensure the MPLMS is completed within the time frame and the allotted budget. With good project management, slippage can be contained while still maintaining desired standards (Por & Fong, 2011a).

Planning

In this first phase – planning, a proper groundwork is laid to ensure all aspects of the system flow smoothly. It begins with defining the scope. The learning content of the MPLMS covers the sounds of phonetic symbols, including consonants, vowels, and diphthongs. Interactive enhancement exercises are also included. After the scope is defined, learner characteristics are assessed. The target learners of the MPLMS are young non-native English speakers aged between 10 and 12. These young learners should be exposed to their second language or foreign language as early to allow them optimise their learning potential and help shape the brain at its flexible stage. Children at this range of age have acquired basic computer literacy which enables them to navigate the MPLMS meaningfully. Constraints of the system development are established to ensure issues that impact the design and development are studied, such as the compatibility of hardware and server system, the potential software, available budget, deadlines and relevant permissions to be obtained. The stages of the study are clearly set in the planning phase to monitor the progress and to ensure milestone achievement is accomplished according to schedule. Table 1 below demonstrates the stages of this study.

Table 1. The Stages of Design and Development MPLMS

Stage No.	Description
1	Prepare needs, syllabus, task and concept analyses
2	Outline instructional design
3	Draft storyboards
4	Build prototype
5	Do video recording
6	Edit the recordings and convert them into 3 modes: full face motions, mouth movements, sound only
7	Conduct usability test
8	Collect, analyse data and revise prototype
9	Complete the development of the MPLMS
10	Conduct usability test and revise the MPLMS
11	Validate the MPLMS
12	Complete the final product of the MPLMS
13	Do write-ups on the learning modules and reports

Design

The design phase is the most creative as it deals with the activities of assembling the content and deciding on how it is to be treated from both an instructional and interactive perspective that will help the target learners achieve the intended learning outcomes.

2.2.1.Conduct task and concept analyses

Task analysis is used primarily for procedural skills, whereas concept analysis is generally used for viewing concepts and their interrelationships. The algorithm refers to the computational procedure for solving a problem in a finite number of steps. The basic analyses are illustrated in Figure 4 and Figure 5.

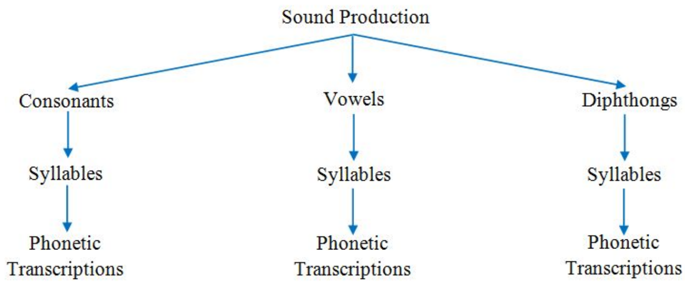

Figure 4. Task Analysis of Sound Production

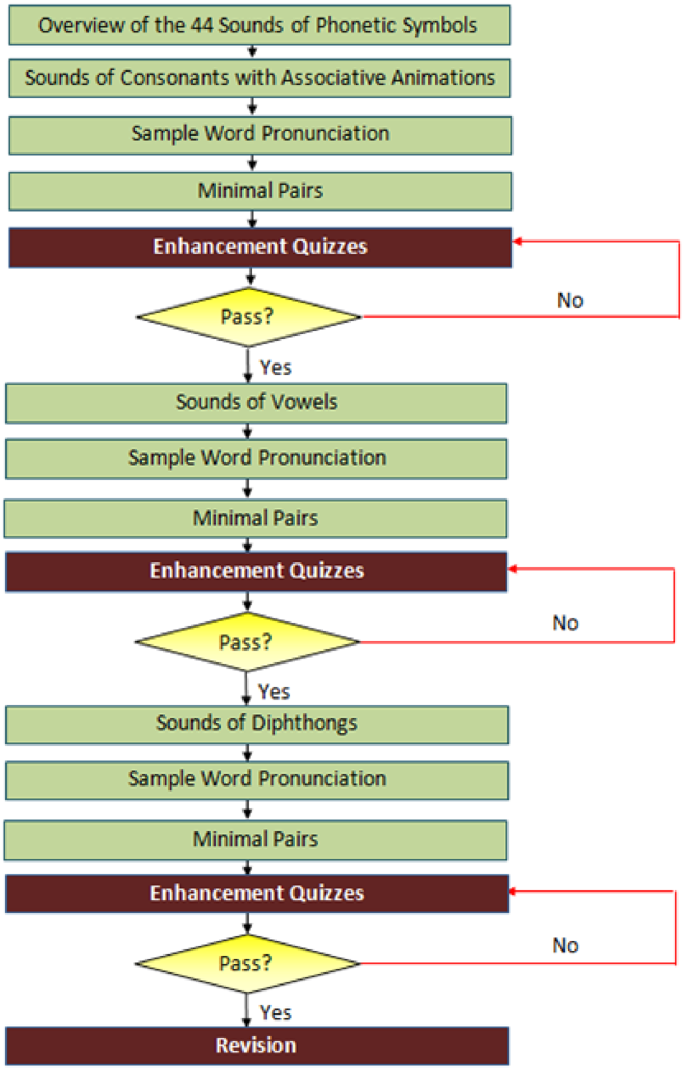

Figure 5. Concept Analysis of the MPLMS

2.2.2.Prepare prototype and create flowchart

After analysing the tasks and concepts, all the ideas are integrated for the MPLMS to work as a whole. A prototype is prepared to illustrate a concrete example for others to react to it and provide feedback (see Figure 6). The aim of prototyping is to enable inputs from the experts and end users at an early stage by giving them the look and feel of the application. Similarly, flowchart reveals the structure and sequence of the instruction. A good flowchart reduces the risk of poor programming. The flowchart that shows the programme sequence of the MPLMS from beginning to end is presented in Figure 7.

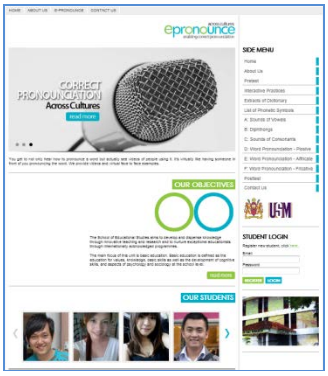

Figure 6. Prototype of the MPLMS

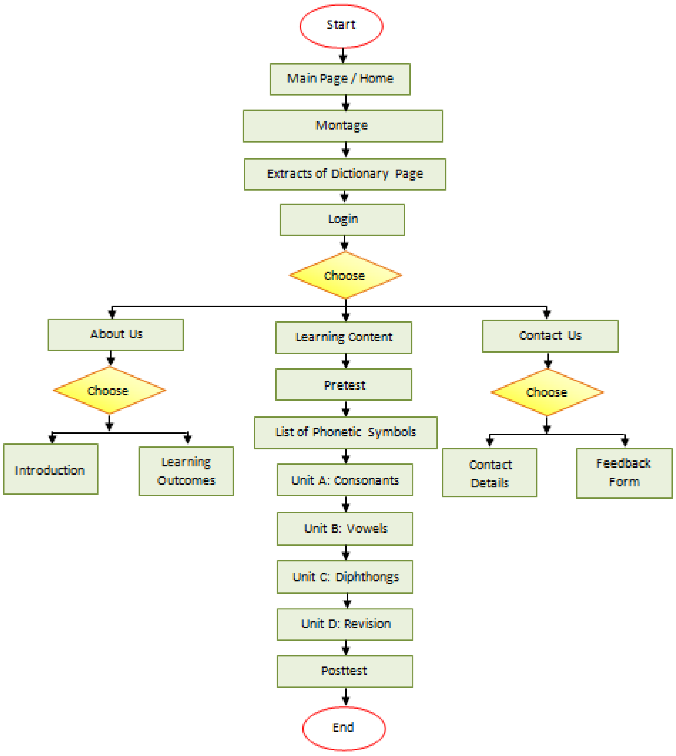

Figure 7. Flowchart of the MPLMS

Development

The third phase is taking the design of the MPLMS and turning it into a robust system. The development is a collaborative process. It includes the preparation and production of texts, graphics, audio and video materials, as well as the development of support materials. It is a demanding part of the overall process and requires a variety of skills. The overall database relationship for the development is summarized in Figure 8 below.

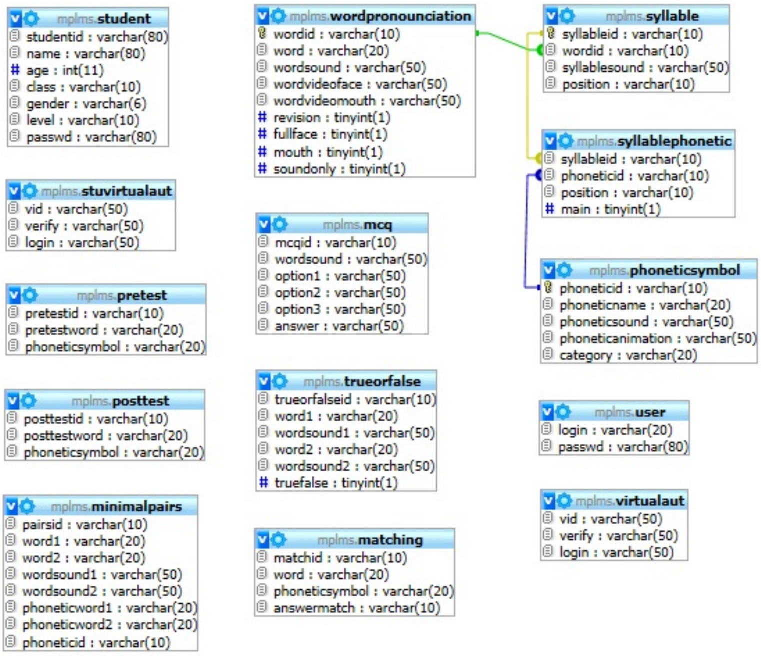

Figure 8. Database Relationship

In this study, the viability of the MPLMS is evaluated through a series of formative tests, and usability testing is also conducted to evaluate the ease of use, aesthetics as well as the educational efficiency of the system. Formative evaluation is used with the intention of improving the quality of the MPLMS throughout its design and development by examining the delivery of the system, the quality of its implementation and the organisational context, structures and procedures (Bevan, Singhal, Werner, Degler, & Wilson, 2009). The usability testing is essential for the overall quality of learning and the system on the basis of interface. Usability ensures the ease of learnability of the learning environment, user-friendliness and visually attractive which increases the effectiveness (Durdu, Yalabik, & Cagiltay, 2009). Ongoing evaluation and revision are essential elements throughout the whole development process to ensure the finished product of MPLMS is robust and effective to help learners attain the desired learning outcomes. During the entire development phase, the costs and time are monitored closely to ensure the MPLMS is done on time and within the allotted budget.

Conclusion

To provide relevant educational tool, the MPLMS is pedagogically addressed and theoretically based. The design and development start from a well-articulated theoretical position and an overall goal for performance is determined in consideration of the learners' characteristics, language proficiency and needs. The learning contents are also built in such a way of developing pronunciation skills in stages by allowing learners to navigate the programmes sequentially. Total freedom of leaving the learners clicking the buttons randomly and aimlessly may not achieve positive learning outcomes (Pennington, 1999).

This paper provides a comprehensive overview of the design and development of the MPLMS which is convincingly expected to supplement the learning of pronunciation among non-native English speakers. The MPLMS is designed and developed in a systematic process within the context based upon Alessi and Trollip

Instructional System Design (ISD) model that help reduce both the product's development time and costs while ensuring quality.

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DESIGN AND DEVELOPMENT OF A CLOUD-BASED SIGN LANGUAGE CENTER USING GOOGLE SITES

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Abstract

This paper shares an innovative approach in the development of a Cloud-based Sign Language Center (CSLC). Based upon the Alessi and Trollip Instructional System design Model, the CSLC was developed using the Google Sites as the main platform and incorporating Google Docs, Profprofs.com and Camtasia Studio to create a rich student centred learning environment. This CSLC is designed to be a sustainable system to supplement the learning of sign language among hearing-impaired learners as well as hearing parents and the general public. Implications of the design and the use of cloud-based tools shall be discussed.

Keywords: Cloud-Based Sign Language Center; design; development; Alessi and Trollip model

Introduction

People with hearing loss are apprehensive about communicating with their peers, family members, and especially the general public. They rarely receive sufficient language intervention to consistently achieve linguistic competencies that allow effective communication, socialization, and thinking skills. The deaf community continue to suffer from significant delays in social skills as well as from difficulties in cognitive development, including academic areas such as literacy, math, and problem solving, as compared to same-age peers with normal hearing (Marschark, 2003). Sad to say that, hearing loss has depleted their language development and even social proficiency.

In general, the majority of Malaysian deaf and hearing-impaired depend on visual communication of the Malaysian Sign Language (MSL) (Malaysian Federation of the Deaf, 2000) for communicating with each other. However, there are challenges of limited face-to-face tutors to train them sign language and to support linguistic intervention. Facilities of teaching and learning aids are still lacking. People with normal hearing who are interested to communicate with the deaf community, including their parents, siblings, friends and general public, also face barriers in finding available resources to learn sign language.

The study aims to develop an innovative approach of a Cloud-based Sign Language Center (CSLC) with close to zero-cost using components freely available in the public domain. CSLC is convincingly expected to equip both the normal-hearing and hearing-impaired learners with basic sign language skills at anytime and anywhere. In the CSLC, alphabets, numbers and a wide range of vocabulary terms are digitised with sounds accompanying hand movements and facial expressions based upon the Malaysian Sign Language (MSL). Figure 1 is a screen capture of CSLC sign language video tutorial in action.

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Figure 1. CSLC Sign Language Video Tutorial

The traditional face-to-face sign language instruction is inhibited by the limitations of time, space and number of learners. Furthermore, a teacher can only repeat the sign language of a word for limited times to a limited group. These can be overcome through the implementation of CSLC which allows infinite repetition across geographical boundaries without the loss of patience and energy. An excellent teacher of sign language may only be able to teach a limited number of learners effectively at any one time, but the CSLC is extensively accessible anywhere, anytime by unlimited number of learners. Hence, it is cost effective and is affordable by the bottom billion. The CSLC will enhance the classroom setting for the deaf and hearing-impaired by taking advantage of the new content and delivery technologies to enable continuous learning of MSL.

Design and Development of CSLC

CSLC is basically an interactive cloud-based e-learning environment operating within Google Sites. It incorporates free or low cost services readily available such as Google Docs, ProProfs.com and Camtasia Studio to create a rich student-centred learning environment.

CSLC basically operates through virtual servers available over the Internet. It allows learners to log into the cloud-based services which host sign language trainings with associated on-line supports and assessment designed for hearing-impaired learners to acquire sign language skills. In CSLC, there is a significant workload shift from local computers to the network of computers which form the cloud. Hardware and software demands on local computers decrease and the web browser is the only requirement on the user's side (Strickland, 2012). According to Leeson and Sheikh (2007), cloud-based learning environment offers a significant impact on learning for deaf or hearing-impaired learners as the comprehensive collection of sign language video tutorials in CSLC provides individualized instruction and visual support for conveying learning content through facial expressions and hand movements. Learners are also provided with self-evaluating multiple choice quizzes and immediate feedbacks, which allow them to assess their comprehension of sign language skills after completing a topic. In addition, reporting features of Proprofs' Quiz Maker provide teachers with relevant indicators of the learner's needs and lacks and enable teachers to track quiz performance.

To achieve meaningful integration of technology, instructional design and development must be based upon didactically tested models and principles with emphasis placed on the use of technology enhanced learning (Zimnas, Kleftouris & Valkanos, 2009). In the present study, developing and implementing CSLC is a combination of instructional design, multimedia development, usability, and information architecture in accordance with the Alessi and Trollip's Instructional System Design (ISD) Model – Planning, Design and Development. The CSLC framework is illustrated in Figure 2 below.

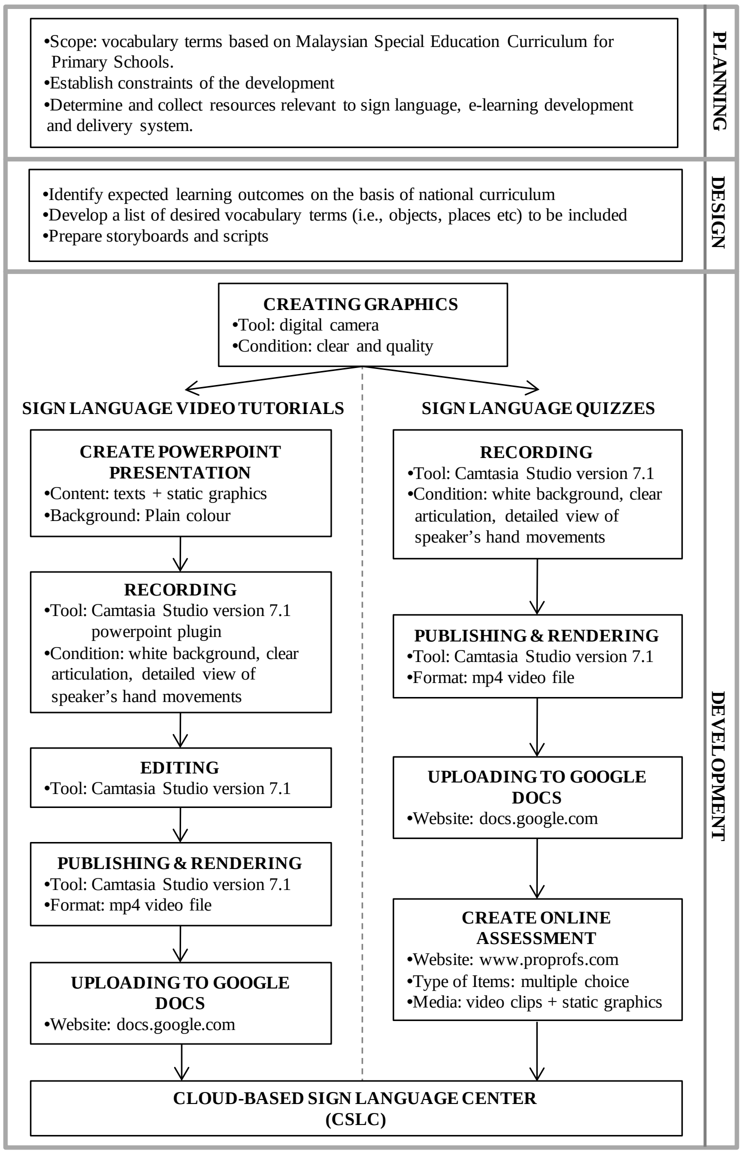

Figure 2. The CSLC Framework based upon the Alessi and Trollip Instructional System Design (ISD) Model

The Planning Phase

An effective instruction, whether traditional or networked, begins with careful and detailed planning to eliminate problems that may surface later in the design and development process. The learning content of the CSLC covers the Malaysian Sign Language (MSL) alphabets, number and a wide range of basic vocabulary terms from the national curriculum.

The Design Phase

This phase involves activities of assembling the content and documenting the best means of achieving the intended learning outcomes. Prior to the development of CSLC, a long list of vocabulary terms are carefully selected from the national curriculum, followed by the preliminary storyboard and script preparation.

The Development Phase

The development of CSLC begins with the preparation of high quality digital images corresponding to the selected vocabulary terms, followed by the production of sign language video tutorials and online assessment quizzes.

2.3.1. Sign Language Video Tutorials

Working from the storyboard, PowerPoint presentation comprising text (i.e., alphabets, numbers or vocabulary terms) with its corresponding static image is produced. The presentation is then recorded along with the instructor's narration, facial expressions and hand movements using the Camtasia Studio Powerpoint Add-Ins. The recording of the presentation is saved as Camtasia Studio project file (.camproj) and it is further enhanced with Camtasia Studio's editing tools such as zoom and pan, callouts, transitions and captions (See Figure 3).

Figure 3. Editing the Recording of Powerpoint Presentation in Camtasia Studio

The edited video is published as an mp4 video file and subsequently uploaded to the Google Docs server. Finally, the video file that has been stored in the Google Docs is inserted into CSLC Google Sites page (see Figure 4).

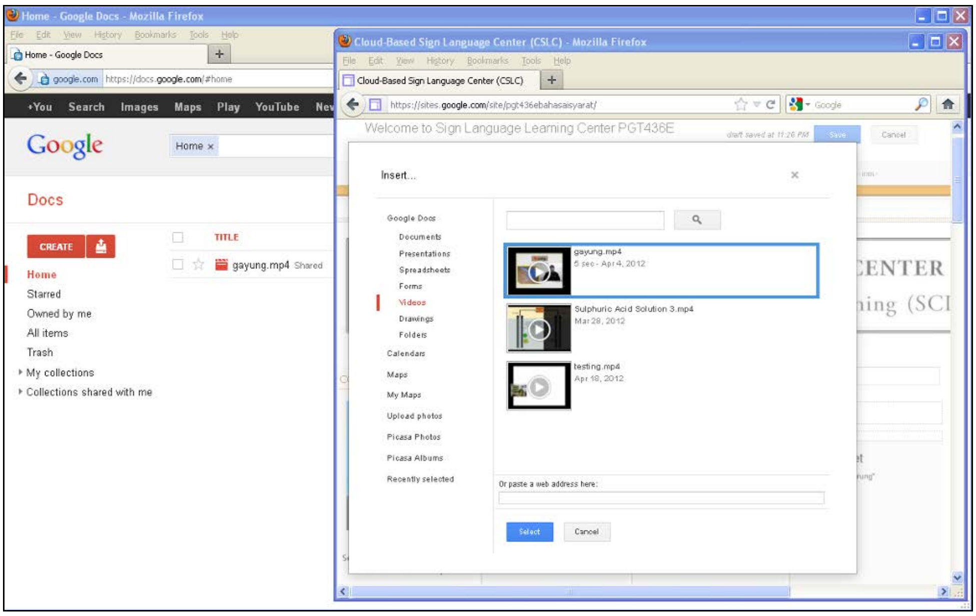

Figure 4. Inserting Google Docs Video into CSLC Google Sites

2.3.2. Sign Language Quizzes

Online self-assessing multiple choice quizzes are generated in a free online quiz making website named Proprofs.com. Static images as well as video that have been uploaded to the Google Docs server are incorporated into each question. Specific feedback option is enabled, allowing instant feedback being displayed after each quiz is attempted based on learner's response.

Once the quizzes have been created, they can be easily customized and integrated into CSLC website. The embed code of the quizzes are first obtained from the Proprofs.com account and subsequently pasted into a Google's Embed Gadget in CSLC Google Sites page (See Figure 5).

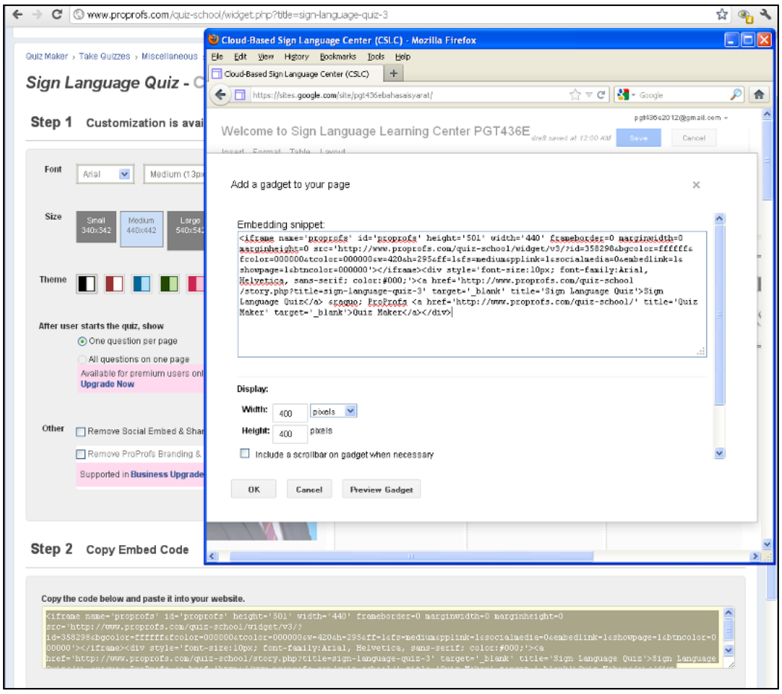

Figure 5. Embedding Quiz from Proprofs.com into CSLC Google Sites

Implication

Instead of traditional instruction, CSLC takes advantage of advanced delivery technologies to enable more interactive and meaningful way of sign language learning. Looking at its unlimited accessibility and reusability coupled with individualized and dynamic learning content, CSLC also promotes continuous acquisition of sign language skills and ensures quality sustainable learning.

CSLC acts as sign language learning resources centre would not merely benefit the deaf community, but also favours the development of sign language skills among the hearing parents and general public. This will eventually contribute to the promotion of effective communication, which in turns, bridging the gap between the hearing and the deaf worlds.

In addition, CSLC gives the deaf or hearing-impaired learners chance to be professional in the era of advanced information and communications technology and develop their own potentials concurrently. In effect, the deaf and hard-of-hearing individual becomes more gainfully employed and self-reliant in future.

Conclusion

This paper aims at the development and implementation of CSLC that is designed specifically to address the problems faced by deaf and hearing-impaired learners. Instructional system design model of Alessi and Trollip is adopted to ensure the whole design and development process flow smoothly and systematically. The CSLC seemingly facilitates sign language learning in a more interactive and interesting cloud-based environment. It is particularly helpful for the hearing-impaired as well as the hearing parents and general public.

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DETERMINING THE RELATIONSHIP BETWEEN MEDIA LITERACY AND SOCIAL SKILLS

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Abstract

In this study, determining the relationship between media literacy and social skill levels of the eighth grade primary school students, considering various variables, is aimed. With this design, the questions of whether the relationship between media literacy and social skill levels of the eighth grade primary school students differs significantly according to gender, having access to internet; as well as whether there is a relationship between media literacy and social skill levels are tried to be answered. This study is based on correlative survey model among general survey models. The study group consists of 947 eighth grade primary school students who study at the schools selected randomly from five different educational areas in the city center of Elazığ. Economical conditions and family profiles were considered in selection of those schools. In the study, two different assessment scales have been used to receive students' opinions. One of them is the "Level Determination Scale for Media Literacy" which was developed by Karaman ve Karataş (2009) and the other one is the "Social Skill Inventory", as translated into Turkish by Galip Yüksel in 2004, which was developed by Riggio in 1989. The study has showed that there is not a significant relationship between media literacy level and social skill level. Considering the relationship according to the sub-factors, it is observed that there is a relationship between some sub-factors; however this relationship is very weak. It is observed that gender of the students does not form a significant difference for media literacy but it does for social skill level. Furthermore, female students' social skill levels are found to be higher. It is observed that the school which the students attend affects neither media literacy nor social skill levels.

Keywords: Media Literacy, Social Skill, Social Development, Primary Education

Introduction

Media Literacy

The purpose of media literacy is to develop individuals as citizens aware of their democratic rights as they are using media, warn them not to be unconcerned for social problems and make them more equipped against media manipulation (Cangöz, 2008). According to the defition by Europe's Information Society (2007), apart from having easy communication in all media, media literacy is the ability of accessing images, words or sounds in daily life; analysing and evaluating them. Gilster (1997), defined media literacy as having information and critical conception about the nature, technique and effect of mass media. When all these definitons are analysed as a whole it is seen that inquiry, or in other word criticism stands in the forefront. As the concept of media literacy is analysed critically it can be argued that it is comparatibility of the content presented in general with the reality in daily life (Apak, 2008).

When the development of media literacy in Turkey is investigated it is seen that it was first brought up in the Council of Communication in 2003, then with the advice of Radio and Television Suprime Council it was brought up again in 2004 in the final report of Media and Violence Working Group acting according to course of action. In accordance with these works media litearcy lesson was instructed in 2006-2007 academic year with the cooperation of Radio and Television Suprime Council and Ministry of National Education in five pilot cities (Ankara, İstanbul, İzmir, Adana, Erzurum), then in 2007-2008 academic year it was instructed as optional lesson for the second grade of primary schools.

Social Skills

According to Hops (1983) social skill is the style of behavior in a social situation. Dowrick (1986:5) defines it as “skill of behaving in a useful and appropriate way for self, others and social norms in a certain situation”. Gresham and Eliot (1990), defines it as “one’s acceptable behaviors learnt socially that provide interaction with others by abstaning from socially unacceptable behaviors” (cited by Yüksel, 2004).

Various structures forming social skills have been developed based on these definitions. The structure created by Riggio (1989) is one of the most acceptable ones all around the world. Riggio (1989) states sub-factors forming social skills. In the Social Skilsl Inventory developed by Riggio social skills and stuctures forming social skills were approached as in the following: 1. Emotional expressivity, 2. Emotional sensitivity, 3. Emotional control, 4. Social expressivity, 5. Social sensitivity, 6. Social control.

There are social skills students in the first grade of primary education are supposed to acquire. Significant social risks may be emerged if they can’t acquire these skills. The skills mentioned are as in the following (Yüksel, 2004): 1. Simple Skills of Communication. 2. Skills of Sharing. 3. Skills of Obeying Rules. 4. Skills of Enterprising and Cooperation. 5. Skills of Defining Objects and Making Decision.

The ages between 7 and 11 are among the most significant terms during which students’ tendency for behaving as their teachers do is quite dense. Besides curriculum and child’s social quality, primary school teacher’s social qualities have an effect on children’s social development (Yüksel, 2011). Teacher has an important role both as a teacher and as a model in the process during which children acquire basic social skills. Thus, primary school teachers’ social skills and the reasons of the factors forming these skills are thought to be important. The purpose of this study is to determine the relationship between media literacy and social skills according to the variables of gender and having a computer.

Method

Working Group

This study is based on correlative survey model among general survey models. The universe of the study consists of 8th grade students in 63 primary schools in Elazığ in 2009-2010 academic year. As studying the whole universe of the study and collecting data is difficult within this universe, sampling method was used. In deciding the sample the regions of the schools in the universe were considered. Schools were selected randomly among the schools in five different education areas . 68 students from Ziya Gökalp Primary School in Karşıyaka Education Area, 325 students from Mezre Primary School in Fırat Education Area, 250 students from İsmetpaşa Primary School in Harput Education Area, 176 students from Şair Hayri Primary School in Hazar Education Area and 128 students from Bahçelievler Primary School. Total 947 students participated in the study. However due to some students’ absence, the total number of participant students were 821. To enable all students read and answer carefully all the questions they were given, the required information was given beforehand and thus all students read the questions. So none of the surveys used in this study was omitted.

Data Collecting Tools

In the study two different evaluating scales were used. One of these scales is Level Determination Scale for Media Literacy and the other one is Social Skills Inventory. As the scale of media literacy, Level Determination Scale for Media Literacy developed by Karaman and Karataş (2009) was used. While developing the original of this scale experts’ opinions were asked and exploratory factor analysis was used and a structure containing 17 items and 3 factors (Having information, being able to analyse and react, being able to judge and see the implied messages) was gained. In the original form of the scale Cronbach Alpha value was found as .840 for the realibility. As the result of the analysis using our own data the realibility coefficient was found as r=.893. The value of Kaiser-Meyer-Olkin (KMO) that is used to determine the sample adequitness was found as .888 . The result of Barlett’s test was significant (909,035, sd: 136, p:00).

The Scale of Social Skills Inventory developed by Riggio in 1989 and translated into Turkish by Galip Yüksel in 2004 was used (Yüksel, 2004: 31). Social Skills Inventory takes 30-45 minutes and individuals 14 years old and above can apply themselves easily. This scale contains 90 items and six subscales (Emotional Expressivity, Emotional Sensitivity, Emotional Control, Social Expressivity, Social Sensitivity, Social Control). The inventory is 5 point Likert type. The cooefficient of realibility of the orijinal form of the scale is r=.94 (Yüksel, 2004:31). According to the analysis in this study the realibility was found as r=.932. In the confirmatory factor analysis, the value of Kaiser-Meyer-Olkin which defines the criterion of sample adequateness was .130 . Barlett’s test was significant (7290,66 sd: 4005, p:00).

Data Analysis

Personal Information

50,5 percent of the students participated in the research are female. 68,6 percent of these students have computer at home.

Analysis Regarding Media Literacy

There isn't a significant difference between media literacy and gender according to the result of t-test [t=1,144; p<.05]. Female students' level of media literacy is higher ($\overline{X}$ =3,95) than the male students' ($\overline{X}$ =3,89).

Also, there is a significant difference between media literacy and having a computer at home according to the result of t-test [t=2,345; p<.05]. Media literacy level of the students who have computer at home is higher ($\overline{X}$ =3,96) than the ones who don't have computer at home($\overline{X}$ =3,83). It can be argued that having computer at home affects the level of media literacy.

The relationship among sub-factors of the Media Literacy Scale was analysed. According to Table 1, all relations among factors are significant and positive (p<.01). The highest relationship is between "having information" and "being able to judge and see the implied messages" (r=.662). The highest value is in the factor "having information" (r= .892), the lowest value is in the factor "being able to judge and see the implied messages" (r= .793).

Table 1.The Relationship of The Scale of Students' Media Literacy with its Sub-factors

	Being able to analyse and react	*Being able to judge and see the implied messages*	*Total*
Having information	,662(**)	,582(**)	,892(**)
Being able to analyse and react		,580(**)	,886(**)
Being able to judge and see the implied messages			,793(**)

** p<0.01

3.3.Analysis Regarding Social Skills

According to t-test there is a significant difference between social skills and gender [t=3,370; p<.05]. Female students' level of social skills is higher ($\overline{X}$ =3,11)than the male students' level of social skills ($\overline{X}$ =2,97). There isn't a significant difference between the level of social skills and having computer at home [t=1,770; p<.05]. The level of media literacy of the students who have computer at home is higher ($\overline{X}$ =3,07) than the students who don't have computer at home ($\overline{X}$ =3,07).

Table 2. The Relationship Among Sub-Factors Of Social Skills Scale

	Emotional Expressivity	*Emotional Control*	*Social Expressivity*	*Social Sensitivity*	*Social Control*	*Total*
Emotional Sensitivity	,708(**)	,569(**)	,553(**)	,504(**)	,468(**)	,784(**)
Emotional Expressivity		,612(**)	,565(**)	,561(**)	,562(**)	,827(**)
Emotional Control			,709(**)	,641(**)	,580(**)	,839(**)
Social Expressivity				,593(**)	,600(**)	,815(**)
Social Sensitivity					,755(**)	,821(**)
Social Control						,806(**)

** p<0.01

The relationship between sub-factors of social skills scale was analysed. According to Table 2 the relationship among factors is significant ($p<.01$) and positive. The highest relationship among factors is the one between “Social Control” and “Social Sensitivity” ($r=.755$), the lowest relationship is the one between “Social Control” and “Emotional Sensitivity” ($r=.468$). However, values of factors and total values are related to each other and there is a close and high relationship within each other. “Emotional Control” factor has the highest value ($r= .839$), “Emotional Sensitivity” has the lowest factor ($r= .784$).

3.4.The Relationship Between Students’ Social Skills and Media Literacy

There isn’t a significant relationship between students’ level of social skills and media literacy (Table 3).

Table 3. The Relationship Between Social Skills And Media Literacy, Values Of ss And $\bar{X}$

		Social Skill	***Media Literacy***
Social Skill	N	821	821
	r	1	,061**
	p		,081
		Social Skill	*Media Literacy*
Media Literacy	N	821	821
	r	,061**	1
	p	,081	

Sub-Factors	$\bar{X}$	ss	N
Emotional Sensitivity	3,2145	,7250	821
Emotional Expressivity	2,8539	,6411	821
Emotional Control	3,0636	,6922	821
Social Expressivity	3,1366	,7161	821
Social Sensitivity	3,0540	,6905	821
Social Control	2,7765	,6309	821
Having Information	4,1754	,7123	821
Being able to analyse and react	3,7245	,8405	820
Being able to judge and see the implied messages	3,9158	,8718	819

Conclusion and Discussion

As conclusion there isn’t a significant relation between level of social skills and media literacy. Thus it can be argued that an individual who is media literate may not have a good level of social skills.

There is significant and positive relationship between the sub-factors of the students’ media literacy scale and the sub-factors of social skills scale. The highest relationship in media literacy scale is between “Having information” and “ Being able to judge and see the implied messages”. The highest relationship in social skills scale is between “Social Control” and “Social Sensitivity”, the lowest relationship is between “Social Control” and “Emotional Sensitivity”.

There is a significant difference between social skills and gender. Female students’ level of social skills is higher ($\bar{X}$ =3,11) than the male students’ level of social skills ($\bar{X}$ =2,97). This result is parallel to the research by Seven and Yoldaş (2007). However, contrary to the result in this study, female students’ level of social skills is lower than male students’ level of social skills in the study mentioned above. So male students have higher level of social skills than female students in that study. This finding doesn’t support the finding that female students have more social skills than male students in Jamyang-Tshering’s (2004); Kazdin’s (1985) ve Raine’s (1993) studies (cited by Seven and Yoldaş, 2007). Also the findings in Uzbaş’s study (2003) show that female students have higher level of social skills than male students.

According to the findings in the study when correlation between students’ social skills and media literacy considering variables is analysed there is higher relation between the sub-factors of social expressivity and having information based on the varible having computer at home when compared to other sub-factors; however this relation is too weak. There is higher relation between sub-factors of emotional sensitivity and being able to judge and see the implied messages when compared to other sub-factors; neverthless this relation is still too weak.

According to the results female students have higher level of media literacy, but there isn’t a significant difference between female and male students from the point of the level of media literacy. However there is a significant difference in their social skills level. Female students have higher level of social skills than male students have.

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DEVELOPMENT OF ONLINE COURSEWARE ON THAI FOOD GOOD HEALTH

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Abstract

The objectives of this research were to1) develop the online courseware on Thai Food Good Health to support the Thai Kitchen to the world project; 2) evaluate the courseware by the learners toward the courseware integrated using in aboard. The research sample were sampling for chefs, Thai restaurant owners, and the students who were studying at the TAFE culinary school in Sydney . The research instruments were a questionnaire to find out the needs and readiness to attend the online learning, and a questionnaire for the learners. Courseware was designed and developed on website **www.thaifoodtolearn.com** by applying the 5 steps model. Firstly, the synthesis of the research results done by the researcher team. Secondly, organizing focus group of the experts in food and nutrition and public relation field discussion on the essential contents and courseware format which would be used to develop the lessons. Thirdly, the survey of needs and readiness of the respondents, Fourthly designing the media in the courseware. Fifth, testing the courseware at TAFE Northern Sydney College in Sydney, Australia . The participants registered and studied from online courseware on thaifoodtolearn.com website as well as the set of multimedia "Thai food good health distributed to the participants with the learner's active participation in demonstration and practices.

The research result found that the respondents were readiness to study online courseware. They needed to learn as 1-2 weeks short course in the morning and evening. The topics they needed to learn were Thai food ways, Thai food cooking techniques, Thai healthy food such as Thai herb, fruit and vegetable, the characteristics of Thai food, safety Thai food, and basics knowledge of Thai food respectively.

After learning online courseware, the learners' opinion mostly showed that the lessons were totally good level. In case of the contents and presentation of video, image, graphics, hyper media links in each pages, the usefulness and benefit of the lessons mostly showed in very good level.

Keywords: courseware development; technology transfer; multimedia; Instructional media design, Thai food;

Introduction

Thai government launched the new policy called "Thai Kitchen to the World Project" in 2004 upon 2008 with the aim of increasing the number of Thai restaurants aboard and to make Thailand the largest food exporter in the world. In this regard, Kasetsart University, under the support of National Research Council of Thailand was given a research grant to study the "Development of Thai Food Products and Proactive Promotion of Thai Food to the World". The researchers studied about the standards and characteristics of Thai food, the product status and taste of foreigners, production process for export and extending the reach of Thai food restaurants to the owners and consumers abroad (Varanyanond, 2008). The research was also found the significant of Thai food promotion to the government sectors. The research project investigated the model of multimedia integration. This study concluded that the next step of technology transfer could be implemented under an online study for target audiences in any part of the world, so Thais and foreigners would be able to access this information anywhere and anytime. Moreover, an online study would be cost effective because there would be no need for researchers or learner to travel. (Sompong, 2010). For these reasons, the researcher then continuingly study furthermore on the development and testing the Courseware through internet on Thai food to the target audiences aboard who were the Thai restaurant owners, Thai and foreigner chefs and the instructors and students who were involved Thai cuisine.

Objectives

The objectives of this research were to: 1) develop the online courseware on Thai Food Good Health to support the Thai Kitchen to the world project; 2) evaluate the courseware by the learners toward the courseware integrated using in aboard.

Review of Related Literature

E-learning is the process of instruction that apply the new digital technology regarding technology of computer, and tele-communication. E-learning may require to learn through computer both online learning with network and offline learning by single computer or non-network linkages. Clark and Myer (2008) defined e-Learning as instruction delivered on a computer by way of CD-ROM, Internet, or intranet with the following features: includes content relevant to the learning objective, uses instructional methods such as examples and practice to help learning, uses media elements such as words and pictures to deliver the content and methods, may be instructor-led (synchronous e-learning) or designed for self-paced individual study (asynchronous e-learning) and build new knowledge and skills linked to individual learning goals or to improved organizational performance. E-learning is essentially the computer and network-enabled transfer of skills and knowledge. Its applications and processes include Web-based learning, computer-based learning, virtual classroom opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.(Wikipedia, 2554)

In case of online courseware design, Sanders (2001) mentions that it must be envisioned in a learning context. The student will learn from the Web page, but it can be a central locus of learning such as it may be a side bar-a review session, extra help, or adjunct to the book or classroom presentation and virtual simulation interface in the first page. In the fundamental design considerations, Siegal (1997) emphasize that the third generation Web site is one that invites the viewer into the site with lure and metaphors. They are none linear and alluring. They should be attractive and interesting to get the viewer's attention. Siegal also notify that "no matter how important and content rich your message, if no one is going to look at it, they're not going to get the message".

From the literature review, it showed that online courseware become the effective way of learning but it should be in well design and development to match with the target audiences or learners.

4.Scope of the Study

This study focused to the develop the online courseware on Thai Food Good Health to support the Thai Kitchen to the world project by using purposive sampling of Thais and foreigners who were the owners of Thai restaurant, chefs, instructors and students of culinary institute aboard. The sample of this study was purposive sampling at TAFE Northern Sidney Institute in Australia. The contents composed of 5 topics which were synthesized from the result of Thai food research under the project of Thai government on "Thai Kitchen to the World" Project. The lessons composted of 5 chapters: 1) Thai cuisine overview, 2) basic knowledge about Thai cuisine, 3) Thai food for health, 4) food safety and 5) the way of Thai cuisine.

5. Methodology

Sample of the Study

The sample of this study was the learners in online courseware. They are Thais and foreigners who voluntarily fill out the questionnaire on the readiness and need for online study on Thai food. The second group of sample was the Thai restaurant owners, Thai and foreigner chefs, instructors and students of culinary institute. TAFE Northern Sidney Institute in Sydney, Australia was selected to be a site for studying because of suitable of facilities and its voluntary to coporate the research project.

Research Instruments

Online courseware was designed and developed for training on Thai food in 5 steps model as this follows:

Fist. Study and synthesize the results in Thai food researches from 2005-2008 for 4 years study. The researcher team identified the research into 5 issues. There were technology in Thai food products for exports, Thai food ready to eat and ready to cook, Thai healthy food, anti-oxidant and prevention cancer substantial in Thai food and strategies for Thai food promotion abroad.

Second. A survey on the readiness and needs of Thai and foreigner respondents who were involved in e-learning through internet was administered. There were 13 respondents voluntarily fill out the data in a questionnaire though the research project website thaifoodtoworld.com.

Third. Twelve experts focus group in food and nutrition was organized and determine the manuscript of the contents to prepared for the Web-based instruction.

Forth. Design the courseware on Thai food with the course content through **Moodle** Learning Management System (LMS) open source software. The components of contents was mainly presented by Flash images, video clips, exercises, pretest at beginning of each chapter and achievement tests at the end.

Fifth, the lessons were tested and tryout with 20 learners who were undergraduate program students in home economics in Kasetsart University, Thailand. The contents and program errors were corrected and revised before using with the sample in Australia.

Questionnaires were developed into two sets for collecting data from the respondents. The first questionnaire aimed to explore the readiness and needs in e-Learning through internet of the target group. The second questionnaire explored the opinions of the learners about the quality of online courseware systems and media uses for learning. It focused on personal information, the development of instructional media on the Web such as format, contents, presentations, video clips, web linkages, benefits and usefulness of courseware, and the appropriate issues in each chapter.

Data collection and analysis

The courseware contents was uploaded to website **www.thaifoodtolearn.com** for testing with the samples at TAFE Northern Institute Campus in Sydney, Australia. The samples attended the training program namely "E-Learning: Innovative Channel of Thai Cuisine and Health Benefit" during November 2010. Thirty eight participants was given instruction on how to use the LMS program for registration, log-in, studying, doing pretest and posttest. The participants were requested to fill out a questionnaire at the final study. Data were analyzed by SPSS for windows. Statistical uses were mean, standard deviation, and percentage.

6. Research Result

The readiness and needs in e-Learning through internet

The result showed that the respondents were readiness for online learning Thai cuisine by using computer at their home 84.6 % and their office 76.9 %. They almost uses e-mail 100% following by MSN 61.5%, Skype 53.8%, blog 23.1% and web board 15.4%. They expected the usefulness of e-Learning on Thai food mostly for their business, healthcare, occupation and food consumption respectively. They needed to learn by following contents in the highest level: Thai food ways, Thai food cooking tips, Thai food for health, Nutritional and functional information of Thai food. However, they also needed to learn the uniqueness of Thai food, history and culture of traditional Thai food and hygiene and sanitation in high level respectively. they preferred to learn a short course for 3-6 days.

The output of the experts' focus group

The experts suggested that the content presentation should use multimedia for drawing attention and gave the highest effective learning. For instants, video clips showed demonstration and sound, the online management systems should be controlling and checking the learners. The online courseware should be the pilot projects which could be cooperated with the Thai Hotel and Thai Chef Association.

Online courseware and feedback from the respondents

The participants who registered to online courseware at TAFE Northern Sydney Institute gave the response about the format of online learning on website www.thaifoodtolearn.com in good and very good level. Their opinions were almost in good level in terms of its contents, however, there were in very good level only on the presentation items such as the color contrast of text and background, and the clarity of images. Format and method of presentation, leading into lessons, text format, graphics design and communication were mostly in good level. For video presentation in case of size, corresponded and clarity of narrative, and easy to control as well as the linking of lesson components were in good level.

The available supported program as chat room, web board and help is almost in good level. They accepted that e-Learning on Thai food could be used for learning resources and promoted in the international contexts in very good level. Nevertheless, they realized that gaining knowledge could be used after taking lessons in good level.

Finally, online courseware in five chapters were totally in good level for 5 items. There were the clarity of images, appropriateness of the text size, colors, and background, images charity and narrating sound in video.

The learners gave the additional suggestion that the program would be easy to learn with the Thai learners aboard, They suggested that the lessons should be bi-lingual program, TAFE Northern Sydney Institute was interested to collaborate to testing the online lessons within an Asian food course in the future.

7. Discussions and Conclusions

Online courseware on Thai food good health was really the new innovative. The methods and techniques deal with the new technologies for online learning. This could be proved that it was workable and compatible for the strategies of "Thai Kitchen to the World Project" of Thailand. Because this learning systems was highly benefits to the learners under the international context. The learners can learn from anywhere, at anytime with the various types of online media. They can communicate with the Instructors and experts in Thailand via the available tools on the internet. In doing so, the learners can achieve their knowledge and apply to their business improvements with high performances in Thai food promotion aboard. **However, the factors to achievable learning may depend on many factors such as the readiness and needs of the target audiences accessibility** to learn by self-pace.

In terms of the design and development of online courseware, it requires the format and knowledge of pedagogy science to design the program matching with the various learners. The learning management program is one of the choice to select the efficiency platform in web designing. For this study, Moodle could be confirmed that it is one of the LMS open source program which is the very useful and convenience to manage online learning.

In conclusion, the learners who use online courseware accepted all the lessons as the good program and consensus opinion was showed that all components in the designed program was in good and very good level. However, according to the participants suggestion if the project had a chance to continue studying, the lessons should be produced the bi-lingual program in Thai and English version so this online courseware would be usefulness for the learners worldwide.

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DEVELOPMENT OF THE MEASUREMENT AND EVALUATION SELF-EFFICACY PERCEPTION SCALE AND THE EXAMINATION OF THE STATUS OF SOCIAL STUDIES TEACHERS

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Abstract

This study has been carried out for two main reasons: One of them is to develop a scale to determine the self-efficacy levels of teachers regarding measurement and evaluation. Whereas the second reason is to determine the self-efficacy levels of social studies teachers and their status based on various variables regarding measurement and evaluation. The study group consists of a total of 395 social studies teachers who have attended the inservice training seminars organnized by the Ministry of National Education from all cities of Turkey. A measurement tool composed of 18 items and 4 factors that explains 64.95% of the total variance has been obtained as a result of the exploratory factor analysis carried out. The factor loads of the scale vary between .45 and .82. It has been determined that both the internal consistency coefficients and the test-re-test reliability coefficients calculated for the whole scale are .93 and that the two half reliability coefficient is .86. As a result of item analysis, it has been determined that the item-total score correlations of the sub-scales vary between .43 and .74 and that all the differences between the averages of the 27% sub-super groups are significant. Based on these results, it can be stated that the scale developed is a valid and reliable tool of measurement. In addition, it has been determined as a result of measurements carried out using the developed scale that the self-efficacy levels of social studies teachers regarding measurement and evaluation is sufficiently high and that there is no difference in terms of the variables of gender, professional seniority and the work residence.

Keywords: Measurement and evaluation, self-efficacy, social studies, confirmatory factor analysis, exploratory factor analysis

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Introduction

Education is one of the key elements that encompasses the whole life span of individuals and has an effect on the determination of the life standards of that individual. Education, defined as "the process of ensuring desired behavior or performing desired behavior modifications" (Ertürk, 1994: 17) or as "The process of shaping and modifying the behavior of individuals" (Tay, 2005: 210) has significant effects on the social, political and economical elements of a country. Accordingly, taking into account the education system and the education policy of a country when trying to determine the development level of a country would enable correct comments to be made.

There are many factors that affect the quality and efficiency of the process of education. According to Kahyaoğlu and Yangın (2007), the quality and efficiency of education depends on the proper management of all parts of the education system. Yalın (1999), defining the process of learning-teaching as a system has also mentioned the necessity of the effective and harmonious arrangement of all elements within the process in order to ensure that education reaches its goals. The quality of education will undoubtedly increase in an environment where factors such as students, teachers, principals, inspectors, family, education materials all interact with each other.

Changes have occurred in the education understanding of this century in the light of advancements in science and technology. Parallel to these changes, learning-teaching process along with the content of measurement and evaluation concepts have also changed. Measuring and evaluation have transformed into advancing activities that give feedbacks to learning and education processes. The objective of these activities carried out with student centered education understanding are to train creative individuals who can use, apply, comment on and relate information to ease life.

The advancements that have drawn the most attention in the education process have been in the field of measurement and evaluation. Measurement and evaluation applications have tried to determine the extent with which students have acquired the basic information and skills within the curriculum whereas enabling the students and their peers to evaluate their own studies. By this means, students can take active part in the evaluation process and perceive themselves and their surrounding with a subjective view. This in turn creates an environment in which they can analyze their strengths and weaknesses and be successful in life (Kutlu et.al., 2008).

Measurement is the visual display of observations by means of numbers and other symbols (Turgut, 1988: 12). In other words, it is the expression by the measurer of a specific dimension of a specific entity using a proper measurement tool (Ural, Erdoğan and Ural, 1998: 7). Whereas for (2004: 31) who defines measurement as a means of depiction, it is the observation of whether a specific object or set of objects have a certain characteristic and its level if there is and the expression of observation results via symbols and especially with numbers. For education, measurement is the thorough analysis of expected behavior changes and the determination of observed and unobserved aspects, the research of the levels individuals display in their behavior changes and lastly the determination of whether the expected behaviors are within the desired limits and in accordance to the desired conditions (Eyitmiş, 2007).

Whereas evaluation is to reach certain conclusions based on the comparison of measurement or observation data (Gümüş, 1977: 32). Evaluation is an interpretation of measurement results. This interpretation is a display of the proficiency of the teacher in addition to being a classification of students as successful and unsuccessful (Karahan, 2007: 6). The continuous follow up of the education process via measurements and evaluations enables one to determine problems and make rearrangements (Yetkin and Daşcan, 2006).

Teachers have a great responsibility in the regular measurement and evaluation of student success to ensure a flawless education process. The realization of effective learning by setting to work is possible through the knowledge, skill and attitudes of teachers who prepare students for the 21st century. These knowledge, skill and attitudes comprise the competency of teachers (MEB, 2006). Kahyaoğlu and Yangın (2007) emphasize that the bringing up of teachers to the desired levels are related with teacher competency. In order for teachers to use measurement and evaluation methods by the book and in an unbiased and reliable manner, it is required that they be skillful in measurement-evaluation and use this knowledge effectively. It is very important for increasing the quality of training and education that teachers are able to use these measurement and evaluation methods effectively and efficiently. Because it is possible to reschedule the process by way of learning the changes in the knowledge, emotions and thoughts of the students only through the application of correct measurement-evaluation. The teacher should have knowledge on the various special information of the field of measurement and evaluation sufficient enough to be able to use them comfortably and should develop some skills in this field along with positive attitudes. To this end, it is very important to put forth the aptitudes of teachers regarding measurement and evaluation. This study has been carried out for two purposes: One is to develop a scale in order to determine the self-efficacy perception levels of the teachers regarding measurement and evaluation. Whereas the second purpose is to determine the self-efficacy perception levels of social studies teachers regarding measurement and evaluation and also to determine whether there are any changes in these levels based on the variables of gender, seniority and the unit of duty.

Method

Research Model

In this study designed as a general scanning model, data was acquired using cross-sectional data acquisition from general scanning models. Cross-sectional scanning model is the approach in which only one measurement is made during the study regarding the properties of the variables to be defined (Fraenkel and Wallen, 2006).

Study Group

The study group consists of a total of 395 social studies teachers 111 of whom are female and 284 of whom are males who have participated to the in-service training seminars arranged by the Ministry of Education. Of the participants, 165 work at city schools, 128 at district schools, 102 at town and village elementary schools and the age range is 22-6. This number was accepted to be sufficient due to the fact that the number of participants was over 300. According to Tabachnick and Fidell (2001), a total of 300 people is "good" for factor analysis, a total of 500 people "is very good" and a total of 1000 people is "perfect". The study group was subject to the trial "Measurement and Evaluation Self-Efficacy Perception Scale" and the analysis of the scale was made accordingly. Additionally, a different group of 35 teachers was also used in order to ensure test-re-test reliability.

Data Acquisition Tool

First, a relevant literature survey was carried out in order to determine the items making up the scale and theoretical information was examined. In addition, interviews with teachers were conducted and 8 teachers were asked to write an essay regarding how they go about the measurement and evaluation processes. The clues obtained from both the interviews and the essays were combined systematically with information acquired from relevant literature and an item pool of 30 items was prepared by the researcher.

In order for the validity of this form prepared using these written statements, specialists were determined to evaluate the comprehensibility, scope and face validity. The form was presented to 4 psychological consultants along with 3 scholars working on measurement and evaluation and 3 scholars working on Turkish language for the evaluation of comprehensibility, scope and face validity and their opinions were asked. Required corrections and exclusions were made in the scale in accordance with the opinions and criticisms and the trial scale of 25 items was prepared after which the reliability and validity studies were conducted. A five point Likert type scale was used to express the relevant acceptance level for the scale which had no negative items. This reting system was composed as "*I agree completely (5), I agree (4), I partially agree (3), I agree very little (2), I don't agree at all (1)"*. In addition, a guideline was included in the beginning of the scale in order to give information regarding the purpose of the scale, the number of items and the method of answering.

Data Acquisition and Analysis

The trial "Measurement and Evaluation Self-Efficacy Perception Scale" was applied to 395 social studies teachers after which exploratory and corrective factor analyses were carried out using the obtained data as a basis for reliability and validity studies. Whereas exploratory factor analysis aims to explore the factor structure based on the relationships between variables, the corrective factor analysis that examines the accordance between the model and the data tests the hypotheses regarding the relationship between the variables (Daniel, 1989). "Principal component analysis rotated to varimax rotation" was used for the accordance of the scale to construct validity. The accordance with principal component analysis was determined using Kaiser-Meyer Olkin (KMO) coefficient used to determine whether the sample size is suited to the selected analysis or not and the Barlett Test of Sphericity which gives information regarding whether the data comes from a multi-variable normal distribution or not. The suggestions of Fabrigar, Wegener, MacCallum and Strahan (1999) were taken into account when deciding on the analysis method and rotation technique. Various fit indexes such as Chi-Square Fit Test, $\chi 2$/sd, Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Root Mean Square Residuals (RMR or RMS) and Root Mean Square Error of Approximation (RMSEA) were used in order to evaluate the fit of the model in confirmatory factor analysis. In relevant literature it is expected for model data fit that the values of GFI, CFI and AGFI are greater than .90 or that the RMS or the standardized RMS and RMSEA values are smaller than .05, however a value smaller than .08 for RMSEA is also acceptable (Gerbing and Anderson, 1993:

Tabachnick and Fidel, 2001; Çokluk, Şekercioğlu and Büyüköztürk, 2010). The value of $\chi 2$/sd is expected to be between 0 and 2, however a value smaller than 5 is also taken as an acceptable value (Schermelleh-Engel, Moosbrugger and Müler, 2003). In addition, internal consistency (Alpha), Spearman-Brown split-half test and test-re-test reliability coefficients were calculated for the whole scale and the dimensions the factor structure of which have been determined. Whereas for item analysis, the significance of the differences between the corrected item-total score correlation and the item averages of the upper 27% and the lower 27% groups were examined using *t* test. In addition, the arithmetic average and standard deviation values were examined to determine the self-efficacy perceptions of social studies teachers regarding measurement and evaluation and One-Way Anova analysis was carried out in order to put forth whether the self-efficacy perceptions of teachers differed according to different variables or not. SPSS 15 and LISREL 8.7 package software were used for the analyses of acquired data.

Results (Findings)

3.1. The Verification Status of the Validity and Reliability of the Scale

Kaiser-Meyer Olkin (KMO) and Barlett Test of Sphericity were carried out in order to determine whether the scale is suitable to factor analysis or not. KMO is a statistical method used to determine whether the data and sample size are suited to and sufficient for the selected analysis or not. A KMO coefficient that is close to 1 means that the data is suitable for analysis. As a result of the analysis that has been carried out, a KMO value of .94 has been found. The selected feature should show a normal distribution in space in order for the parametric method to be used. *Barlett Sphericity* test is a statistical method that can be used to check whether the data come from a multi-variable normal distribution or not. A significant chi-square ($\chi 2$) test statistic obtained as a result of this test shows that the data come from a multi-varible normal distribution. As a result of the analysis carried out during the study, the Barlett sphericity test was determined to be significant ($\chi 2=5300.29$; $p<0.01$). The results of KMO test measurements should be equal to or greater than 0.60 and the Barlett sphericity test result should be statistically significant (Jeong, 2004). It was conclude that factor analysis can be carried out since the values obtained as a result of the analyses carried out were in good accordance with the basic assumptions.

Principal component analysis rotated to varimax rotation was used to test the construct validity of the self-efficacy perception scale. Results for the factors have been given in Table 1.

Table 1. Data regarding factors obtained as a result of factor analysis

Factor	Value	Variance Percentage	Cumulative Variance Percentage
1	10.53	42.14	42.14
2	1.74	6.96	49.10
3	1.29	5.17	54.27
4	1.08	4.31	58.58

When Table 1 is examined, it is seen that there are four factors with eigen values of greater than 1.00. The contribution of these factors to the total variance is 58.58%. More correct and realistic decisions can be given by looking at the scree plot along with the eigen values. In factor analysis, factors with eigen values equal to or greater than 1 are accepted as dominant factors (Büyüköztürk, 2006). Scree plot helps to decrease factors by putting forth the dominant factors (Çokluk et.al., 2010). The scree plot can be seen in Figure 1.

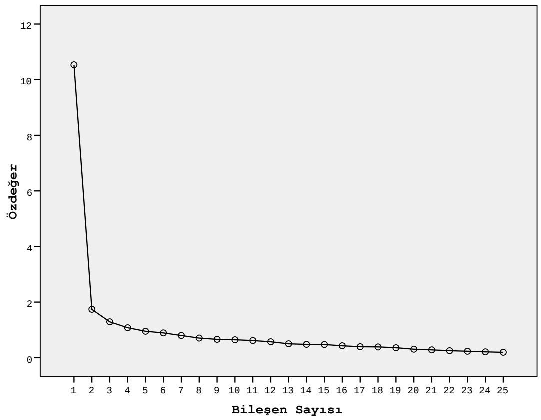


Figure 1. Scree plot

Since according to the plot in Figure 1, the slope of rapid decreases does not start to be fixed after the fourth factor, the number of factors can be accepted as four. In addition, the existence of factors with eigenvalues greater than 1 also support this finding.

In construct validity testing, the sample size has been taken into account (Şencan, 2005) and the principle that the load of each variable should be greater than .32 (Tabachnick and Fidel, 2001) has been accepted as the basic principle for the factor loads of the scale consisting of 25 items. When the four factor structure is evaluated in terms of whether the items meet the overlapping and factor load acceptability levels, it is observed that six items are overlapping (items 6, 7, 8, 10, 11 and 19) and that one item (item 9) is below the acceptable factor load value. As a result of the analysis excluding a total of seven items, it was observed that the contribution to total variance of factor one is 44.44%, factor two is 9.76%, factor three is 6.16 %, factor four is 5.59 %. Whereas the contribution to the total variance of the determined four factors is 64.95 %. Whereas it can be accepted that the total variance for single factor patterns is at least 30 % (Büyüköztürk, 2006), this ratio is expected to be over 41 % for multi factor patterns (Kline, 1994). In this regard, it can be stated that the total variance percentage explained by four factors is sufficient.

The factor pattern of the 18 item scale obtained as a result of the analyses carried out, the factor load values, common factor variances, item-total correlations and internal reliability coefficients have been given in Table 2.

Table 2. Results obtained after factor analysis regarding factors

Item No.	**Common Factor Variance**	**Load Value After Rotation**				**Corrected Item-Total Correlation**	**Reliability**		
		Factor 1	**Factor 2**	**Factor 3**	**Factor 4**		**Internal Consistency**	**Spearman Brown**	**Test-re Test**
3	.69	.80				.58			
2	.63	.74				.57			
4	.66	.74				.64			
1	.59	.70				.55	.86	.85	.84
5	.56	.64				.60			
13	.54	.51				.64			
24	.76		.80			.68			
22	.77		.78			.70			
23	.78		.77			.74	.89	.83	.83
21	.75		.74			.72			
25	.47		.58			.56			
15	.76			.82		.58			
14	.76			.78		.66	.80	.80	.90
20	.55			.61		.55			
12	.56			.45		.65			
17	.67				.73	.57			
16	.68				.69	.60	.70	.60	.85
18	.54				.68	.43			
Reliability coefficients regarding the total scale							.93	.86	.93

When Table 2 is examined, it is observed that six of the scale items (items 1, 2, 3, 4, 5 and 13) have accumulated under factor one, five (items 21, 22, 23, 24 and 25) under factor two, four (items 12, 14, 15 and 20) under factor three and three (items 16, 17 and 18) under factor four. When the items under each factor are evaluated for content and suitability to the structure, the items under the first factor can be named as the sufficiency of teachers regarding measurement and evaluation "*method and technique determination"*, under the second factor as "*process review according to results*", under the third factor as "*data analysis and comments*" and under the fourth factor as "*giving feedback about the student*". The factor load values regarding the items that comprise the scale vary between.51 and .80 for the first factor, between .58 and .80 for the second factor, between .45 and .82 for the third factor and between .68 and .73 for the fourth factor. When the common factor variances of each item in this multi-factor structure are examined, it is observed that the values range between .47 and .78. According to these values, it can be stated that the variables form a homogeneous structure. When the factor load values are evaluated in terms of magnitude, it can be stated that items 12 and 13. are "mediocre" in terms of load values and that the other items range between "good" and "perfect" (Tabachnick and Fidel, 2001). All these findings can be shown to be proofs that the construct validity of the scale is acceptable.

The item test correlations regarding the construct validity and homogeneity of the scale have been calculated. It has been determined that the item test correlations of the scale varied between .43 and .74. These values show that the items represent similar behaviors. Internal consistency (alpha) coefficient regarding the reliability of the scale has been calculated as .93. This value shows that the items that make up the scale are in accordance with each other. In addition, since during the trials carried out by taking out an item in turn there was no increase in the internal consistency coefficient that was calculated as .93, no item was taken out of the scale (Özdamar, 1997). Also, internal consistency reliability coefficients along with item test correlations for each factor were calculated and the results have been given in Table 2. The internal consistency reliability (alpha) coefficient for the scale in total was calculated as .93, the reliability coefficient regarding the first factor as .86, the second factor as .89, the third factor as .80 and the fourth factor as .70. Spearman Brown split-half correlation was calculated as .86, first factor coefficient as .85, second factor coefficient as .83, third factor coefficient as .80 and fourth factor coefficient as .60. Whereas it has been determined that the test-re-test reliability coefficient is .93, .84 for the first factor, .83 for the second factor, .90 for the third factor and .85 for the fourth factor. All these findings can be used as proofs showing that the scale has a satisfactory reliability.

The total scores of 395 teachers obtained from the scale have been arranged in increasing order in order to put forth the distinctiveness features for each of the 18 items of the scale. The total score averages of the teachers in the lower and upper groups have been compared for each item using t test. The results obtained have been given in Table 3.

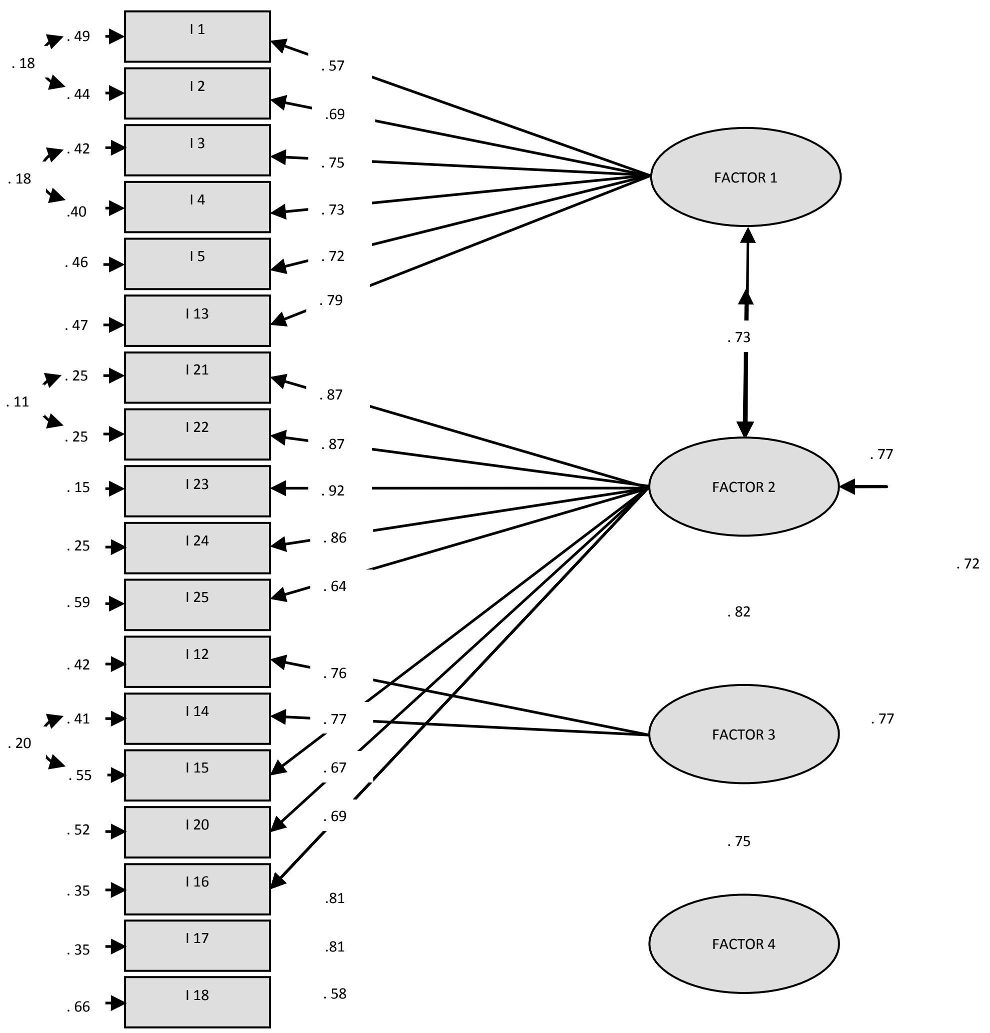
Table 3. Comparison of lower and upper groups for each item

Item No	N	Lower Group (%27)		Upper Group (%27)		t
		$\overline{X}$	S	$\overline{X}$	S	
3	107	3.29	.99	4.62	.64	11.64*
2	107	3.69	.78	4.79	.47	12.40*
4	107	3.08	.83	4.52	.6	14.32*
1	107	3.90	.78	4.85	.36	11.53*
5	107	3.14	.90	4.53	.65	13.03*
13	107	3.18	.87	4.54	.57	13.56*
24	107	3.34	.86	4.66	.51	13.72*
22	107	3.11	.86	4.67	.47	16.44*
23	107	3.16	.80	4.67	.47	16.82*
21	107	3.12	.83	4.68	.49	16.74*
25	107	3.17	.94	4.54	.59	12.86*
15	107	2.27	1.00	4.17	.79	15.48*
14	107	2.61	.94	4.45	.61	16.98*
20	107	3.00	1.08	4.58	.74	12.49*
12	107	3.06	.87	4.53	.61	14.43*
17	107	3.47	.79	4.61	.56	12.13*
16	107	3.28	.89	4.74	.44	15.19*
18	107	3.96	.72	4.77	.45	9.88*

*p<.001

When Table 3 is examined, it is observed that the t (sd=212) regarding the differences in the item scores of the 27 % lower and upper groups vary between 9.88 and 16.98. In addition, it has been determined that all items are significant at a level of $p<.001$. All values show that the reliability of the items in the scale are high and represent similar behaviors.

Figure 2. Path Diagram and Parameter Estimations Regarding Measurement and Evaluation Self-Efficacy Perception Scale



An additional confirmatory factor analysis (CFA) has been carried out in order to validate the construct validity of the scale developed via exploratory factor analysis (EFA). The fit indexes of the model obtained as a result of CFA have been examined and it has been determined that the chi-square value ($\chi 2$=484.93; N=395; sd=125; p=.00) is significant. Whereas the fit index values have been determined to be RMSEA=.08; NFI=.97; CFI=.97; IFI=.97; RFI=.96; GFI=.89; AGFI=.84 and SRMR=.05. These fit index values can be interpreted such that model is a good fit.

In addition, CFA was carried out for the single factor structure of the scale and the chi-square value ($\chi 2$=898.52, N=395, sd=131, p=.00) according to the fit indexes of the model has been determined to be significant. Whereas the fit index values have been determined as RMSEA=.13, NFI=.94, CFI=.94, IFI=.95, RFI=.93, GFI=.78, AGFI=.71 and SRMR=.07. According to these results, it can be stated that it is better to use the scale as multi-factored.

3.2. Self-Efficacy Perception Levels of Social Studies Teachers Regarding Measurement and Evaluation

The lowest and highest scores along with average scores and standard deviation values for the factors and the scale as a whole of the self-efficacy perception levels of social studies teachers regarding measurement and evaluation have been given in Table 4.

Table 4. Descriptive statistics of the replies of social studies teachers to the scale along with the factors and the whole scale

	N	Min.	Max.	$\bar{X}$	S
Factor1	395	9.00	30.00	24.15	3.80
Factor2	395	5.00	25.00	19.53	3.50
Factor3	395	4.00	20.00	14.39	3.27
Factor4	395	6.00	15.00	12.52	1.85
Total	395	29.00	90.00	70.60	10.37

When Table 4 is examined, it is observed that scores close to the highest score that can be taken from all of the four dimensions of the scale (Factor1: 24.15, Factor2: 19.53, Factor3: 14.39, Factor4: 12.52, Total score: 70.60) have been taken when the replies of the social studies teachers to the "Measurement and Evaluation Self-Efficacy Perception Scale" have been taken into account. According to these results, it can be stated that the self-efficacy perceptions of social studies teachers regarding all four factors and the total scale are high.

3.3. The Examination of the Self-Efficacy Perception Levels of Social Studies Teachers According to Various Variables

One way ANOVA test was carried out in order to determine whether there was a statistically significant difference in the self-efficacy perception scores regarding gender, career seniority and the unit of duty after which the results obtained have been given in Table 5.

When Table 5 is examined, it has been observed that the total scores of social studies teachers regarding their answers to the "Measurement and Evaluation Self-Efficacy Perception Scale" have not caused any significant changes on the gender, career seniority and unit of duty variables (p>.05). Accordingly, it can be stated that gender, career seniority and unit of duty have no effect on the self-efficacy perception levels of social studies regarding measurement and evaluation.

Table 5. Anova results for the measurement and evaluation self-efficacy perception total scores of social studies teachers according to various variables

Variables		Sum of Squares	df	Mean Square	F	p
Gender	Between Groups	12.19	66	.19	.90	.70
	Within Groups	67.62	328	.21		
	Total	79.81	394			
Career Seniority	Between Groups	90.99	66	1.38	1.21	.15
	Within Groups	375.15	328	1.14		
	Total	466.14	394			
Unit of Duty	Between Groups	58.62	66	.89	.86	.77
	Within Groups	339.04	328	1.03		
	Total	397.66	394			

Discussion, Conclusion and Suggestions

In this study, "Measurement and Evaluation Self-Efficacy Perception Scale" has been developed in order to determine the self-efficacy perceptions of teachers regarding measurement and evaluation. When a literature survey is carried out, studies to develop a scale regarding the measurement and evaluation efficiency have been found (Toptaş, 2011; Yaman, 2011; Yaman and Karamustafaoğlu, 2011; Yıldırım Ekinci and Köksal, 2011; Yayla, 2011; Kilmen and Çıkrıkçı Demirtaşlı, 2009; Gelbal and Kelecioğlu, 2007; Çakan, 2004; Karaca, 2003). However, it has been observed that some of these studies have been carried out on teacher candidates (Yaman amd Karamustafaoğlu, 2011; Karaca, 2003), that some have been carried out for efficacy regarding measurement tools (Yıldırım Ekinci and Köksal, 2011), that some have been carried out for efficacy regarding alternative tools (Yayla, 2011; Toptaş, 2011), that some have been carried out before the structural change in the programs (Çakan, 2004; Karaca, 2003) and that construct validity studies in accordance with psychometric properties have not been carried out in these studies. The objective of this study is to eliminate these deficiencies in the field. First, a five-point Likert type scale has been prepared by making use of opinions of experts and teachers along with data from relevant literature. The prepared scale was examined by experts regarding its comprehensibility, scope and face validity. Items with an agreement of 90-100 % were accepted and 5 items that do not fit this criteria were eliminated after which construct validity studies for the 25 item scale were started.

Exploratory and confirmatory factor analyses were carried out for construct validity and it has been determined that the items forming the scale have been collected under four factors. It has been observed that these factors have a structure suited for naming and grouping. The items of the factors have been examined in terms of content and features. Accordingly, the items in the first factor have been named as "*method and technique determination*" regarding the measurement and evaluation of teachers, the second factor has been named as "*process overview*", the third factor has been named as "*data analysis and interpretation*" and the fourth factor has been named as "*giving feedback about the student*". The fact that all of the 18 items that make up the scale have high factor load values for their own factors and low values for the other factors has been accepted as an indication of factor independency. The model fit of the structure obtained by testing via exploratory factor analysis has been examined via confirmatory factor analysis. It has been determined as a result of the exploratory and confirmatory factor analyses that the model comprised of 18 items and four factors is appropriate both institutionally and statistically. In addition, according to the confirmatory factor analysis carried out to test both the multi-factor and single factor structure of the scale, it can be stated that using the multi-factor structure is proper since it has better fit values in comparison with the single factor structure.

As a result of the item analysis carried out, it has been observed that the corrected item-score correlations are at an ideal level. In addition, as a result of the *t* test carried out between the 27 % lower and upper group scores, a significant difference has been determined for all items and sub-scales. The fact that the internal consistency, split-half test and test-re-test reliability coefficients are quite high puts forth that the items in the scale measure the same structure in consistence and accordance with each other. Thus, all these results are proofs that the properties measures by the "Measurement and Evaluation Self-Efficacy Perception Scale" are homogeneous and that all the items in the scale measure the same property (Tavşancıl, 2002). In short, it shows that the scale developed is a valid and reliable tool. In this regard, the scale that has been developed can be used in further studies carried out to determine the measurement and evaluation self-efficacy levels of teachers. In addition, the self-efficacy levels of teachers in different fields regarding measurement and evaluation can be determined and it can be examined whether there are any differences or not.

In the study, the self-efficacy levels of social studies teachers regarding measurement and evaluation have also been determined and the status according to various variables have been put forth. It has been concluded that gender, career seniority and unit of duty have no effect on the measurement and evaluation self-efficacy perception levels. In a study carried out by Yaman (2011) and Toptaş (2011), it has been put forth that gender and career seniority has no effect on the measurement and evaluation efficacies of teachers. Similarly, a study carried out by Yaman and Karamustafoğlu (2011) on teacher candidates has put forth that gender has no statistically significant effect on the measurement and evaluation self-efficacy perceptions. It has been determined that the self-efficacy perception levels of social studies teachers are quite high both in terms of factors and in general. Gelbal and Kelecioğlu (2007) have obtained similar results in their study carried out on class and branch teachers regarding their measurement and evaluation teacher efficacies. However, it is also observed that this result of the study is in conflict with many other studies (Kilmen and Çıkrıkçı Demirtaşlı, 2009; Güneş, 2007; Çakan, 2004; Karaca, 2003; Ulutaş, 2003; Yanpar, 1992). This can be explained by the difference of the studied groups, the fact that it is a group of teachers who are trying to develop and renew themselves by participating in in-service activities and the fact that teachers are better equipped now with the widespread use of information technologies in recent years. According to all these results, it can be stated that in-service training activities to increase the measurement and evaluation efficacies of teachers are effective. To this end, it can be beneficial for teachers to attend in-service training activities to increase their career efficiencies. In addition, it can also be beneficial to increase the interaction of teachers via the use of computers and internet.

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DEVELOPMENT OF WEB-BASED BASİC FRENCH COURSEWARE (EASİFRENCH) BY USİNG CONTENT MANAGEMENT SYSTEM

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Abstract

This research was conducted to develop and evaluate a prototype of Web-based Basic French courseware (EASIFRENCH) for Basic French subject at diploma level. It also engaged of web applications that offer various facilities in providing interactive, effective and innovative learning environment. This research also evaluates some features of Basic French courseware such as pedagogical approach, learning strategies, theories in education and effectiveness usage test in term of achievement towards the application of Basic French courseware in teaching and learning compared to conventional way. The research methodology applied was pra and post quasi-experimental for balanced groups. The samples for the study were 4 Subject Experts, 56 students and 3 lecturers from UniKL Malaysia France Institute (UniKL MFI). The students were divided into two groups where 28 students use the Web-based Basic French courseware (treatment group) and 28 students learn Basic French in conventional way (controlled group). In this study, 7 instruments were used to interpret the research problems, needs analysis, courseware evaluation through formative and summative assessments. The findings were analyzed by using SPSS version 11.5 and descriptive and inferential statistics were applied. Findings of the research found that the experiment group (R) that underwent the teaching and learning process using the Basic French Software (EASIFRENCH) had a higher achievement level as compared to the controlled group (K) that followed the conventionaal approach to teaching ang learning. This research contributes to aspects such as: (i) design of the development methodology of the Basic French courseware EASIFRENCH; (ii) design of the instructional design (ID Model) for EASIFRENCH; (iii) development of prototype of the Basic French Courseware EASIFRENCH; (iv) development of modules such as: Tutorials Module, Exercises Module, Communication Module, Activities Module, Links Module and Learn More Module; and (v) findings of the usability test conducted on the Basic French Courseware, EASIFRENCH.

Keywords : Web-based courseware ; CMS (Content Management System); Instructional Design ; EASIFRENCH ; prototype

Introduction

Language is the medium or medium of communication among humans. Humans communicate with each other using different languages, and each language is different from others in various forms (from the obvious differences in pronunciation and vocabulary to the difference is not so obvious as in the grammar).

French is a tool to communicate both verbally and in writing as many languages in the world. This language is also an international language used by more than half the world's population. According Hazlina (2008), French is the language of the second power in the world, it is also the official language of the United Nations (UN), one of the official languages for the Olympics, the only language used in the universal postal service , and the main language for the African Nations Union (UAC). It is also a second language is used in Internet communications. In aeronotik engineering, rail transport, food and fashion, it is viewed as an intermediary language skills, technology and modernity. (http://www.diplomatie.gouv.fr, March 2003).

The trend of current and future education is focused on the application of Information and Communications Technology (ICT). Use of the Internet has become a catalyst and opened a new dimension in teaching and learning approaches (T&L) because of its ability in providing a variety of sources of information using search engines and directories efficient engine (Sonnenrich 1998). The development of ICT has an impact on the world's best educational pre-school level and tertiary level. The emergence of Internet and web sites, as well as advanced computing facilities and quickly provide many facilities for students and instructors but it's an important thing in education today (Anderson & Elloumi 2004; Hall 2000a; Kramer 2000).

Many people have tried to produce graduate students who are able to master many languages in the face of today's globalized world. Malaysia is no exception in this aspect where the emphasis given in creating a human resource that can capture a foreign language in driving the knowledge-based economy (k-economy) and is also competitive at the national or international. In today's globalized world foreign language proficiency is no longer seen as an added value, but may become necessary to compete in the arena of politics, security, international trade and education. What's more important is the development of software that takes into account the needs and learning objectives without neglecting aspects of local value or character of the nation.

The importance of speaking foreign languages such as French language is vital in this globalization in which the third language proficiency or a foreign language is no longer an option but it is a necessity. This is also consistent with the objectives of the National Key Result Areas (NKRA), the National IT Council (NITC) and National Information Technology Agenda (as contained in the Malaysian Smart School Roadmap 2005-2020: An Education Odyssey, 2005:23). According to The Smart School Milestones (4 waves), in the fourth wave (2010-2020), will be a key enabler of technology in teaching and learning.

Background of The Study

Web-based learning or also known as e-learning can change how a person or organization acquire new skills and knowledge. According Jeurissen (2004), e-learning is defined as the use of innovative technologies and learning models that can be used without the limitations of place or time factors. Dalgarno in Sidek et al. (2007) stipulates that the students can develop their knowledge and access to various learning resources that abound in the Internet space. According to Sufyan (2001), with the Internet, students now have access to language resources on-line much like the notes, item documentaries, essays, quizzes online, announcements, and various other reference materials. Several studies on the e-learning shows use of the Internet has left a large and positive impact on those who learn the language.

According to Olivier (2000), the use of internet or web technology in language learning is a new media in teaching and learning languages. Supyan (2001) stated the Computer-Based Language Learning (PBBK) or Computer-Assisted Language Learning (CALL) is not new in education. Most applications are still not widely PBBK in Malaysia and has not been integrated into the national education system.

Teachers who diversify teaching strategies can help students master a variety of linguistic students quickly and effectively. This view is recognized by Graham (1997) in Lessard-Clouston (1997) in which their findings on the SPB in the French language teachers use Language Learning Strategy (LLS) can help the students understand the second language learned better. Therefore, teachers should train students to build and use the DPS, which according to them. In terms of lesson plans, teaching strategy means measures taken by students to accelerate the acquisition, retention, recall and use of information resources (Abu Talib, 1998).

Therefore, this study is to develop software, web-based Basic French and innovative interactive specially developed to meet the standard and requirements of today's students. According to Sufyan and Roziana (2001), interactive features such as repetition, drill and practice, corrections and rewards spontaneously, language learning will be more meaningful and positive impact on teachers and students. Hamzah (2003) and Juriah et al. (2001) supports this statement with spell out the use of computer or Internet technology is able to function and create a conducive environment in T&L.

3.0 Problem of Statements

Problems of this study is shown through a preliminary study conducted on teachers who teach French as well as experience and observation of student researchers who have low grades in French and report students' academic performance on the subject. A study of need analysis was conducted among teachers and students to find the current constraints in the French T&L in a Technical Institutions here. The findings of the preliminary study carried out to show some of the problems or constraints have been identified, among which are: (i) Interest and student motivation is relatively low in learning the French language, (ii) Lack of use of audio-video in teaching and learning the French language, (iii) provisions time is limited, (iv) different learning styles, (v) implement a limited aspect of culture, (vi) use of the Internet or online access is much poorer, (vii) the infrastructure facilities or infrastructure, (viii) The use of the text, (ix) concerns about the recent conduct of teaching equipment, (x) non-student Teaching berpusatkkan examination, and (xi) lack of local content.

Findings from the study of the needs analysis, all the teachers agreed with the statement that they are difficult to use the current technology in teaching and learning French. They also agree with the idea of the French language on-line software as an alternative to the problem. Based on some initial findings, the French software development is an important basis for further development to enable T&L carried out without limit of time and place either via the internet (on-line) and not (off-line). This development is important because it provides freedom for students to follow the learning process according to their capabilities and are free to repeat any part of the subject is not understood in accordance with their needs and their level of understanding.

Pufahl, Christian and Rhodes (2000) has conducted research on policy and practice foreign languages in 19 countries. According to them, the success of a program of foreign language has features as follows: (i) students begin to learn a foreign language from the beginning (early stage), (ii) alignment framework in teaching & learning, (iii) leadership that is efficient and gives importance to language foreign, (iv) the status of foreign language language of priority, (v) the determination of teachers to teach, (vi) integration of foreign language in other subjects, and (vii) the creative use of technology. Public awareness about the importance of foreign language in the economic, social, cultural, science and religion has also contributed to the effectiveness of foreign language curriculum. Many previous studies related to language teaching implementation (delivery system) and whether at the secondary level or in public or private.

For the T&L French in Southeast Asia, Hazlina (2008) also said only a few countries such as Vietnam, Cambodia and Laos, which was occupied by the French nation. Most other Asian countries still have a limited relationship, both geographically and influence frankofon. In addition to geographical problems, should be submitted also the distinction that separates the linguistic character of the French languages in Southeast Asia; difference is interpreted at various levels, such as aspects of grammar, syntax, and phonetics. That is, the difference is not only appear on the geographical limitations, but it also includes language and cultural logic. It is therefore important in the development process of a software local factors taken into account local values and the more important characters are applied in the development of the nation.

4. Purpose of Study

This study was undertaken aims to develop a software prototype web-based Basic French (multimedia software) for the French subjects at the basic level. It will also involve a web application that offers a wide range of facilities to provide an interactive learning environment, effective and innovative. This study will also assess the characteristics of the French language software prototype basis of some aspects such as pedagogical approach, learning strategies, learning theories, aspects of usability and performance test the effectiveness of the use through the use of French Software Foundation web technology compared with the teaching and learning (T&L) conventional.

4.1 Objective of the Study

To achieve the stated purpose of the study, two main objectives of the study was developed as follows:

(a) Develop Basic Software French (multimedia software) for web-based Basic French subjects for the students a diploma at an institution of higher learning (IPTS) Tech as a case study. Sub-objective involves the following aspects:

1) Identify and design the French language software development methodology for Web-based Basic French Basic subjects for a diploma semester.

2) To design and develop the model ID (design directive) for Software Basic French for one semester of a diploma in Technical Institutions.

(b) To evaluate the software features and effective use of software, web-based Basic French in UniKL Malaysia France Institute (UniKL MFI). Software evaluation and testing the effectiveness of the Basic French software involves the following aspects:

1) Identify the basic French language software developed using the approach of tutorials, drills and games in education.

2) Identify the basic French language software developed using self-learning strategies, flexible, mastery, cooperative, active and problem-based learning.

3) Identify the basic French language software developed based on learning theories such as behaviorism, cognitivisme and constructivism.

4.2 Research Questions

To achieve these objectives, several key questions were constructed as follows

(i) What is the French language software development methodology suitable for use in elementary teaching and learning process for semester one diploma student in Technical Institutions?

(ii) Is the model design directive (instructional model) - ID model suitable for Basic French Software in the process of teaching and learning for students in private institutions semester one Technical diploma?

(iii) Are the Basic French language website developed using a tutorial approach, drills and games?

(iv) Are the Basic French software developed applying the self-learning strategies, flexible, mastery, cooperative and active?

(v) Is the software developed is to apply the learning theories behaviorism, constructivism and cognitivism ?

4.3 Research Framework

In this study, instructional design (instructional design) adapted from a design model ADDIE. ADDIE model which has five main stages of the analysis, design, development, implementation and evaluation. According to Ismail (2002), web-based teaching works not only as an added value, but as a key to the learning needs smart. Sufyan (2001), states are able to integrate multimedia CALL various forms of media and learning theory also supports the use of pictures, graphics, video, and voice to help students understand and remember what is learned the better (Kemp and Smelle 1989). Romiszowski (in Sufyan 2001) states that students can remember about 20% of what they saw, about 30% of what is heard, and about 60% of what is done. Because

CALL multimedia software could integrate various forms of media, language learning becomes more interesting, meaningful and productive. This distinction was not found in other teaching aids such as books, audio tapes and video tapes more characteristic of a directional or undirectional. In the French language website development bases, multisensori aspects (aspects of audio, visual and kinesthetic) concern because it can improve memory (retention time) for a particular topic or subject.

5.0 Research Methodology

Methods using quasi-experimental design of pre-post test for unequal groups. Subjects or respondents is composed of three lecturers of 56 French and one semester of Diploma in Engineering Technology majoring in a Technical Institutions in the district of Hulu Langat. In this study, students will be divided into two separate studies, a total of 28 people will attend the Basic French subjects using a prototype software will be developed (treatment group) while 28 other students from different classes will learn the basic French language in the conventional (control group). In this study, seven instruments will be used for purposes of assessment problems, the analysis of the (identify problems in T&L time), software evaluation is formative and summative CALL. The findings will be analyzed using SPSS software version 11.5 and deskriktif and inferential statistics will be used to answer the research question.

5.1 Population and Sample Survey

Subjects or respondents is composed of three French lecturer, four experts (two experts for the evaluation of aspects of language and two experts for the evaluation of the technical aspects) and a total of 56 students per semester for Diploma in Engineering Technology majoring in a Technical Institutions in the district of Hulu Langat. In this study, students will be divided into two separate studies, a total of 28 people will attend the Basic French subjects using a prototype software developed (treatment group) while 28 other students from different classes will learn the basic French language in the conventional (the control group).

5.2 Procedure and Implementation Study

In the process of developing software Basic French (EASIFRENCH), several phases have been followed by the function are:

- Software requirements analysis process
- The process of designing the software prototype model
- Software development process
- The process of software implementation
- The process of testing and evaluation of some aspects of the use of software.

5.3 Pilot Study

A pilot study was conducted on 15 students to determine the admissibility and validity of all items in the questionnaire used in this study. Although a number of constructs adapted from several of the past, but it is tested once again to test the reliability of the data items in a checklist or questionnaire. Internal consistency of the method used in this pilot study was Cronbach Alpha method in which this method can be used for all types of data (Norazah 2002). Here are the results of the reliability index of pilot studies carried out.

5.4 Research Instruments

According to Mohd. Majid Konting (2004), the research instrument is essential to achieve the objectives of the study and it is a measuring instrument used to measure the variables under study. According to her, a good measuring instrument to measure accurately a variable to be measured. In this study a number of studies have used instruments. Among them is the direct observation of student researchers who use this software, unstructured interviews with lecturers and several sets of questionnaires which include questions about the background of the respondents, the objective of teaching and learning, easy to use software, multimedia features, design issues form of teaching, screen design (user interface) and so on. Sets of this questionnaire is used for the continuous assessment evaluation of the prototype developed.

6.0 Findings

Q1: What is the French language software development methodology suitable for use in elementary teaching and learning process for one semester diploma in Technical Institutions?

From the study, researcher has found that the development of basic French language software has been applied pedagogical approaches, theories, appropriate learning strategies in R & D for one semester. The findings show the design aspects, the aspects of interactivity, content organization and integration of multimedia elements enhance the development of this software.

Q2: What model design directive (instructional model) - ID model suitable for Basic French Software in the process of teaching and learning for students in private institutions semester one Technical diploma?

From the study of the directive design (conceptual model) and the modules produced (as described in chapter 3), software development was developed based on the following aspects;

- Basic French teaching approaches
- Instructional design for teaching language
- holistic development of students
- The modules plannedT&L process that integrates the elements of interactive multimedia.

ADDIE model has been selected and found suitable for the model instructional design (ID model)

Q3: Are the Basic French language website developed using a tutorial approach, educational drills and games?

The findings showed that that 82.1% of respondents agreed (23 respondents) and 17.5% (5 respondents) did not agree that this basic French language software approach drill and practice and educational games. For a tutorial approach, the 85.7% (24 respondents) agreed and 14.3% (4 respondents) disagreed Basic French software uses a tutorial-based pedagogical approaches. The findings of this study is important in particular for teachers in using the right approach, especially in web-based teaching and learning. This finding is supported by Juriah et al. (2001) and Azmeela (2003). This finding also supports the study of Collin (2001), Carol (2003) and Humprey (in Nor Rasimah 2007) which states the student will get better results by doing the drill and practice, repeating the process intensively and increasing training and strengthening. Therefore, the tutorial, drill and practice and educational games are seen the right approach in teaching and learning on the web.

Q4: Are the Basic French software developed applying the self-learning strategies, flexible, mastery, cooperative and active?

The study showed that 100% (28 respondents) agreed that this basic French language software to apply the self-learning strategies, flexible, and cooperative control. For active learning strategies, 96.7% (27 respondents) and 3.3% (1 respondent) does not. According to Ismail (2002), teachers must strive to diversify the approach towards optimizing the potential of the students in mastering the skills and knowledge in their learning. This finding is important because appropriate learning strategies will yield results or better results that needs to be achieved by students. Most of the respondents agree that this basic French language software has applied active learning strategies.

Q5: Is the software developed is to apply the learning theories such as behaviorism, and constructivism and cognitivisme?

The study showed that 100% (28 respondents) agreed that this basic French language software has appllied the learning theories such as behaviorism, constructivism and kognitivisme. According to Alessi and Trollip (2001), students who participate in behavioral learning will always give a positive response because this approach focuses on students' behavior changes as a result of the response or stimulus that is in the process of R & D. Baharuddin et al. (2002) also stated this approach (web-based approach) make students more clear about their goals and respond towards the achievement of better result in teaching &learning. This finding is also consistent with Mohamed Amin and Afendi (2005) and the proposed framework for the development of language-based software on-line. Afendi and Mohamed Amin (2009), stated that the application of these theories (in teaching & learning foreign language) is seen to assist in student achievement.

7.0 Conclusion

This study has successfully developed Basic French software (EASIFRENCH) by integrating web-based pedagogical approaches such as tutorials, drills and practice and educational games. This software development strengthened further by applying learning theories such as theories of behaviorism, cognitivism and constructivism. Some learning strategies such as independent learning strategies, flexible, mastery, cooperative and active learning also successfully applied in the development of this software. With the conceptual model based on characteristics such as language teaching approach, holistic development of students, a systematic and planned modules, chain of inter-related modules with each other and approach has made development multisensori EASIFRENCH software is unique and distinctive. By integrating elements of interactive multimedia, software development has been successful in increasing student achievement as being obtained from pre and post test conducted by two research groups have used two different methods of learning this basic French software.

Finally EASIFRENCH software is hopefully can motivate the teaching staff in developing web-based teaching material. This study also found that the approach (online learning) change the method of teaching and learning in enabling and enhancing the participation and achievement of students. This study is also expected to contribute in enriching the collection of teaching materials, especially in R & D Basic French language as well as to assist the intersted parties (stakeholders) in planning and managing design (framework) for teaching & learning in the future. This finding is also in line with the Malaysian Smart School Road Map 2005 - 2020: An Educational Odyssey - who expect the fourth wave (2010-2020) will focus on strengthening the teaching materials and technology as a facilitator (enabler) in the process of teaching and learning.

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DIGITAL STUDIO VS. CONVENTIONAL IN TEACHING ARCHITECTURAL DESIGN PROCESS

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Abstract

The main objective of this paper is to present an action research conducted in a polytechnic in determining the effect of using digital studio on architectural diploma students for teaching the design process compared to the use of conventional studio. For the past three years part of the semester six students had been exposed to the use of digital studio for the design process in helping students to produce creative design and more alternative ideas. The semester six students were selected for this study because all of these students already had basic skills to produce three-dimensional digital model using AutoCAD which they learn in semester five. The creativity of the design products for this study had been evaluated using an instrument developed based on the Creative Product Analysis Matrix (CPAM) (Besemer and Treffinger 1981). The strength of the design products was not affected by the quality of students' drawing, but depended a lot on the characteristics of creative products that were based on CPAM model. Students were involved with the use of a digital studio in the design process using AutoCAD, SketchUp, 3D Studio Viz and Lumions. This study involved architectural students with 12 different design projects in the period of three years. For the research purposes students were divided into two groups, one group involved in design activities using digital studio and the other group involved in design activities using conventional method. In this study no new digital studio was built physically, but every student was involved with the use of a digital studio in the design process required to carry out design activities in CAD lab, or students were asked to use their laptop in the studio. This study shows that students from groups that used digital studio in the design process produce more alternative ideas. Study also shows the digital design method can produce more complex and dynamic design ideas.

Keywords: digital studio, architectural design process, design activities, computer simulation

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1. Problems in Teaching Architectural Design Module

Architectural design is a complex and dynamic process. Designers start from something that is abstract and has progressively developed a problem that can be produced in the form of products. According to Lawson (1997), the architectural design is a process in which architects create spaces, places and buildings that have a major impact on the quality of human life. For this study the design process is a systematic process that has several levels to produce new products that can be evaluated physically and has many benefits. According to Kalisperis and Pehlivanidou (1998), the main problems faced by students in the design process is the limited ability of conventional media to produce a good visual presentation of more complex space. The conventional media also does not have the capability to evaluate the performance of any design space in a real situation. The past experiences of the researchers showed the lack of sensitivity of the students to manipulate the elements such as light, scale, finish and proportion in the design process. The students gave high priority to the production of accurate drawing and to the selection of graphic techniques suitable for use in producing interesting drawings. More time spent and effort had been given in producing presentation drawing rather than producing creative design products. Another problem of the conventional method is that the design activity relied heavily on a static graphic image without taking into account the effect of movement in a space, the effect of light in a space and the effect of finishing material in a space. The visual effects by moving images can facilitate designers to create the effective and creative interior design. Computer animation can help the designer to study the interior space based on the effect of light, color, texture and scale. One of the greatest advantages of AutoCAD is its capability to understand the weaknesses of the design of buildings and spaces before the building is constructed (Kalisperis & Pehlivanidou, 1998).

2. CAD Technology Built in Design

According to Husain (2007), CAD now known as computer-aided design is a technology that can actually do more than just a sketch. CAD technology has also been able to produce a digital model of three dimensional objects. This digital model has a good visual impact and gives freedom to the architect to think about objects, space and form on the same screen.

The fast development of CAD technology today has created a lot of software that can be used for drawing of two dimensional and three dimensional models. The digital model can be used easily for simulation activity. The development of CAD technology today has opened up new opportunities to assist the development of architectural education, especially in learning the design process.

3. Computer Simulation

Simulation is a method to bring the actual situation in a process or activity during the learning process (Humphreys, 1990). Computer simulation can be described as a method involving the use of a computer to replicate events, processes or situations into learning activities (Michael, 2000). The integration of computer simulation in the architectural design process can help students to study the physical impact of building finishes and colors in the actual situation on the building designed using CAD software. Two methods based on CAD technology can be used to help students in simulation activities. Three dimensional digital models can help students to carry out static simulation to study the effects such as texture and finishes of finishing materials on the architectural design. The computer animation can be used in performing a dynamic computer simulation. Computer animation being integrated in the design process can also help students to assess the quality of space in terms of movement. The main advantage of using computer simulation in the design process is that it can help students to quickly assess the quality of the designed shape and space. If computer simulation is integrated into the design process the polytechnic students are expected to produce a creative design product. Integration of CAD technology in the design process can improve the quality of polytechnic education in architecture, especially for learning architectural design process through design module. Integration of CAD technology can help students create new ideas in architectural design process.

4. Research Methodology

For the last eight semesters part of the students who attended design module class in semester six were required to use CAD technology in the design process. This study session was held from January 2007 to June 2010.

This study was conducted at a Polytechnic in one of the states in Malaysia involving 240 students. This study was quantitative in nature and examined the effect of the digital studio in the design process for producing creative design product. Quasi-experimental method was used to study the effect of integrating CAD technology in the design process. For each module in a three week periods all students involved in the retrieval of designs' information and analysis in respect of the project given. For 14 weeks remaining students were asked to participate in design activities. To see the effect of integration of CAD technology in the design process the students were divided into two groups in each semester.

Fifteen students received the highest grade in the AutoCAD class were asked to perform design process with the integration of CAD technology and the remaining 15 students were asked to carry the design process in conventional method. This strategy was used by researcher to ensure that time is not spent to retrain students using AutoCAD and 3D Studio Viz during the study. To facilitate integrating CAD technology in the design process students were asked to use CAD laboratory for design module. The rest of the students who followed the design process in conventional method, the design module was implemented in the third year design studio. Throughout the research was carried out, the type of project made by students was a public utility buildings with less than four levels such as child care centers, automotive centers, museums, craft centers, sports centers and recreational sea centers. The students' final design products for each semester were evaluated by two lecturers. To create the scenario of using digital studio in the design process CAD laboratory being used as design studio for those students that integrate CAD technology in the design process. CAD laboratory brought the feeling of digital design environment in the digital studio to the students. There were four activities in the design process for this research which were design information analysis, synthesis, simulation and determination of the final product. Analysis of design information was an activity to analyze the information derived from information search activities to provide design information to be used in the design process. Next, was the synthesis activity, and during this activity the ideas being triggered in the preparation of preliminary alternative ideas before decisions were made in the preparation of the final design ideas. Simulation activities were activities to produce final design ideas from the selected alternatives. A simulated activity was to provide a real situation in the design process. For this study building simulation were made using 3D Studio Viz and Lumions.

5. Findings

In assessing students' skills on the synthesis stage in the design process with the integration of CAD, this study was conducted to determine whether students who used CAD technology in the synthesis activity make more changes from two dimensions to three dimensions compared to conventional methods in the synthesis stage. The findings are shown in Table 1. Thus, the students involved in digital design methods scored a higher mean to change from the initial idea of two-dimensional to three-dimensional compared to the conventional method

Table 1 Mean for changing initial idea from 2D to 3D

Session	No of Students	Mean for Treatment Group	Mean for Control Group
Jan 2007	30	1.95	4.10
Jun 2007	30	2.05	3.85
Jan 2008	30	2.15	4.05
Jun 2008	30	2.10	3.45
Jan 2009	30	1.95	3.65
Jun 2009	30	2.20	3.85
Jan 2010	30	2.10	4.05

Jun 2010	30	2.05	3.75
Average		2.07	3.84

In assessing students' skills on the simulation activity during the design process with the integration of CAD, analysis had been made to determine whether students who used CAD technology did more simulations than students using conventional methods. The findings are shown in Table 2. Thus, the students involved in digital design methods scoreda higher mean in simulation activity compared to conventional methods.

Table 2 Mean for simulation activity

Session	No of Students	Mean for Treatment Group	Mean for Control Group
Jan 2007	30	2.00	3.95
Jun 2007	30	2.15	3.65
Jan 2008	30	1.95	4.15
Jun 2008	30	1.50	4.05
Jan 2009	30	1.65	3.90
Jun 2009	30	2.15	3.85
Jan 2010	30	1.95	3.75
Jun 2010	30	1.85	4.15
Average		1.90	3.93

This finding shows that students who undergo a digital design process made more simulations than students who undergo conventional design process. In conclusion, the descriptive analysis showed that the integration of CAD technology in the design process helped students at the synthesis and simulation activities. Inferential data was derived from the assessment of student outputs in the synthesis, simulation and final products in the design process. This data was used to determine the impact of CAD technology integration on student products in the design process, determining the effect of integrating CAD technology in the synthesis activity, and whether there were differences between initial ideas generated during the synthesis stage integrated with CAD technology compared with the initial ideas generated in the conventional synthesis activity. Inferential data show a significant difference between the initial ideas generated at the synthesis activity integrated with CAD technology (M = 82.3) compared with the initial ideas generated during the synthesis stage in the conventional method (M = 71.2), t (238) = 13 410 significant.

In determining the effect of CAD integration in simulation activity in terms whether there were differences between the ideas generated at the end of simulation technology integrated with CAD ompared with the ideas generated at the end of a conventional simulation, inferential analysis shows a significant difference between the ideas generated at the end of the simulation with CAD technology integration (M = 81.8) compared with the ideas in the conventional simulation (M = 71.63), t (238) = 9992 significant. In looking at the impact on the integration of CAD technology into the design process in producing creative product researchers looked at the effect of this integration based on the CPAM model. The results showed significant differences between the final product produced by the integration of CAD (M = 80.3) compared with the final product produced by the conventional design process (M = 71.3) in terms of creativity, t (238) = 9198 significant. Inferential analysis also showed a significant difference between the design process integrated with CAD technology (M = 82.3) compared with a conventional design process (M = 74.1) in producing unique product, t (238) = 11,090 significant. The findings also showed significant differences between the design process integrated with CAD technology (M = 78.0) compared with a conventional design process (M = 71.3) in producing practical product, t (238) = 6901 significantly.

The study also showed a significant difference between the design process integrated with CAD technology (M = 81.5) compared with a conventional design process (M = 72.0) in producing high details product, t (238) = 11 076 significant. Overall findings showed that there was a positive effect in integrating CAD technology in the design process to produce creative product. The comprehensive study at the polytechnic for eight semesters with design activities carried out by digital methods helped the students to produce more creative products compared to conventional design methods. Digital studio has the capability to help the students in producing creative during design process.

6. Product Review

The results showed significant differences between the products produced by digital method compared to the products produced by conventional methods. CAD technology assisted the students to produce designs' products with higher creativity. Some of the final design products produced by the students as a result of this study are shown in Figure 1 and Figure 2.

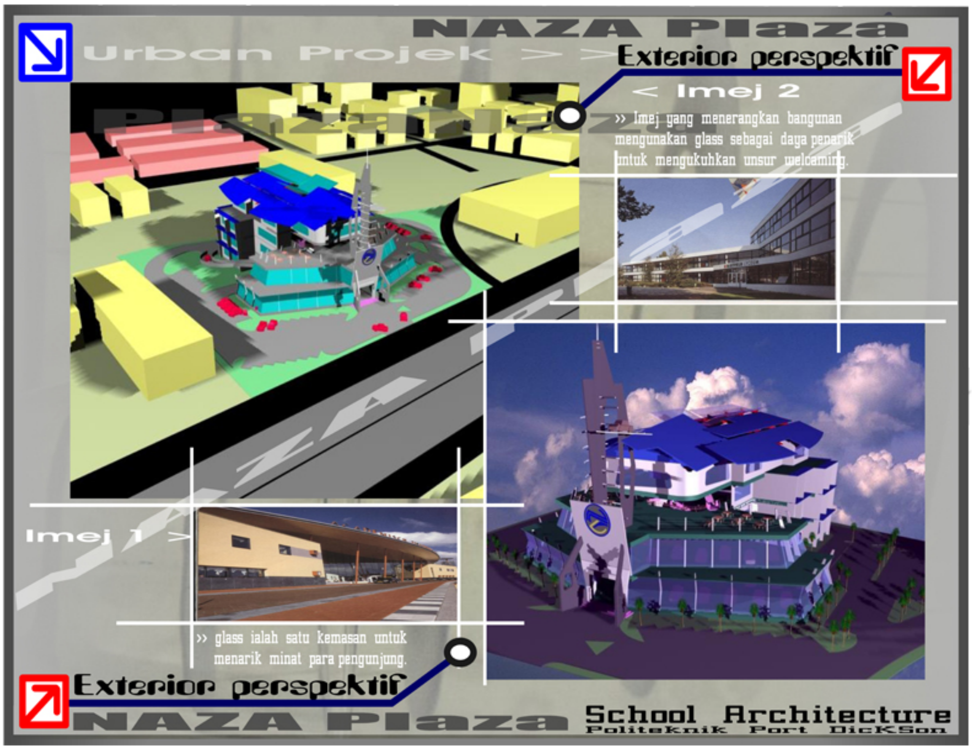

Figure 1 The Naza Plaza was designed by treatment group student in January 2007 session

Figure 2 Motor Sports Complex was designed by treatment group student Session in June 2007

7. Conclusion

This study demonstrates that the integration of CAD technology in the design process increases the number of ideas in the synthesis activity and the number of simulation in the simulation activity. This study also shows that the use of a digital studio in the design process is to build an environment to enhance students' desire to gain more knowledge and design ideas. CAD technology had been able to increase the students' abilities in producing good design ideas and rapid changes of design ideas from two dimensions to three dimensions. The integrated design process not only increases the number of solutions for design problem, but was able to improve the quality of the design solution presented by the students whether at the synthesis level or in the simulation level. The success of the product in the design process depends on the creativity of the product. To study the characteristics of creativity in determining the success of the design product based on the CPAM models consists of unique, practical and accurate details. Architectural design process is a systematic activity to produce creative products. Thus, the integration of CAD technology in the design process has been proven through this study which can help students to produce creative architectural product. CAD technology can help students in stimulating creative ideas during the design process.

Conclusions can be drawn for this study: that the use of CAD technology in learning architectural design process helps students in producing creative products, the CAD software helps the students to construct the digital model easily, especially for synthesis and simulation activities in the design process, the use of CPAM model as a basis to evaluate the creative design product enhances the quality of product evaluation and the use of a digital studio in the polytechnic provides the infrastructure that can stimulate students to produce creative design product.

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EDUCATION FOR THE BASE OF THE PYRAMID PEOPLE (BOP) USING VOICE INTERNET E-LEARNING

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Abstract

The need for education, especially for the Base of the Pyramid people (BOP) is very important from various aspects including their survivability, Economic, Social, Cultural and other developments, and minimizing the Digital Divide & Rich-Poor gap. Since many BOP are illiterate, live in rural areas where schools or educational institutions are scarce and cannot afford to go to schools, educating such population is a daunting task. In this paper, we describe a practical affordable solution to educate BOP using Voice Internet e-Learning that uses an Intelligent Agent and user's voice using any phone. Our approach uses both informal and formal learning including learning how to read or write using natural language. We emphasize on practical informal learning on Innovation and Entrepreneurship to ensure immediate and sustainable significant impact on Economic, Social and Cultural developments, along with creation of an enormous "Resource ".

Keywords: Internet; Voice Internet; e-Learning; Informal Learning; Formal Learning; Rendering; Intelligent Agent; Artificial Intelligence; User Interface; Education; Innovation; Entrepreneurship; Natural Language Understanding (NLU); Base of the Pyramid People (BOP).

Introduction

The need for education, especially for the BOP (Base of the Pyramid people) to eradicate poverty, minimize rich-poor gap, improve health, improve quality of life and more is obvious. Education is the key for economic, social, cultural and other growths. Education empowers a person and helps to become proactive, gain control of the life and broaden the range of available options [4]. Education is recognized as a basic human right. Education is the key for innovation, entrepreneurship, productivity improvement and resource creation.

In general, education is more important for women and children as they are less likely to receive medical services, clean water, sanitation and other services. Education is equally important for the people with various disabilities to help them become more independent, getting employed, avoid social exclusion and getting entertained. And, of course, education is good and important for all other types of people.

However, to have access to education, access to the Internet is almost a must in this information age. Hence, it is important that everyone can access the Internet easily and economically. It is needless to mention the importance of accessing the Internet for other needs including employment, economic, social, cultural & other developments, and more. Accessing the Internet in a practical and affordable way, and having e-Learning capability are even more important for BOP as they either do not have easy access to educational institutions or they cannot easily afford to attend an educational institution. In [1] and [2], we have described how Voice Internet can provide Internet access to everyone and help bridge the Digital Divide in a practical way by solving the key issues related to the existing approaches in bridging the Digital Divide. We argued that existing approaches to bridge the Digital Divide are good but not sufficient to completely bridge the Digital Divide. We then showed a more practical solution using "Voice Internet" to provide the benefits of the Internet to over 5 billion people (out of about 7 billion people in the world) who have some access to a phone. In [3] we emphasized that for the BOP, we would need to provide access using an ubiquitous device (like a simple phone), with a natural user interface (like Voice), without a requirement to be literate (no need to know how to read or write; rather use talking and listening), use existing content on the Internet (avoiding to re-write with another language like WML), and start with simple most desired services (like e-services).

What's next after Internet access is provided and Digital and Language Divides [1] are bridged from connectivity standpoint? Well, we would need to utilize the access to the information to knowledge, use knowledge to drive innovation & entrepreneurship to finally drive economic, social, cultural and other developments with increased world peace. Education is a key component to develop knowledge from the

information. It is also a key component for innovation and entrepreneurship. And, of course, it is a key component to more easily get employed as well as increase productivity. Thus, access to the Internet and Education goes hand to hand.
It is important to note that although education lowers or help eradicate poverty (as stated above), there is no strict causal relationship in a macro sense [4]. In fact, one key reason for this is lack of emphasis on informal education and education on innovation & entrepreneurship.

In this paper, we describe a practical affordable solution to educate BOP using Voice Internet e-Learning that uses an Intelligent Agent. Our approach includes both informal and formal learning including learning how to read or write using natural language. We emphasize on practical informal learning on Innovation and Entrepreneurship to ensure immediate and sustainable significant impact on Economic, Social and Cultural developments along with a valuable "Resource Creation", and thus show a better causal relationship between education and eradication of poverty. Section 2 provides a short description of existing efforts. Section 3 describes a method to effectively bridging the Digital and Language Divides as these are strongly related to effective e-Learning. Section 4 describes our solution. Section 5 emphasizes on innovation and entrepreneurship along with the need for a well integrated approach to ensure effective implementation helping Global Development, and Section 6 provides conclusion.

Existing Approaches and Critical Issues

Many organizations around the world have been very active in providing education to the poor. Such organizations include the United Nations, World Bank, Governments, NGOs, Foundations, Non-profit entities, Corporations, Universities and Research Institutions. They usually provide help in various ways including special summer classes, special courses, equipments, books and other related materials. In addition to teaching via face-to-face classes, some of these organizations also provide various help with e-Learning. These efforts are well aligned with the following conclusion

"There is no way the world can succeed in eradication of poverty if the developing world is not part of the knowledge creation, its dissemination and its utilization to promote innovation"

made by both the United Nations Millennium Project Task Force and the World Bank after conducting some good research.

Since traditional classroom based education for the poor is expensive, although very important, we focus here more on e-Learning.

> One good source describing various efforts on conventional education as well as e-Learning education for the poor is [4] where authors provide a good summary of the current efforts and some good recommendations in moving forward with e-Learning. All such recommendations are geared towards mainly literate people, use of existing e-Learning framework and existing approaches to access the Internet, which is mainly dominated via using a computer. While such recommendations are great and should be continued, these would not provide a practical affordable solution to the poor for the following key reasons:

Poor (BOP) do not have access to computers.
Most of the BOP are illiterate.
Most rural areas do not have Internet Access.
Most e-Learning courses are formal courses geared for the literate people.
Most e-Learning courses are in English.
No noticeable focus on Innovation and Entrepreneurship.

Thus, we would need to address the problem by focusing on the following:

Effectively address the issues of bridging the Digital and Language Divides to ensure easy access to the Internet through a ubiquitous device like a simple phone.
Use voice and natural language for interaction as many BOP are illiterate.
Focus mainly on "informal education" as BOP would need something affordable, simple and quick that would help them much sooner than going through some formal degrees or certificates.
Focus on some good "Automated Method" to ensure that content delivery, use, teaching and learning are simple, natural and easy.
Focus on Innovation and Entrepreneurship as these are critical to expedite and sustain development.

We believe our proposed solution using **Voice Internet e-Learning** would effectively meet above needs, and hence would be a good, affordable and practical solution as well supported by the existing users of Voice Internet.

Effectively Bridging the Digital and Language Divides

The existing approaches of bridging the Digital Divide can be broadly classified into **three groups**:

(a) by providing computers or low cost simple computers or computer like devices to people who do not have one.
(b) by providing personal devices like PDAs and cell phones with good size display screen.
(c) by using TV with a set-top box.

In [1] and[2] we have argued that existing approaches to bridge the Digital Divide are important and will minimize the Digital Divide but are not sufficient to truly bridge the Digital Divide, mainly for the following reasons:
Connected computers represent about 15% of the total phone population. Besides, for many people (especially at BOP), learning and using a computer is difficult.
Personal devices like a cell phone with good size screen or PDA are great devices to communicate via voice or text with small contents. But these are not good devices to do computing or to access the Internet. The key reasons are:

a. difficult user interface because of small screen and small keypad. In fact, these devices are getting smaller, in general, whereas our eyes and fingers are not.
The content is limited as one would need to re-write the content in another language like WML (Wireless Markup Language) in case of cell phone viewing; or the content needs to be manually scrolled in case of a PDA.

Visual access makes such devices difficult in an eyes busy-hands busy situation like while driving.

Many people, especially, in the developing world do not know how to read or write. So, a visual display based access would not be very useful to such population.

> Accessing the Internet via a TV and set-top box has not been very successful yet. However, it has a great promise. With TV becoming more interactive device, people getting more and more familiar with the Internet and more attractive content becoming available through digital TV and IPTV, Internet access via TV shows great potential. The cost issue and fear of learning how to use a computer will be significantly minimized for many people. However, most of the other key issues mentioned for computer or mobile phone based access will still apply – like digital TV will still be beyond reach by many people at the base of the pyramid, learning how to use complex features will still be there via a complex remote control.

Voice Internet overcomes the difficulties mentioned above with existing approaches:

- **no need to buy a special device (thus allowing easy & affordable access to many more people)**

- **no need to deal with small screen or small key pad as users basically talk and listen**

- **much easier to learn as learning how to use a phone is much simpler than learning how to use a computer or personal device**

- **no need to re-write the content in another language. There are over 3 billions of websites on the Internet. Re-writing all of them would be very expensive and hence not practical**

- **no requirement to know how to read or write**

The **other key challenge that Voice Internet overcomes** is the **"rendering"** problem. The Internet was designed with visual access in a large display device in mind. Thus, all the information is laid out in a manner that attracts our eyes but not ears. **Rendering or converting such information into short, precise, easily navigable, meaningful and pleasant to listen to content** is a very hard problem that Voice Internet has overcome. These key features of rendering are very important as when listening, one does not have time to listen to everything on a page, would like to move around easily and quickly and make sure that content heard is the content that was desired.

An **Automated Attendant (also called an Intelligent Agent, IA)** is used to perform the "rendering" function. IA performs rendering by

(a) automatically generating important information of the page, called, "Page Highlights", presenting them in a small amount of information at a time that one can easily follow

(b) finding appropriate as well as only relevant contents on a linked page selected by a Page Highlight, assembling the relevant contents from a linked page, and presenting them

(c) and providing easy navigation.

Rendering allows users to easily navigate within and between pages using simple voice commands or keypad entries. The Intelligent Agent is capable of learning user preferences, to continually improve ease of access and use over time.

Rendering is achieved by using algorithms similar to the algorithms used by sighted users. The key steps of rendering are done using the information available in the visual web page itself and employing appropriate algorithms to use all such information including text contents, color, font size, links, paragraph, amount of texts and meaning of the words. Some language processing algorithms are also used to further refine the rendering, navigation and filling of on-line forms (Form Filling). This is similar to how the brain of a normal sighted person renders information from a visual page by looking into the font size, boldness, color, content density, link, meaning of titles/labels, and then selecting a topic, going to the desired page and then reading only the relevant information on the desired page. Form filling is done by presenting forms as Form Page Highlights and also creating appropriate questions, taking the text/voice inputs from the user and then filling and submitting the form.

Thus, a user can seamlessly access any content on the Internet, interact with any forms and complete transactions like shopping, banking etc. using a simple phone and his/her own voice. Another key feature is that contents can be translated in real time into another language, providing audio access to, for example, English-language web pages for those with limited English language skills, thus bridging the **Language Divide**. A good example of Voice Internet is netECHO® from **InternetSpeech, Inc, a company based in California, USA (www.internetspeech.com).**

Voice Internet is an **enabling technology**. The core technology can be used to develop many new products and services including MicroBrowser (to allow any website content to be automatically and effectively displayed on any cell phone or PDA screen at ease) without the need to re-write the web content in another language, Voice Computer (to allow a user to store, edit and manipulate files etc. on a server via phone call), netTalk (allowing VoIP call using no broadband phone or no broadband connection) and more. In this paper, we extend the Voice Internet Intelligent Agent for effective e-Learning for the BOP.

Our Proposed e-Learning Solution for the BOP using Voice Internet

Our e-Learning solution is built on the Voice Internet technology as it addresses some of major issues related to the BOP in providing effective education via e-Learning, namely,
Help bridges the Digital and Language Divides in an effective way to ensure easy access to the Internet through a ubiquitous device like a simple phone.
Uses voice and natural language for interaction.
Renders content into Short, Precise, Easily Navigable and Meaningful content.
Users basically talk and listen to the Internet using their voice and hearing.

These key features available in Voice Internet are enhanced with an augmented Intelligent Agent to handle the e-Learning needs. Thus, the **Voice Internet e-Learning Intelligent Agent (VIELIA)** addresses the following additional issues:

Focus on some good “Automated Method” to ensure that content delivery, use, teaching and learning are simple, natural and easy.
Uses Question and Answer type System Approach in the domain of Interest.
Focus mainly on “informal education/courses” as BOP would need something affordable, simple and quick that would help them much sooner than going through some formal degrees or certificates.
VIELIA also focuses on “formal” existing e-Learning courses but with better delivery and user interaction.
Focuses on Innovation and Entrepreneurship as these are critical to expedite and sustain development.

These additional features are achieved by using better content management, enhanced dialogue design, enhanced rendering, Natural Language Understanding, Q&A approach and an automated way to improve performance over time using some self-learning. **Fig. 1 shows VIELIA** architecture with all major blocks.

Focusing on Innovation and Entrepreneurship

As already emphasized, education, especially e-Learning based education is a very important element for BOP. To stimulate real economic growth, “education” needs to be highly emphasized and targeted, especially with “**creativity”, “productivity” and “resource” creation** in mind. Creativity will in turn **drive innovation, entrepreneurship and productivity** (and even resources – like discovering new oil reserve, alternate energy…) resulting successful business entities which in turn will create jobs and **drive economy, reducing rich-poor gap**. In a nut shell, the key idea is to use the benefits of getting to the Internet to create valuable resources.

As already emphasized, education needs to be targeted with special focus **on Innovation and Entrepreneurship in both informal and formal setting** (with more emphasis on informal setting to meet the needs of the BOP).

Fostering Innovation:
Education is great and essential but not sufficient to have a great impact by itself. E.g. even after everybody is well educated, most possibly there will be more job seekers than number of jobs. So, education itself will not solve the ultimate goal of having great economic development.

Innovation is a very important element to apply education in a manner it is impactful in solving some key problems in more efficient ways, and thus, help many people and in turn help economic growth. Innovation does not need to be at high level – it can be at all levels. So, there is no need to think that only certain highly educated people can do innovation. In fact, many illiterate people can be very innovative in solving their key problems. This is why we would need to emphasize on both formal and informal education as many people at the base of the Pyramid can become innovative faster using informal education.
Similarly, higher education is the key for innovation at high level. Thus, graduate studies (with special focus on multi-disciplinary education) in key subject areas including science, engineering, medicine, and business are very important. A pure technical innovation may not be effective in producing good results unless there are also innovation in marketing, sales and business development.

Innovation needs to be in almost everything including improving various types of existing systems (transportation, communication, business processes, ..), automating various processes (economic, social,,…), coming up with new product or business ideas (in the local, regional or global contexts), and research. *A well integrated approach addressing all key issues and using a sound business model is needed to ensure effective implementation & helping Global Development [1].*

Fostering Entrepreneurship:
Innovation & Education alone cannot really make things happen unless innovations are implemented using a sound business model. Thus, fostering “entrepreneurship” using innovation is the key to take full advantage of innovation - developing products and services, deploying them to the users, ensuring that such products and services are beneficial to the users & society, and thus helping social, economic, cultural and other

developments. These will also help monetize the innovation. Like innovation, entrepreneurship should also be at all levels.

An Example of How Voice Internet Helps in Education, Innovation and Entrepreneurship
Voice Internet is an important enabling technology that helps in Education, Innovation and Entrepreneurship:
Provides basic farming related education to all farmers via any phone and user's voice.
Provide many Extension services via on-line using any phone.
Helps farmers sell more easily via simple outlets.
Help farmers sell via online shopping portals.
Help farmers learn how to minimize waste and preserve their produce by converting them into various processed food products.
Help farmers to get funding through Voice Internet based Microfinance.

All these help improve the efficiency significantly, make their selling process much easier, minimize waste and increase their ROI (Return on investment). Voice Internet based e-Learning also enables them to move up the food chain and come up with new forms of products and services. Because most of them are illiterate and do not know how to read or write, Voice Internet is a very good affordable, easy to learn and easy to use practical way to help farmers. Once they become more efficient and improve their ROI, it will be easier for them to ensure sustainability and growth.

5.2 Voice Internet based Microfinance Model with Higher ROI & Higher Participation
Voice Internet can successfully use existing microfinance infrastructure to stimulate growth.
The microfinance borrowers borrow a small amount of money and use it to do some business e.g. buying cows and selling milk. One of the main issues is that most borrowers do the same or similar things. Consequently, in a village, most borrowers are likely to sell milk to the same customers. This causes price competition resulting lower margin. In addition, the borrowers would need to return money back to lenders, usually every week, which puts extreme pressure on the borrowers (it is important to note that as a policy, Microfinance model does not provide any business idea, it just provides funding [8]).

Now, let's say that in addition to lending money to the borrowers, we provide specific valuable information via the Internet (e.g. using Voice Internet) that can be used by the borrowers to do some innovative new businesses – e.g. a farmer can do better farming, sell produce with higher margin, learn how to preserve produces & minimize waste and many more. By providing such valuable information and associated training on entrepreneurship & innovation, many people will be able to come up with new compelling business ideas that can provide much higher financial & social **ROI** ***(Return on Investment) allowing them to keep more for themselves and also providing higher financial return to the lenders.***

As reported in many texts, the interest rate for **microfinance is high** (can range from 30% to 60%). Higher ROI will alleviate this by a substantial amount. Use of the Internet and Voice Internet in processing microfinance would also reduce the management cost, thus lowering the high interest rate. Hence, Voice Internet enabled microfinance would attract many more lenders and borrowers in a positive win-win way – generating more revenues with higher ROI, lowering interest rate and also returning more to the lenders. Accordingly, it would make the microfinance model more successful and will strengthen the whole microfinance infrastructure. Apart from a higher financial ROI, there is obviously a strong Social ROI. And hence, it is a key driving force not just for traditional lenders, but also for many donors and companies to maintain their good corporate citizenship. **And, of course, it would also help Voice Internet significantly as many microfinance borrowers will use the Voice Internet service.**

This will also help the Social Business and Social Entrepreneurship. Thus, **Voice Internet based Microfinance Model will significantly help innovation and entrepreneurship, and in turn will help Economic, Social, Cultural and other developments of BOP. It will also help the investors (rich) as they will get higher ROI.**

Conclusion
e-Learning based education *for the Base of the Pyramid (BOP) people is the key for their survival and development. However, we need to ensure that such an e-Learning system meets all the key criteria needed by*

the BOP, namely, Bridging the Digital and Language Divides by using a ubiquitous and affordable device like a simple phone, Use voice and natural language for interaction as many BOP are illiterate, Focus mainly on "informal education" as BOP would need something affordable, simple and quick that would help them much sooner than going through some formal degrees or certificates, Focus on some good "Automated Method" to ensure that content delivery, usage, teaching and learning are simple, natural and easy, and Focus on Innovation and Entrepreneurship as these are critical to ensure development with sustainability and growth.

Our proposed solution using **Voice Internet e-Learning** would effectively meet above needs, and hence would be a good, affordable and practical solution as well supported by the existing users of Voice Internet.

*We believe our proposed approach can create an**, enormous resource from the BOP people who can** then actively participate in driving **global economy**. This would not only help the base of the Pyramid people to get out of the poverty but would also help top of the Pyramid people who can effectively use such an enormous low cost resource.*

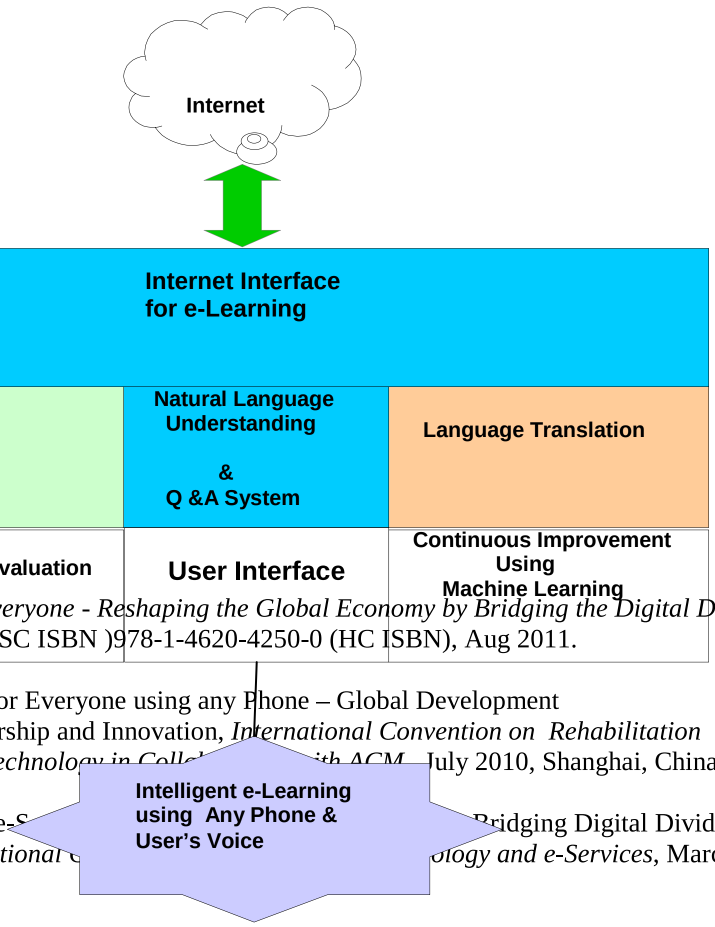

Fig. 1 Voice Internet based e-Learning Intelligent Agent (VIELIA)

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EFFECTIVENESS OF INTEGRATING EDUWEBTV RESOURCES ON FORM TWO STUDENTS' ACHIEVEMENT IN LEARNING SCIENCE

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Abstract

This study evaluated the effects of integrating resources from the Eduwebtv online portal on students' achievement in learning science. The study employed quasi experimental design using pre and post tests. Two classes of Form Two secondary school students were randomly assigned to the experimental (n=32) and control (n=30) intact groups. The experiment involved ten science class sessions. Students in both groups received similar content on the topic 'Dynamic, Support and Movement' and taught by the same teacher. For the treatment group the teacher integrated video-based resources obtained from the Eduwebtv portal to teach the topic. On the other hand, the control group was taught in the conventional way, without the video-based resources. Achievement in learning the topic was assessed using two similar sets of validated teacher-designed tests administered before and after the experiment. Data were analyzed by Statistical Packages for the Social Sciences (SPSS) version 15.0. using descriptive (mean, frequency, percentage & standard deviation) and inferential statistics (t-test). Findings demonstrated that there was a significant difference in students' achievement in the post-test in the treatment group ($M = 51.75$, $SD = 7.45$) compared to the control group ($M = 41.87$, $SD = 6.85$); $t(29) = 5.361$, $p<0.05$.

Keywords: online educational portal, Eduwebtv, students' achievement, effectiveness

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1. Research Background

Nowadays information and communication technology or ICT, especially web-based technology is a norm in almost every educational field. Teaching and learning process is not limited to physical classroom anymore as ICT offers flexibility to users in the aspects of time, space and place. New concepts such as 'learning on demand' and 'mobile learning' provide opportunities for students to acquire educational services anywhere, anytime or whenever needed. It is clear that the creative use of ICT can increase educators' teaching quality (Rosnaini Mahmud, 2006; Norton & Wilburg, 2003), increase students' learning and performance (Valdez, McNabb, Foertsch, Anderson, Hawkes & Raack, 2000), and encourage students' development (Kamariah Abu Bakar, Mohamed Amin Embi & Afendi Hamat, 2006).

Thus, web-based education has become a teaching and learning trend today. In an attempt to produce quality education for all, the Ministry of Education Malaysia (MMOE) has introduced a video-based online educational portal known as Eduwebtv (www.eduwebtv.com). Eduwebtv was developed by MMOE as a platform to provide education in digital format for all namely students and teachers, and the public in general. This move is in line with the Education Development Master Plan (PIPP) 2006-2010 that stipulates four main crux including equity and access to quality education for all citizens (Education Development Master Plan, 2006).

Before the introduction of the educational online portal, the ministry, specifically the Educational Technology Division, has consistently brought technology into the Malaysian schools ranging from then educational radio and television, computer in education, and now smart school applications, online learning networks and resources. The educational television introduced in the early 1970s had over the years played a significant role in bringing authentic learning materials into the classroom, and bridging the gap between the classroom and the real world. However, aired educational television had several setbacks such as poor reception during bad weather, program scheduling particularly live telecast (Rosnaini Mahmud & Wan Zah Wan Ali, 2003), and limited place for viewing due to minimal number of television sets (Rosnaini Mahmud & Mohd Arif Hj. Ismail, 2007). On the other hand, the Eduwebtv online portal serves as instructional and learning resources for both teachers and students (Malaysia Ministry of Education, 2008). At its conception in 2008, the portal has seven channels, nevertheless, latest checking of the portal shows that the video-based channels are streamlined into four – News, Special Event, Curriculum and Guideline (Eduwebtv.com, 2012). In the Curriculum channel, teachers have access to video-based instructional resources for primary and secondary school subjects including science.

In the context of Malaysia, the science subject is taught as one of the core subjects at primary and secondary schools. One of its aims is to provide students with the knowledge and skills in science and technology, make decisions and solve problems based on scientific attitudes and noble values (Curriculum Development Division, 2010). The importance of using technology in the science classrooms is undeniable. Gee, Hull and Lankshear (1996) suggest the use of technology as tools for increasing productivity, communication, investigation and creation. In the same vein, Roblyer and Doering (2010) highlight the importance of using technology resources to assist various teaching and learning strategies by supporting authentic science experiences, scientific inquiry skills, science concept learning and providing access to science information and tools.

2. Research Problem

There are many factors that prevent successful technology integration in schools which may involve teachers, school and also technology facilities. Several researches examining technology integration in teaching and learning demonstrate that teachers were not given enough support to use technology effectively in classrooms. Norizan Ahmad's (2005) study on technology integration in teaching and learning science at secondary schools found that teachers can learn how to integrate technology in teaching and learning science, however its success depends largely on the stake holders' capability and commitment to overcome issues related to curriculum, school's expectations, time constraints and access to technology.

The Eduwebtv is an interactive video-based education portal that can be used in teaching and learning particularly school subjects such as science. Teachers and students can access the portal anytime as long as they have access to the Internet. Although various technology tools and resources are provided to teachers and schools (such as provision of laptops, teaching courseware and CDRI) the ICT usage in schools is still below satisfactory level (Rosnaini Mahmud, 2006). A small study related to readiness in using Eduwebtv for teaching and learning purposes among teachers found that they have moderate skills in using the resources (Siti Salbiah Ahmad, Rosnaini Mahmud, Fadzilah Abdul Rahman, & Nurzatulshima Kamarudin, 2010). Another study conducted by Johari Hassan and Nor Hafiza Sulaiman (2010) found that primary school teachers use Eduwebtv resources at moderate level too.

The Eduwebtv educational portal was launched in 2009, but so far no studies have explored its effectiveness in terms of providing resources for teachers or enhancing students' achievement. Thus, this study aimed at examining the effects of using the instructional resources from the portal on form two students' achievement in learning science, namely on the topic 'Dynamic, Support and Movement'

3. Research Objectives

The objectives of this study were to determine:

Whether there was a significant difference between the pre-test mean scores between treatment and control groups.
Whether there was a significant difference between the pre-test mean scores and post-test mean scores in the control group.
Whether there was a significant difference between the pre-test mean scores and post-test mean scores in the treatment group
Whether there was a significant difference between the post-test mean scores between the treatment and control groups.

4. Research Methodology

4.1 Design

This study employed the quasi experimental using pre-test and post-test design to assess students' achievement in learning the topic 'Dynamic, Support and Movement'. The independent variables in this research were the teaching methods using educational materials from Eduwebtv and conventional method. The dependent variable was the students' achievement in learning the topic.

4.2 Samples

A total of 62 form two students from an urban school were involved in the study. They were chosen from two classes (intact groups). One class was randomly selected as the experimental group, while the other one served as the control group. The students in the experimental group were exposed to the teaching method which integrated instructional resources and materials from the Eduwebtv portal. The control group on the other hand, went through the teaching sessions using conventional method. Both groups were taught by the same teacher, and the treatment lasted for eight sessions. Each session was conducted for 80 minutes.

4.3 Instruments

In this research two teacher-made and validated tests were used to determine students' achievement. The pre-test was used to gauge students' level before the treatment, while the post-test was employed after the treatment sessions.

4.4 Procedure

This experimental study was conducted following five phases. The first phase involved developing lesson plans and test items for the topic on 'Dynamic, Support and Movement' in accordance with the form two science syllabus. In the second phase, the lesson plans and test items were then sent for validation by a panel of experts involving two very experienced science teachers. Next, the treatment and control groups were given the pre-test to determine their knowledge level before going through the learning process. The next phase involved the treatment group receiving instruction in which the teacher integrated with the use of educational resources and materials from the Eduwebtv portal. The control group received instruction through the conventional way, without video-based downloaded from the portal. In the final phase both groups of students were given post-test to measure their achievement in learning the topic they were taught.

4.5 Data Analysis

Data were analyzed descriptively (mean, frequency, percentage & standard deviation) and inferentially (t-test).

5. Findings and Discussion

This study attempted to determine significant differences between the pre-test mean scores between treatment and control groups, pre-test mean scores and post-test mean scores in the treatment and control groups, and post-test mean scores between the treatment and control groups. Accordingly four hypotheses were formed and the results were analyzed using t-test at significant level of 0.05 for each test.

Ho1 There is no significant difference in the pre-test achievement mean scores between the treatment and control groups before the experiment.

Group	**N**	**Mean**	**Standard Deviation**	**df**	**t Value**	**Sig. p**
Treatment	32	23.93	8.077	29	0.213	0.833
Control	30	23.47	8.386			

* Significant Level at <0.05

Table. 1. Pre-test Mean Scores Achieved by Treatment and Control Groups

Table 1 presents the treatment group pre-test mean score was 23.93 (SD = 8.077) while the control group pre-test mean score was 23.47 (SD = 8.386) with t value(29) = 0.213, p>0.05. This shows that Ho1 failed to be rejected. It can be concluded that there was no significant difference in the pre-test mean scores between the treatment group and control groups prior to the experimental study conducted. Both groups were found to have similar existing knowledge and skills on the topic related to ‘Dynamic, Support and Movement’.

Ho2 There is no significant difference between the pre-test mean score with the post-test mean score among students in the control group.

Control Group	**N**	**Mean**	**Standard Deviation**	**df**	**t Value**	**Sig. p**
Pre-test	30	23.47	8.39	29	-8.856	0.000
Post-test	30	41.87	6.85			

* Significant Level at <0.05

Table. 2. Pre-test and Post-test Mean Scores for the Control Group

Referring to Table 2, it can be seen that the pre-test mean score for the control group was 23.47 (SD = 8.39), while the post-test mean score was 41.87 (SD = 6.85) with t value(29) = -8.856, p<0.05. Since the significant value was 0.000, and smaller than significant level of 0.05, Ho2 was rejected. This finding demonstrated that there was a significant difference between the pre-test mean score with the post-test mean score of students who underwent conventional method in learning science.

Ho3 There is no significant difference between the pre-test mean score with post-test mean score for the treatment group.

Treatment Group	N	Mean	Standard Deviation	df	t Value	Sig. p
Pre-test	32	24.31	7.95	31	-19.671	0.000
Post-test	32	51.75	7.32			

* Significant Level at <0.05

Table 3: Pre-test and Post-test Mean Scores for the Treatment Group

Table 3 shows the pre-test mean score for the treatment group was 24.31 (SD = 7.95), while the post-test mean score was 51.75 (SD = 7.32) with t value(31) = -19.671, $p<0.05$. Results showed that the significant value 0.000 was smaller than significant level of 0.05, thus Ho3 was also rejected. There was as a significant difference between the pre-test mean score with post-test mean score of students who underwent the alternative teaching method which integrated video-based materials from the Eduwebtv educational portal. The large mean difference, 27.44 demonstrated that the lessons using Eduwebtv resources and materials were effective in increasing students achievement in learning the topic taught.

Ho4 There is no significant difference in post-test mean scores between the treatment and control groups.

Group	N	Mean	Standard Deviation	df	t Value	Sig. p
Treatment	32	51.75	7.45	29	5.361	0.000
Control	30	41.87	6.85			

*Significant Level at <0.05

Table 4: Post-test Mean Scores Achieved by the Treatment and Control Groups

Based on Table 4 it can be seen that the post-test mean score of the treatment group was 51.75 (SD = 7.45), while the post-test mean score of the control group was 41.87 (SD = 6.85) with t value(29) = 5.361, $p<0.05$. The significant value obtained 0.000 was smaller than the significant level of 0.05, thus Ho4 was rejected. This finding demonstrated that there was a significant difference between the post-test mean score of the treatment group using the video-based educational resources and materials compared to control group which used conventional method of instruction.

This study found that students benefitted more from the use of educational resources and materials accessed from the Eduwebtv online educational portal compared to the group taught in the normal science classroom. As stated by Roblyer and Doering (2010), integration of technology in a science classroom can improve teachers' instruction and students learning. The Internet provides teachers opportunities to expand their content knowledge and online professional development. As for the students they have an abundance of learning resources that can assist them in learning, on their own, or guided by teachers. Although many resources and materials can be found online students may not realized the full potential of the Internet for their own learning if they are not provided with the proper guidance and "thoughtful integration of these marvellous resources into instruction by trained and knowledgeable teachers, (Lever-Duffy & McDonald, 2009, p.305.).

Conlusion

The resources provided by the Eduwebtv online portal is found useful to both teachers and students. These online resources can assist in overcoming barriers to integration of technology in science classroom such as teachers' lack of time in designing and creating their own materials. Nevertheless, teachers still have to spend some time in exploring what the portal has to offer, and make decisions as to what, when and how to integrate these resources into teaching and learning. Although teachers still need support from various authorities particularly in terms of technical expertise and facilities, they are the ones who make the choice of using or not using the resources afforded by this educational portal.

Acknowledgement

This research was funded by the Research University Grant (RUG) Universiti Putra Malaysia (06-01-09-0761RU)

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EFFECTIVENESS OF ISMAN INSTRUCTIONAL DESIGN MODEL IN DEVELOPING PHYSICS MODULE BASED ON LEARNING STYLE AND APPROPRIATE TECHNOLOGY

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Abstract

The study examines the effectiveness of Isman Instructional Design Model in developing a Physics module based on learning style and appropriate technology in secondary educational setting in Malaysia. Two instruments were used to collect data for this study. The pre-posttest designed to identify students' achievement score and Felder Silverman's Learning Style Inventory to measure students' learning style. Findings from evaluation of the module conducted among 120 participants involving 30 participants of each learning style (visual/verbal, active/reflective) suggested that the module is effective for visual, active, reflective and not for verbal learners. The findings from this study suggest that Isman Instructional Design Model which pays attention to instruction from the learner perspective than from content perspective is suitable in designing and developing Physics module based on learning style and appropriate technology in secondary educational setting in Malaysia. The findings of this study is also hoped to provide insights to promote teaching and learning of Physics based on learning style and appropriate technology.

Key words: Isman Instructional Design Model; Learning styles; Appropriate technology

Introduction

A key to success of science education is the use of technology tools which can greatly enhance a student's understanding of science concepts (Isman, Yaratan, & Caner, 2007). The educational technology tools can take a difficult to learn science concept and change it from abstract to concrete to make it easier to understand (Isman et al., 2007). Identifying a learner's unique learning style is important in ensuring that learners are engaged in learning (Graf, Kinshuk, & Liu, 2009; Larkin-Hein & Budny, 2001; Yang & Tsai, 2008; Naimie, Siraj, Ahmad Abuzaid, & Shagholi, 2010). It has been observed that when instruction is aligned with the learners' learning styles learning achievements will increase together with affective and motivational advantages (Franzoni & Assar, 2009; Lau & Yuen, 2010; Saeed, Yang, & Sinnapan, 2009). Learning style defines how a learner concentrates, processes and retains information during learning (Dunn, 1990).

Felder and Silverman (1988) have created a learning style model that brings focus to the learning styles aspects among the Engineering students. This model has classified the students into eight categories based on four dimensions: (visual/verbal, active/reflective, sequential/global, sensing/intuitive). In the context of this study, Felder Silverman Learning Style Model is used because the Index of Learning Style (ILS) Felder-Soloman provides a practical approach for determining the dominant learning style of students (Kinshuk & Lin, 2004). ILS was devised for engineering students. Physics is one of the components in engineering; hence the ILS is the most suitable instrument for this study. Local researchers have used the model to determine the learning style of Physics and Chemistry students (Ng Sook Chin, 2005; Saedah Siraj & Nabihah Badar, 2005).

Previous research shows that matching the Physics concept, technology and learning styles can increase the students' mastery of concepts (Hein, 1997; Ross & Lukow, 2004; Tsoi, Goh, & Chia, 2005). It can be implied that the development of Physics module based on technology and learning style would attract students' interest in Physics. Hence, this study was aimed at examining the effectiveness of Isman Instructional Model in developing a Physics module based on learning style and appropriate technology. This study does not compare the effect of traditional lesson to Physics module based on technology and learning style but rather draws attention to effectiveness of Isman Instructional Design Model in developing a Physics module based on technology and learning style.

The Aim of Research

The aim of this research is to examine the effectiveness of Isman Instructional Design Model in developing a Physics module based on learning style and appropriate technology in the secondary educational setting. This study seeks to answer the following research questions:

- Are modules based on learning style and appropriate technology which was developed by employing Isman model effective?

Scope and Limitations

In this study, a sample size of 120 students at an urban secondary school in the state of Selangor was selected as the population reflected the proportion of the multiracial communities in Malaysia. Students' modules designed, developed and tested in this study were only on visual, verbal, active and reflective modules, as suggested by the panel of experts.

Instruments

Two instruments were used in this study: First is the Index of Learning Styles (ILS) (Felder & Silverman, 1988) for identifying the students' learning styles. The survey instrument used was Learning Style Index (LSI) developed by Felder and Soloman (1988) which had been translated to Bahasa Malaysia by Nabihah Badar and Saedah Siraj (2005) and administrated to 120 form four students in the same district as this research. The instrument has a Cronbach alpha reliability score of .72. The second instrument is two multiple choice tests used for pretest and posttest. This test was designed to analyze students' achievement on "Charles's Law" and "Boyle's Law". There were 50 items in these two instruments. The content of the instrument was validated by three Physics teachers while the language was validated by two language teachers with more than 10 years working experience.

Theoretical Framework

The major goal of Isman Instructional design Model is to point up how to plan, develop, implement, evaluate and organize full learning activities effectively so that it will ensure competent performance by students (Isman, 2011). The theoretical foundation of the new model comes from behaviorism, cognitism and constructivism views. This model is interested in how to store the information into long term memory, hence instructional activities are designed in this model. Isman model also uses constructivism which pays attention to personal applications. The researchers aim to test the effectiveness of Isman model in developing Physics module based on learning style and appropriate technology in Malaysian secondary educational setting as shown in Table 1.

Table 1: Use of Isman model to design and develop a Physics pedagogical module

Steps	Work log	Descriptions
Step 1 Input	Identify needs Identify contents Identify goals-objectives Identify teaching methods Identify evaluation materials Identify instructional media	Designing Physics module based on learning style and technology by a panel of experts. Designing the webpage for teachers' module and students module for visual learners, verbal learners, active learners and reflective learners.
Stage 2 Process	Testing prototypes Redesigning of Instruction Teaching activities	Using expert panel to redesign the website produced.
Stage 3 Output	Testing Analyze Results	Implementing the modules with teachers and students.
Stage 4 Feedback	Revise Instruction	Revise the comments given by students and teachers.
Stage 5 Learning	Learning	Pre/posttest was conducted to test the effectiveness of the module.

3.0 Results

The effectiveness of the Physics module based on learning style and appropriate technology which was developed by employing the Isman model was analyzed across visual, verbal, active and reflective modules. Findings from the module evaluation conducted among 120 participants involving 30 participants of each learning style (visual/verbal, active/reflective) suggested that the module is effective for visual, active and reflective but not for verbal learners. A *t*-test was performed to determine if there were significant differences between the groups in the achievement scores. Table 2 to Table 5 shows the results of *t*-test comparison of pre/posttest achievement towards Physics module for visual learners, verbal learners, active learners and reflective learners respectively.

Table 2: t-Test comparison of pre/posttest achievement towards Physics module for Visual learners

	Pretest (n = 30)	Posttest (n = 30)	*t*-value	*p*	Effect size
Mean	53.37	56.23	6.11	< .05	0.73
SD	17.23	16.25			

Table 2 shows that there is a significant difference between pretest (mean = 53.37, SD = 17.23) and posttest (mean = 56.23, SD = 16.25) marks, t (29) = 6.11, $p < .05$. The mean scores indicate posttest have significant higher achievement towards Physics module for Visual Learner than pretest.

Table 3: *t*-Test comparison of pre/posttest achievement towards Physics module for Verbal learners

	Pre test (n = 30)	Post test (n = 30)	*t*-value	*p*	Effect size
Mean	52.97	53.80	0.960	> .05	0.06
SD	16.14	14.55			

Table 3 shows that there is no significant difference between pretest (mean = 52.97, SD = 16.14) and posttest (mean = 53.80, SD = 14.55) marks, t (29) = .96, $p < .05$. The mean scores indicate posttest does not have significant higher achievement towards Physics module for Verbal Learner than pretest.

Table 4: t-Test comparison of pre/posttest achievement towards Physics module for Active learners

	Pretest (n = 30)	Posttest (n = 30)	t-value	*p*	Effect size
Mean	52.07	55.03	5.55	< .05	0.69
SD	18.18	16.58			

Table 4 shows that there is a significant difference between pretest (mean = 52.07, SD = 18.18) and posttest (mean = 55.03, SD = 16.58) marks, t (29) = 5.55, p < .05. The mean scores indicate posttest have significant higher achievement towards Physics module for Active Learner than pretest.

Table 5: t-Test comparison of pre/posttest achievement towards Physics module for Reflective learners

	Pretest (n = 30)	Posttest (n = 30)	*t*-value	*p*	Effect size
Mean	51.80	54.17	3.39	< .05	0.45
SD	15.18	12.63			

Table 5 shows that there is a significant difference between pretest (mean = 51.80, SD = 15.18) and posttest (mean = 54.17, SD = 12.63) marks, t (29) = 3.39, $p < .05$. The mean scores indicate posttest have significant higher achievement towards Physics module for Reflective Learner than pretest.

IMPLICATION AND CONCLUSIONS

This paper has examined the effectiveness of Isman Instructional Design Model in developing a Physics module based on learning style and appropriate technology in Malaysian secondary educational setting by employing the Isman model. It was found that the module was effective for visual learners, active learners and reflective learners. However module was less effective for verbal learners. It indicates that Isman instructional model was implemented successfully in the design and development of the Physics module in the Malaysian secondary educational setting. The modules are now published in freewebs.com (http://modulpedagogifizik.webs.com, http://pedagogifizikactive.webs.com, http://pedagogifizikreflective.webs.com, htttp://pedagogifizikvisual.webs.com, http://pedagogifizikverbal.webs.com) and will be implemented in one Science Learning Centre in FELDA secondary school and Teachers Training College for two years. The outcome of this project will hopefully enhance the process of teaching and learning Physics in secondary educational setting by giving emphasis on learning style and appropriate technology.

Acknowledgement

Funding of this research work is generously supported by grants from University of Malaya, Malaysia.

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EFFECT OF NOVAK COLORFUL CONCEPT MAP WITH DIGITAL TEACHING MATERIALS ON STUDENT ACADEMIC ACHIEVEMENT

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Abstract

This study explores whether the Novak colorful concept map with digital teaching materials can enhance student academic achievement in learning Advanced Accounting. Four different teaching materials included conventional digital teaching materials (CDMs), Novak monotonic concept maps digital teaching materials (MCMDMs), hierarchical Novak colorful concept maps digital teaching materials (hierarchical CCMDMs) and clustered CCMDMs. Three major results were found in this study. First, the MCMDMs and CCMDMs can significantly improve student achievement than CDMs. Second, CCMDMs can significantly improve student long-term memory than MCMDMs and CDMs. Third, no significant differences exist in student achievement by using different coloring methods.

Keywords: Advanced Accounting; colors; concept maps; constructivisit perspectives; higher education

Introduction

Different from the conventional rote learning, Ausubel (1963) suggested the assimilation theory of cognitive learning and proposed the human's cerebrum and nervous system is an information-processing and information-storing system with the actively cognitive capabilities to receive and store messages. In virtue of the learning taken as a cognitive course including various processes such as advance organizer, superordinate learning, integrative reconciliation, subsumption, and progressive differentiation, Ausubel advocated the "meaningful learning", i.e., the meaning of knowledge discovered by students themselves, and emphasized both the relationship between the new learning and the old experience existed in the inherent "cognitive structure" of an individual's cerebrum and nervous system and the linking of new and old knowledge to embed new knowledge into the existing conceptual system. In consideration of an organizational structure composed of knowledge and experience inherent in the cerebrum with the concepts (or principles) categorized to abstraction, generality and inclusiveness on the top layer while specific or concrete instances on the lower layer (Lefrancois, 1988), Ausubel (1963) argued the top-down learning in which a student should first absorb the top-layered concepts with inclusiveness and generality, and then the lower-layered concepts, definitions or properties while the concrete or specific instances at the last.

Referring to the assimilation theory of cognitive learning proposed by Ausubel (1963), Novak and Gowin (1984), scholars of Cornell University, proposed the concept map as one tool for teaching, learning and evaluation in which students construct the integrated knowledge structure realized by scholars for diagnoses of misconceptions. Thus far the concept map has been extensively and well-effectively applied to teaching various academic disciplines such as Physics (Roth & Roychoudhury, 1993), Chemistry (Novak, 1984), Mathematics (Malone & Dekkers, 1984), Medicine (Laight, 2004), Language teaching (Carrell, Pharis, & Liberto, 1989) and Business education (Chiou, 2008, 2009).

As one basic unit to develop the human being's senses and memories, colors possess superior expression and identifiability or psychological imagery effect (Davidoff, 1991). In contrast to monotonic teaching materials, colorful ones substantially attract student attention (Bacon & Egeth, 1997; Kaptein, Theeuwes, & van der Heijden, 1995; Pett & Wilson, 1996), effectively save time in searching information (Pett & Wilson, 1996; van

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Schaik & Ling, 2001), and promote student learning memory (Pett & Wilson, 1996; Schwier, Misanchuk, & Boling, 2000). In this regard, colorful teaching material, compared to the monotonic ones, is an instrument to improve the interaction between students and teaching materials and it can not only catch student attention but encourage student to learn more in a comfortable way (Pett & Wilson, 1996; Schwier et al., 2000; Tufte, 1990).

Despite concept maps and colorful teaching materials can significantly improve learning performance have been confirmed in the previous studies, studies about the impact on the learning performance by integrating these two teaching materials are rare. With the knowledge map and the display of colors integrated, Hall and Sidio-Hall (1994) studied college students and found that their learning memories receiving colorful teaching materials (both the knowledge map materials and conventional ones) were significantly superior to those receiving monotonic teaching materials.

Extending the theoretical basis of the Accounting Principles as well as the Intermediate Accounting, the curriculum of the Advanced Accounting contain consolidation accounting, accounting treatment for long-term equity investments based on the equity method, and the preparation of consolidated financial statements. To this end, student could complete the meaningful learning by linking the learned concepts for the Advanced Accounting to both the Accounting Principles and Intermediate Accounting previously comprehended (Ausubel, Novak, & Hanesian, 1978; Chiou, 2008). Basically, the concept map is characterized by linking two relational concepts to become one meaningful proposition (Chiou, 2008), for instance, the proposition of "consolidated Balance Sheet includes consolidated assets" connects two concepts of "consolidated Balance Sheet" and "consolidated assets" by the relation link of "includes". In addition, the concept map is also a hierarchical structure (Novak, Gowin, & Johansen, 1983), for example, "consolidated Balance Sheet" (the most generalized concept of Advanced Accounting), "consolidated assets", "parent company's assets", and "parent company's current assets" (other lower hierarchical concepts with specific characteristics) which constitute a hierarchy. Furthermore, the cross link is one important property in the concept map learning because it displays a student breaking through his or her one-way thinking (Chiou, 2008, 2009). For example, two concepts, "parent company's inventories" and "subsidiary's inventories", connected by the cross link become the concept of "non-contra accounts combined in merger of a parent company and a subsidiary".

Despite the concept map seldom cited in literatures of business education in contrast to other academic disciplines, it is applicable to business education but few studies verified its effectiveness instead (e.g. Chiou, 2008, 2009). Therefore, in consideration of few literatures studying student learning performance by integrating the concept map and colors with digital teaching materials, this paper intends to combine the Novak concept maps and the display of colors, and applies them into Advanced Accounting class.

In addition, the positive effects of colorful teaching materials on students' learning performance have been demonstrated in previous studies (Bacon & Egeth, 1997; Kaptein et al., 1995; Pett & Wilson, 1996; Schwier et al., 2000) and current technology could well support display of colorful digital teaching materials (Durrett & Stimmel, 1982). However, research about the topic of effectively improving student's learning achievement and long-term memory by the colorful digital teaching materials with the concept maps is wanting thus far.

To summarized, this study intends to investigate if student's learning achievement and long-term memory for Advanced Accounting are improved with the digital teaching materials based on concept maps, and if there is any difference between digital teaching materials out of colorful concept maps and monotonic concept maps on student's learning achievement and long-term memory.

Method

Participants and materials

Participants in this study were juniors in required Advanced Accounting classes from department of Accounting and Information in one private technical university in Taiwan. There were 120 students involved in this study of them 51 enrolled in day program and 69 in evening program. None of the students had any experience with concept map. The sample was 77% female. The teaching hours were two hours per week.

Four kinds of digital teaching materials were designed for different educational purposes and showed from Figure 1 to Figure 4. The conventional digital teaching materials (CDMs) were similar to textbook except for the digital format and illustrated in Figure 1. The monotonic concept maps digital teaching materials (MCMDMs) were designed according to concept maps theory with black and while colors in the digital format and illustrated in Figure 2.

The hierarchical Novak colorful concept maps digital teaching materials (hierarchical CCMDMs) were designed also according to concept maps theory with multiple colors in different hierarchical concept levels in the digital format and illustrated in Figure 3. The major difference between this teaching material and MCMDMs was the coloring method on hierarchical concepts and color selections were adjusted to computer screen following the suggestions of Heinich, Molenda, Russell, and Smaldino (2002). For example, light background with dark text and the combination of related colors were considered.

Figure 4 illustrates clustered Novak colorful concept maps digital teaching materials (clustered CCMDMs). It was also a digital teaching material with coloring based on individual clustered concepts and the coloring design was also following the suggestions of Heinich et al. (2002).

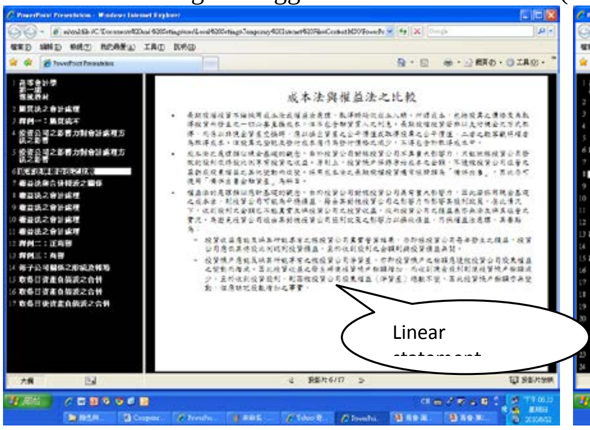

Fig. 1. CDMs

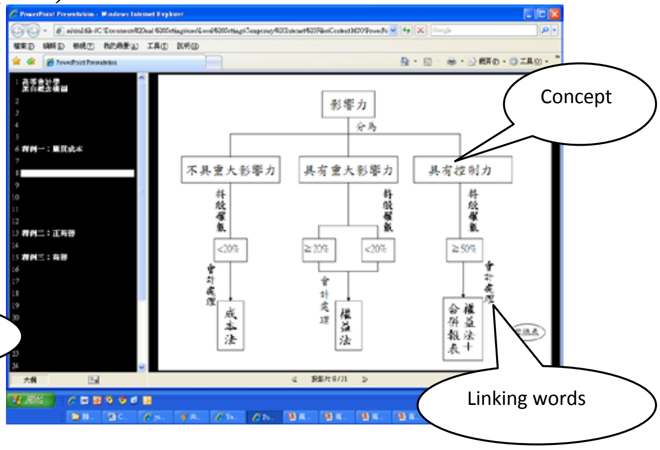

Fig. 2. MCMDMs

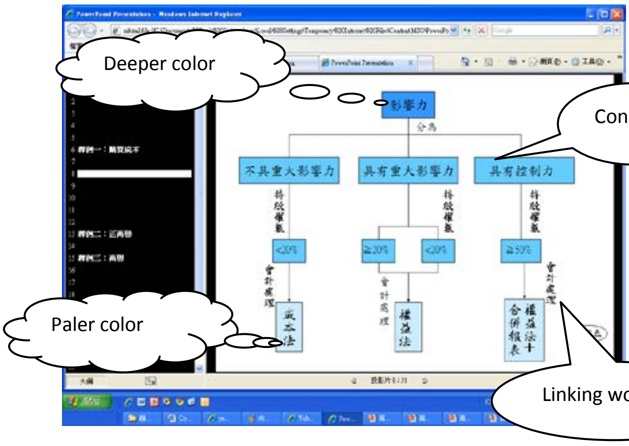

Fig. 3. Hierarchical CCMDMs

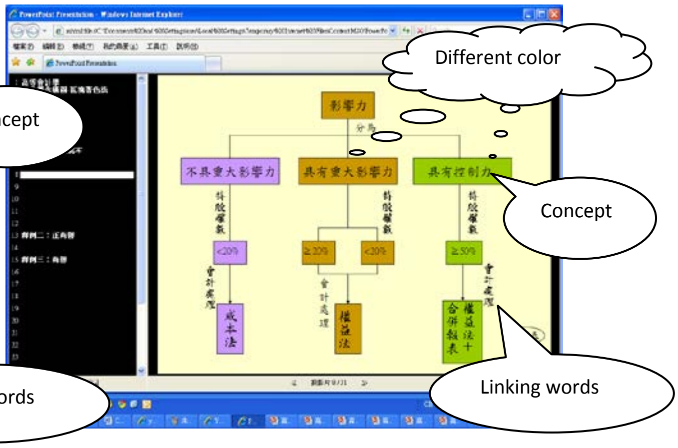

Fig. 4. Clustered CCMDMs

Experimental design

This study adopted randomized subject with unequalled pretest-posttest control group design. To minimize the differences in students' accounting prior knowledge, we randomly assigned students into four groups in which 31 in CDMs, 29 in MCMDMs, 31 in hierarchical CCMDMs, and 29 in clustered CCMDMs.

Four treatments, CDMs, MCMDMs, hierarchical CCMDMs and clustered CCMDMs, were contained as four independent variables. Each group received identical lectures and pretest and took the same posttest after self-learning by using different digital reviewing materials. Two dependent variables were short-term learning achievement and long-term memory.

Experimental process

Six phases were involved in this experiment. Phase one referred to official class period, the teacher taught chapter one to three using textbook lecturing method from week one to week five with two hours per week. In phase two, it took 30 minutes for students to finish Advanced Accounting pretests as a measurement of their accounting prior knowledge

In phase three, students were randomly assigned to four groups. Three groups, except for CDMs group, were explained how different concept map digital materials were used for 15 minutes. For example, MCMDMs group was taught about the meaning of concept map, hierarchical CCMDMs group was taught both the meaning of concept map and hierarchical displayed by colors, clustered CCMDMs group was taught both the meaning of concept map and clustered displayed by colors. Students in each group should obtained fully understanding of the use and meaning in their digital teaching materials.

In phase four, all students reviewed chapter from one to three by using their assigned digital reviewing materials as self-learning tools for 30 minutes. In phase five, after self learning stage, all students were administered an Advanced Accounting posttest for 30 minutes. In the last phase on week 13, seven weeks after phase five, four groups of students were again took the Advanced Accounting posttest two for 30 minutes to measure their long-term memories for the Advanced Accounting.

Instruments

An Advanced Accounting pretest was applied to evaluate the students' initial accounting knowledge and posttest one and two were administered to measure the experimental effect on learning achievement. The original pretest contains fifty multiple choice questions, from chapter one to three, which developed from the National CPA (Certified Public Accountant) TEST sponsored by the Ministry of Examination of the Examination Yuan of ROC and the textbook exercise. Three chapters include: introduction of business combination, long-term investment and introduction of consolidation financial statements.

The test was piloted by thirty-nine students of which thirty-three senior students from Department of Accounting at National Changhua University of Education and six senior students from Overseas Chinese University in Taiwan.

Ten questions were eliminated after the pilot test and the final pretest was constructed with 40 multiple choice questions. The K-R 20 reliability coefficient of the instrument was 0.81 for the pilot sample used in this study.

Posttest one (as the achievement test) and posttest two (as the long-term memory test) contain the same questions as the pretest of 40 final multiple choice questions. The K-R 20 reliability coefficients of the two instruments were 0.88 and 0.91 for the experiment sample used in this study.

Results

Effect of different digital materials on short-term learning achievement

The overall average scores in the pretest were 67.95 and the average scores for CDMs group were 69.47, the average scores for MCMDMs group were 68.97, the average scores for hierarchical CCMDMs group were 67.74, the average scores for clustered CCMDMs group were 65.52. The overall average scores in the short-term learning achievement posttest were 77.65 and the average scores for CDMs group were 70.00, the average scores for MCMDMs were 76.12, the average scores for hierarchical CCMDMs group were 82.82, the average scores for clustered CCMDMs group were 81.81.

This study explored the effect of different digital materials on students' learning achievements. Students in four groups did not perform equally well in their pretest scores and this may interfere the result of this experiment. In this regard, a one-way analysis of covariance (ANCOVA) was applied. The pretest scores were the covariates and the posttest scores were the dependent variables.

A statistical significance was found in different groups in terms of various digital materials, $F(3, 115) = 12.24$, $p < .001$ (see Table 1). The result implied that different digital learning materials have significantly different effects on students' Advanced Accounting posttest one scores.

LSD on post hoc comparisons showed that students performed significantly better in MCMDMs, hierarchical CCMDMs and clustered CCMDMs groups when comparing with CDMs group, $t(115) = 2.38$, $p < .05$; $t(115) = 5.18$, $p < .001$; $t(115) = 5.09$, $p < .001$ (see Table 1). In addition, students performed significantly better in hierarchical CCMDMs and clustered CCMDMs groups when comparing with MCMDMs group, $t(115) = 2.72$, $p < .01$; $t(115) = 2.69$, $p < .01$. However, no statistically significant difference was found between hierarchical CCMDMs group and clustered CCMDMs group, $t(115) = 0.02$, $p = .98$.

Table 1. Analysis of covariance in posttest scores

Source of variation	SS	Df	MS	*F*

Model	6999.90	4	1749.98	16.31***
Group	3940.65	3	1313.55	12.24***
Pretest scores	3786.51	1	3786.51	35.28***
Error	12341.30	115	107.32	
Post hoc comparisons				
Groups	Difference in mean		t	
MCMDMs-CDMs	6.12		2.38*	
hCCMDMs-CDMs	12.82		5.18***	
cCCMDMS-CDMs	11.81		5.09***	
hCCMDMs-MCMDMs	6.70		2.72**	
cCCMDMs-MCMDMs	5.69		2.69**	
hCCMDMs-cCCMDMs	1.01		0.02	

Note. hCCMDMs=hierarchical CCMDMs; cCCMDMs=clustered CCMDMs. *$p < .05$. **$p < .01$. ***$p < .001$.

Effect of different digital materials on long-term memory

The overall average scores in the posttest two were 78.10 and the average scores for CDMs group were 71.94, the average scores for MCMDMs group were 76.09, the average scores for hierarchical CCMDMs group were 83.22, the average scores for clustered CCMDMs group were 81.21.

A one-way ANCOVA in which the pretest scores of the four groups were the covariates and their long-term memory test scores were the dependent variables was conducted. Table 2 shows that the main effect was significant, $F(3, 115) = 6.88$, $p < .001$, thus implying that with the exclusion of pretest scores, the four groups achieved significantly different scores in the long-term memory test.

Post hoc comparisons showed that no statistically significant difference was found between CDMs and MCMDMs groups, $t(115) = 1.43$, $p = .16$ (see Table 2). However, statistically significant better performances existed in students' long-term memories in Advanced Accounting for hierarchical CCMDMs and clustered CCMDMs groups when compared with CDMs group, $t(115) = 3.99$, $p < .001$; $t(115) = 3.52$, $p < .001$. In addition, students performed significantly better in long-term memories on hierarchical CCMDMs and clustered CCMDMs groups when comparing with MCMDMs group, $t(115) = 2.50$, $p < .05$; $t(115) = 2.07$, $p < .05$. However, no statistically significant difference was found in long-term memory between hierarchical CCMDMs and clustered CCMDMs groups, $t(115) = 0.39$, $p = .70$.

Table 2. Analysis of covariance in long-term memory test scores

Source of variation	SS	Df	MS	*F*
Model	4694.11	4	1173.53	8.49***
Group	2853.21	3	951.07	6.88***
Pretest scores	2304.05	1	2304.05	16.68***
Error	15888.53	115	138.16	
Post hoc comparisons				
Groups	Difference in mean		t	
MCMDMs-CDMs	4.15		1.43	
hCCMDMs-CDMs	11.28		3.99***	
cCCMDMS-CDMs	9.27		3.52***	
hCCMDMs-MCMDMs	7.13		2.50*	
cCCMDMs-MCMDMs	5.12		2.07*	
hCCMDMs-cCCMDMs	2.01		0.39	

Note. hCCMDMs=hierarchical CCMDMs; cCCMDMs=clustered CCMDMs. *$p < .05$. ***$p < .001$.

Discussions and conclusions

The purpose of this paper was to explore the effect digital teaching materials based on Novak colorful concept maps on improving student's learning performance for the Advanced Accounting. For the above purpose, this study investigated if four kinds of digital teaching materials such as the CDMs, MCMDMs, hierarchical

CCMDMs and clustered CCMDMs had difference in improving students' short-term learning achievements and long-term memories.

In the case of the short-term learning performance, the Novak concept map digital material was verified to significantly improve students' short-term learning achievements for the Advanced Accounting that was identical to the outcomes concluded in previous literatures (Chang, Sung, & Chiou, 2002; Chiou, 2008, 2009; Mass & Leauby, 2005; Simon, 2007).

Many scholars (Beasley & Waugh, 1995; Chang et al., 2002; Dias & Sousa, 1997; Huang et al., 2012; Lee & Baylor, 2006; Liu, 1994) showed that using an e-learning environment based on conventional linear digital material might create problems such as learning disorientation, cognitive overload and the inability to integrate knowledge structure, all of which can reduce students' learning performance. Using the maps' two-dimensional displays can reduce weaknesses in conventional linear teaching. Chang et al. (2002) found that using the maps' two-dimensional displaying manner can reduce students' problems of disorientation when browsing linear-structured material. Many scholars have applied maps and graphics for designing basic internet courses. Their study results indicated that internet material using graphic displays fashions can reduce problems of learning disorientation and improve learners' learning outcomes (Beasley & Waugh, 1995; Chang et al., 2002; Huang et al., 2012; Lee & Baylor, 2006; Liu, 1994; McDonald & Stevenson, 1999).

Furthermore, graphic displaying can help learners to integrate knowledge structure (Chiou, Huang, & Hsieh, 2004; Cliburn, 1990; Huang et al., 2012; Novak, 1980; Novak, 1990; Ruiz-Rrimo & Shavelson, 1996). Concept maps display graphics based on educational psychology theories. Applying concept maps to structure teaching material enables knowledge to be structured and integrated in a hierarchical order. Many previous academic researches pointed out that this application can improve the design of course material and its means of presentation and thus promote students' academic performance (Chang et al., 2002; Chiou et al., 2004; Coffey, 2007; Huang et al., 2012; Kennedy & McNaught, 1997; Komers & Lanzing, 1997). Therefore, the Novak concept map digital material can better assist students with their short-term academic achievements than can conventional linear digital material.

Many studies showed that colored visual picture is helpful for obtaining teaching goals (see Dwyer, 1978). In addition, colored teaching materials can not only improve students' learning motivation and attention but also structure their perceptual and associative information, and thus with the recall of pictures can enhance and facilitate learning (Lamberski, 1980). Much of the literature has confirmed that colored teaching materials can effectively attract and manage student attention in contrast to monotonic teaching materials (Bacon & Egeth, 1997; Kaptein et al., 1995; Pett & Wilson, 1996; Schwier et al., 2000; Thurmon, 1974). Attention can influence the direction of eye searching and learning performance accordingly (Pett & Wilson, 1996; van Schaik & Ling, 2001). Therefore, the application of colors in teaching can assist learners in their cognitive learning, information recalls and enhance learning performance (Berry, 1977; Pett & Wilson, 1996; Schwier et al., 2000). Short-term memory is facilitated if the same color is used in related or chunking information when designing teaching materials. In this sense, through the systematic rehearsal, long-term memory could also be enhanced (Kemp & Smellie, 1989). In this study, colored teaching materials (hierarchical or clustered CCMDMs), in contrast to MCMDMs materials, were designed based on information chunk to enhance learning memory and performance.

Results of this study showed that hierarchical and clustered CCMDMs can better enhance long-term memory in contrast to MCMDMs and CDMs; however, no significant difference was found for MCMDMs and CDMs in enhancing long-term memory.

Long-term memory serves the function not only contains information but also processes and stores information by meaning of events with creative ideas and concepts. On the other hand, short-term memory processes and stores information based on the sequence of information arrived. Given that the characteristics of long-term memory, this study employs hierarchical CCMDMs by categorizing meaning of different concepts along with the depth of colors to illustrate the hierarchical relationship of concepts and the clustered relationship of concepts in clustered CCMDMs. Long-term memory can be enhanced by either of these teaching materials. Much of the literature has confirmed that colored teaching materials can effectively improve recalls (Berry, 1977; Pett & Wilson, 1996; Schwier et al., 2000). Colored teaching materials can also assist clustered concepts and hence enhance long-term memory (Kemp & Smellie, 1989). This study confirmed the aforementioned literatures that colored teaching materials could enhance learning and our results showed that both kinds of CCMDMs have better improve student long-term memeory when compared with MCMDMs and CDMs.

As the first trial to investigate if a student's short-term achievement and long-term memory for the Advanced Accounting are effectively improved with the concept maps and the display of colors integrated, this study comprises experiments for 120 college students. In contrast to pupils as subjects studied in research for colorful teaching materials (Hall & Sidio-Hall, 1994), this study contributes to both the concept maps studied and developed in a new scope and the progress of the higher education or the research in the education field.

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EMPLOYING DESIGN AND DEVELOPMENT RESEARCH (DDR) APPROACHES IN THE DESIGN AND DEVELOPMENT OF ONLINE ARABIC VOCABULARY LEARNING GAMES PROTOTYPE

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Abstract

The design and development research, first proposed by Brown and Collins in the 1990s, is currently among the well-known methods in educational research to test theory and validate its practicality. The method is also known as developmental research, design research, design-based research, formative research and design-cased and possesses conceptual underpinning and practical aspects of the 'what' and 'how' of 'doing'. This paper describes the design and development of a web-based Arabic vocabulary learning games prototype incorporating the methods and approaches of DDR for elementary learners in Centre for Foundation Studies (CFS), International Islamic University Malaysia (IIUM). The effort in generating this learning prototype attempts to design, develop and integrate a game-based learning application in an online platform. It is meant to provide an interactive learning experience for learners who have been through traditional non-computer based Arabic teaching and learning methods. Their feedbacks and responses are then gathered and analysed as the formative evaluation for the design and development principles. The exploration of the potential of use for the game-based learning prototype in teaching and learning in real setting by various experts, learners and teachers was also among the steps taken to evaluate the usability and practicality of the prototype during the design and development phases.

Keywords : *Design and development research; online games; Arabic vocabulary learning; formative evaluation; web-based games*

1. Introduction

Nowadays, online digital educational games are described as the new model of e-learning (Squire, 2005) and have attracted researchers' attention from around the world and perceived as an integrated tool within the teaching and learning process (Prensky, 2001; Pivec, Koubek & Dondi, 2004; Whitton, 2010; Roslina et. al., 2011). The term 'game-based learning' or GBL describes the teaching and learning process via computer games similar to terms such as 'digital game-based learning' (Prensky, 2001), 'edutainment' and 'serious games' (Tsai F.H., et. al, 2008). 'Serious games', however, differ from edutainment games in terms of more advanced design consideration, latest hardware and software and rules of simulation (Michael & Chen, 2006). The differences between games and simulations are also viewed as fulfilling a particular psychological situation for the player in games and participants in simulations (Gredler, 1992). Simulations are also found potentially helpful in assisting the students to learn by construction in a simulated embodied experience and problem solving skills (Liu, Chen & Huang, 2011) and is also capable of evoking flow experiences and positive effects (Chiang, et. al., 2011). The computer games characteristics are also among the main factors that differentiate them from any other instructional media and technology. Malone and Lepper (1987), for instance, identify motivational factors in games such as challenge, fantasy, curiosity and control. Other researchers have expanded the potential characteristics of games in designing game-based learning framework in terms of fun, entertainment, constraints, goals achieving, acquiring knowledge and skills (Gredler, 1992), experiential learning and challenging (Gredler, 2004), competitiveness, enjoyable, creativity (Akilli, 2007), played on various platforms or game consoles (Roslina & Azizah, 2008), motivating (Tuzun, 2004; Alessi & Trollips, 2001) and experienced-based storyline (Zarina & Hanafizan, 2005).

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2. Design and Development Methodology in Educational Games

The design and development of games proves to be a not so easy process requiring an extensive programming project from the development of game engine, middleware, interface programming and audio programming. Despite the difficulties, a number of tools such as functional authoring tools and drag and drop interface have been recently developed to ease the complexities (Roslina & Azizah, 2008). Several frameworks and models have been proposed by researchers in the field of game design such as The Design Framework for Edutainment Environment by Embi (2005), Adopted Interaction Cycle for Games by Barendregt and Bekker (2004), Game Object Model by Amory (2001) and The Engaging Multimedia Design Model for Children by Said (2004), as cited in Tan, Ling and Ting (2007). The design and development principles of the online Arabic vocabulary games in study were based on the 5 level of games learning which Prensky (2001) refers to as: "How," "What,""Why," "Where," and "When/ Whether" levels at which learning occurs in video and computer games (Pivec, Koubek & Dondi, 2004, p. 42). The design and development process of the Arabic vocabulary games prototype in this paper involves the integration of Arabic learning contents from the traditional text book and the Raptivity ® e-learning authoring software supplying many and various games templates. The selection of this software is due to reasons of its supportive features to the correct display of Arabic fonts and the right to left Arabic writing system. It is also a tool that can be easily navigated through by educators without requiring high level of computer skills, which is among the identified shortcomings of the Arabic language teachers (Mohd Feham & Isarji, 2006; Mohd Feham, 2006; Zawawi, 2008). The online mode is selected as the games platform for this prototype because it allows learners, regardless of their geographic location, to independently participate in the learning environment (Connolly & Stansfield, 2006). It is played on a computer platform with the internet connection; the games are stored and played directly from the server (Roslina & Azizah, 2008). An online platform is also chosen for the games prototype to facilitate the usability and ensure easy-access to this application for the Arabic language learners.

3. Design and Development Research (DDR) Method as Employed Approaches

The employment of design and development research (DDR) methodology as the selected approach is justified in this study by its pragmatism in testing the theory and validating the practicality. Besides, it is described as a way to establish new procedures, techniques and tools based on specific needs analysis (Richey & Klein, 2007). This methodology is also formerly known as developmental research (Richey, Klein & Nelson, 2004), designed case (Reigeluth & Frick, 1999), design-based research (Reeves, 2006 & Herrington, et. al, 2007), formative research (Nieveen, 2007), and design research (Bannan-Ritland, 2003; Van der Akker, 2007). Although many terms have been introduced to explain and describe this research method within its similarities and differences, it was first proposed by Brown and Collins in 1992 as an extension to other educational research methods (Wang & Hannafin, 2005, Markauskaite & Reimann, 2008) and to test theory and validate its practices (Richey & Klein, 2007). It is also employed to design and develop an intervention (such as programs, teaching-learning strategies and materials, products and systems) with the aim to solve a complex educational problem and to advance our knowledge on the characteristics of these interventions and the processes to design and develop them (Plomp, 2007, p.12). Wang and Hannafin (2005) define it "as a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories" (p. 6). Table 1 illustrates the pragmatic elements of a design and development research that have been adapted in this study:

Table 1 : Elements of a design and development research

Goals	Dual goals – theory and practice
Theory development	Multidisciplinary and interdisciplinary
Method	Mixed modes
Process	Cyclical, iterative, teamwork
Resources	Extensive literature, collaboration, partnership, various research technologies
Outcomes	Improved theory, product, design principles

Adapted from Nor Aziah (2007)

4. A Pragmatic Model of Design and Development of Online Arabic Vocabulary Learning Games Prototype

The employment of pragmatic elements of a design and development research (DDR) in this paper is described as the followings :

4.1 Multidisciplinary and interdisciplinary theory development: The design and development of the online Arabic vocabulary learning games involved various multidisciplinary and interdisciplinary analyses of needs for the design and development of games addressing numerous aspects of Arabic vocabulary learning problems among learners, teachers and experts. The design and development aspects from other fields of knowledge were also considered prior to the games' design and development process.

4.2 Mixed modes methods : The mixed modes methods were implemented in the formative evaluation of the online Arabic games. The evaluation is meant to *judge the strengths and weaknesses of its instruction in its developing stages, for purposes of revising the instruction to improve its effectiveness and appeal* (Tessmer, 1993, p. 11). The evaluation was divided into 2 phases of game prototype 1 and game prototype 2 implementing both quantitative and qualitative mix-method instrumentations. The validation of the instruments for the formative evaluation was conducted by an expert in instructional design and game-based learning from the University of South Dakota, United States of America (USA). The process of consultation, discussion and validation were communicated through the researcher's email at sabriqld2003@gmail.com. The formative evaluation for pre-prototype 1 went through several try-out sessions with a limited number of the user groups such as teachers and learners who will eventually use the materials and expert appraisal or review from a group of experts consisting of subject matter experts, instructional design experts, and teachers review of the materials (Nieveen, 2007). Prototype 1 and prototype 2 have been evaluated via four (4) types of formative evaluation which are expert review, one-to-one evaluation, small group test and field test which were adapted from Tessmer (1993, p. 15). The process of formative evaluations for the design and development principles were conducted in the following phases as shown in Table 2 below:

Table 2 : Phases of Formative Evaluations for the Games Prototype

GAMES PRE-PROTOTYPE (ANALYSIS, DESIGN AND DEVELOPMENT)	
Participants and Methods	Instruments
- 115 out of 133 learners in semester 3, 2008/2009 - 13 lecturers teaching in semester 3, 2008/2009 - 2 senior IT officers at CFSIIUM - (consultation in IT facilities) - 2 programmers from Raptivity ® - (consultation in using Raptivity's authoring tool) - 3 experts in digital game-based learning (DGBL) – consultation in survey design	Needs analysis Open-ended questionnaires Interviews Think-Aloud protocols Content Analysis
GAMES PROTOTYPE 1 (DESIGN AND DEVELOPMENT)	
Participants and Methods	Instruments
- 2 programmers from Raptivity ® - (consultation in using Raptivity's authoring tool) - 1 subject matter expert in Arabic language - 3 experts in validating the survey design - 2 experts' review in instructional designs, English language and Arabic language.	Open-ended questionnaires Interviews Think-Aloud protocols Content Analysis
GAMES PROTOTYPE 2 (FORMATIVE EVALUATION)	
Participants and Methods	Instruments
a) Pre-Formative Evaluation - Peer reviews (2 lecturers) - SME in Arabic language (1 expert) b) Formative Evaluation 1 - Experts' review (6 experts) - Learners' review (2 learners) - Evaluator's review (1 peer lecturer/asst. coordinator) c) Formative Evaluation 2 - small group testing (16 learners) - field testing 1 (33 learners) - field testing 2 (49 learners)	Survey Open-ended questionnaires Interviews Think-Aloud Methods Class observations Testimonials

4.3 Cyclical, iterative, teamwork :

The iterative cycles of the five (5) phases of analysis, design, development, implementation and evaluation used in this project are in accordance to the ADDIE Model as shown in Figure 1 :

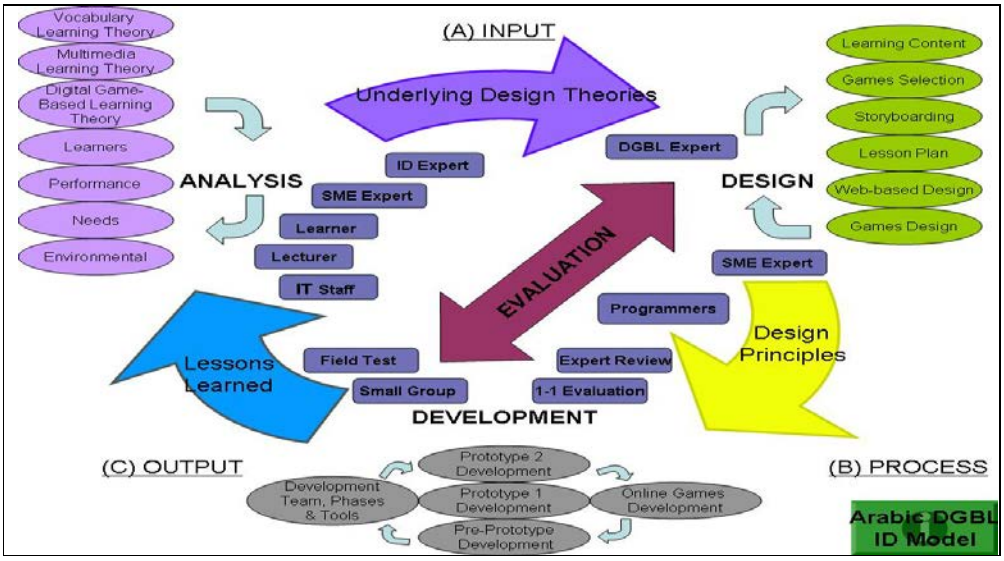

Figure 1 : Iterative cycles of adapted ADDIE's model

The front-end analysis for the learning needs of the prototype's design and development was then conducted based on the design and development of product and tool research (Richey & Klein, 2007) or previously known as Type 1 of developmental research (Richey, Klein, & Nelson, 2004). The differences between TYPE 1 and TYPE 2 developmental research are shown in Table 3 below :

Table 3 : A Summary of the 2 Types of Developmental Research

	Product and Tool Research Or Type 1 of DR	Model Research Or Type 2 of DR
Emphasis	Study of specific product or program design, development, &/or evaluation project	Study of design, development, or evaluation processes, tools, or models (can focus only on ONE phase)
Product	Lessons learned from developing specific products and analyzing the conditions that facilitate their use	New design, development, and evaluation procedures &/or models and conditions that facilitate their use
	CONTEXT-SPECIFIC CONCLUSION	*GENERALIZED CONCLUSION*

This research has embraced the product and tool research method (Richey & Klein, 2007) or previously known as Type 1 of developmental research (Richey, Klein, & Nelson, 2004). The product for this study is an online Arabic vocabulary learning games prototype, which was conceptualized, designed and developed based on both theoretical and practical aspects. The development of the online Arabic vocabulary learning games prototype as a final educational product is a combination of the design and development principles with vocabulary games templates from Raptivity ® e-learning authoring tools in an online learning environment. The researcher is the main designer and developer of this learning prototype module. It is however, the nature of developmental research that the researcher collaborates with a development team.

4.4 Extensive literature, collaboration, partnership and various research technologies : The design and development of the online Arabic vocabulary learning games prototype have not been simply conducted as in designing and evaluating the games formatively or summatively. It has been scrutinized through the analysis of extensive literature, collaboration and partnership between different learners, lecturers, experts and instructional designers and integrated various research technologies and tools. In order to construct the framework for the online Arabic vocabulary learning games prototype, as shown in Figure 2.0, analyses of theories from literature such as of Nation's (2003), digital game-based learning (Prensky, 2001) and multimedia learning (Mayer, 2001) were conducted. The analyses of extensive literature were combined with a 9-year personal teaching experience of the researcher and the reasons for failures in Arabic subjects among learners in 4 consecutive semesters of 2005/2006 until 2008/2009 (TEMU Report, 2005-2009). Based on the researcher's initial analysis and observation, the lack of instructional technologies in current teaching and learning of Arabic has led to the problem of memorizing the content of Arabic lessons taught in the classroom, as echoed by Mohd Feham (2006) and Zawawi (2008). Concurrently, the reports on students' failures revealed that among the main and obvious factors were poor attendance in the classroom, weaknesses in memorizing Arabic vocabularies and their minimal effort to improve and pay attention in Arabic language learning. These factors are mainly related to students' learning attitude and motivation in learning Arabic. In addition, the ADDIE's adapted model is chosen as the instructional design model for the research as it fits the design and development methods, objectives and approaches to portray a complete picture and understanding, theoretically and practically, of an online vocabulary learning module. Walter Dick and Lou Carey are widely viewed as the torchbearers of the ADDIE methodology, through their book *The Systematic Design of Instruction* (Dick & Carey, 1996). Akilli (2004) has proposed the FID^{2}GE model, also consisting of four phases of design; analysis, design, development and evaluation, which stands for "**F**uzzified **I**nstructional **D**esign **D**evelopment of **G**ame-like **E**nvironments" for learning in which the name was derived from the dynamism, non- linearity and the fuzziness of games (p. 139-142). The researcher, however, opted to use the adapted ADDIE's model (Figure 1) instead of FID^{2}GE due to the uncertainty of the implementation phase in FID^{2}GE and the existence of five (5) main phases in ADDIE to facilitate the research. The argument of whether ADDIE is a model or just a process is not the objective of discussion in this paper. To reiterate, the ADDIE model is chosen for its systematic generic approach in instructional design, which clarifies the instructional framework to the designers or researchers in order to ensure the effectiveness of instructional products with creative processes (College Station, 2001).

4.5 Improved theory, product and design principles based outcome : The refinement of theories from the literature in the *iterative cycles of testing and refinement of solutions in practice* (Reeves, 2006 & Herrington, 2007) begun at the front-end analysis phase directed at analysing four (4) components of needs analysis; performance analysis, environmental analysis, learner analysis and needs assessment, as suggested by Dabbagh (2006). The participants involved were 113 out of 133 students studied Arabic language in semester 3, 2008/2009 as well as the lecturers and were required to answer the needs and pre-design survey of an online Arabic vocabulary games in CFSIIUM (Muhammad Sabri and Nor Aziah, 2011). The validation of the instrument was completed by a lecturer, from the Institute of Education (INSTED, IIUM), teaching the subject of Research Methodology in IIUM. The initial design from the analysis phase was then validated by an expert who is an Arabic language lecturer from the Centre for Language and Pre-University Academic Development (CELPAD) of IIUM in order to refine the contents of Arabic language integrated in the online games. The theories were also refined by an expert from the Centre for Professional Development (CPD) of IIUM who specializes in instructional design and teaching using technology. At the end of this phase, the design and development principles were established to guide the development process. The details of procedures conducted were previously shown in Table 2.

5. Design and Development of Online Arabic Vocabulary Learning Games Prototype

The online vocabulary learning games was designed as a final research product of additional teaching and learning aid in Arabic vocabulary learning and was hosted in a web-based environment. The general outlines of design and development of this online Arabic vocabulary games prototype are as the followings: a) constructing general research framework, b) conducting front-end analysis procedures, c) validations from various experts (ID & SME), d) consultations from various experts (ID & SME), e) constructing 'initial design principles', f) revising and validating 'design principles', g) development of initial pre-prototype, h) revisions of prototype 1 and prototype 2 in iterative and cyclic and process – meant for changes and improvement of final games prototype, i) conducting formative evaluation of design and development among various experts, lecturers, and learners, and j) Final product is ready for use. The samples of website screenshots are as shown below in Figure 2:

Figure 2 : Screenshots of Online Arabic Vocabulary Learning Website

6. Conclusion

This paper has described an effort to design and develop an online Arabic vocabulary learning games prototype in IIUM using the design and development research (DDR) methodology and approach. *This Arabic educational DGBL is now in function and linked to several learning and research institutions such as My-Arabic at CELPAD, IIUM (Link:* http://myarabic.e-celpad.com/*), Malaysian Foundation of Innovation and educational blog in Arabic learning such as* http://mari-belajar-bahasa-arab.blogspot.com/. The outcome of this project will hopefully enhance the process of teaching and learning Arabic language in IIUM as well as in other institutions. This research is hoped to trigger more in-depth research methodologies and approaches in the design and development on online educational games based on real needs in the real settings of learning environment and institutions, This prototype has reflected a set of design and development principles for an online Arabic vocabulary learning games in the Malaysian context specifically and for non-native Arab speakers in general.

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EMPLOYING TEXTUAL AND FACIAL EMOTION RECOGNITION TO DESIGN AN AFFECTIVE TUTORING SYSTEM

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Abstract

Emotional expression in Artificial Intelligence has gained lots of attention in recent years, people applied its affective computing not only in enhancing and realizing the interaction between computers and human, it also makes computer more humane. In this study, emotional expressions were applied into intelligent tutoring system, where learners' emotional expression in learning process was observed in order to give an appropriate feedback. Emotional intelligent not only gives high flexibility to the interaction of tutoring system, it also to deepen its level of human interaction.

This study uses dual-mode operation: facial expression recognition, and text semantics as the main elements in affective computing to understand users' emotions. Text semantics are used to understand learner's learning status, and the results would contribute to course management agents in order to choose the most appropriate teaching strategies and feedback to the users. Facial expression recognition allows interactive agents to provide users a complete sound and animation feedback.

Keywords: Affective Computing, Affective Tutoring System, Intelligent Tutoring System, Emotional Intelligence, Emotion Recognition ;

Introduction

Affective computing means to obtain facial expressions and signals of physical change aroused by emotions and feelings via various sensors and to recognize these signals so as to understand human emotions to give proper feedback (Li & Cheng, 2011; Li & Huang, 2007). This is an emerging academic field, concerning the study of detecting human emotions and establishing proper emotional models so that emotions may be expressed in every possible way and even be transmitted on the Internet (MIT Media Lab, 2008). In this case, affective computing is regarding two aspects: affection and emotion. Therefore, it will also need to detect information from both physical and psychological resources. According to Ammar et al. (2010), the latest scientific study has proved that emotions do exert great influence on decision making, perception, and learning.

For the time being, most "intelligent tutoring systems (ITS)" place more emphasis on providing users with a highly flexible and interactive learning environment. Moreover, they may present users with proper learning materials along with teaching strategies based on their background knowledge. For example, when users do not reach desired grades, the tutoring system may lower the learning level timely to suit the users' needs. Nevertheless, studies concerning the learning status of users are rare to be found. For instance, when a user's learning capability is in decline, the cause for his/her weakened learning motivation may come from the individual's mood swings rather than his/her poor capability of learning. In this case, it is hoped that the involvement of affective computing may help to observe users' emotions and learning status so that the fluctuation may help the tutoring system to provide users with suitable courses and feedback (Lin et al., 2011a; Lin et al., 2011b; Tsai et al., 2010).

However, humans have a complicated way to express their emotions, such as facial expression, eye contact, body language, physiological phenomenon, and even words. In this case, any single method is not likely to obtain affection or situation in a complete manner. Therefore, this study suggests adopting facial expression recognition and text semantics as a dual-mode operation so that information regarding a user's emotions and learning status may be discovered and understood better (Willems, 2011; Abulibdeh & Hassan, 2011; Yeo & Que, 2011). This study is aimed at applying affective computing to ITS so that a user's learning status as well as immediate emotions may be considered an index for the reference of flexible tutoring courses.

Literature Review

Kort et al.(2001) proposes a fundamental learning framework, whose abscissa means "Emotion Axis," while the ordinate suggests "Learning Axis." The farther an axis value on the right side of Emotion Axis is, the higher the positive energy will be and the further it on the left side is, the stronger the negative energy will be. On the other hand, the higher the "Constructive Learning" is, the stronger learning interests the use will have. Otherwise, the higher the "Un-Learning" is, the lower learning interests the user will have.

It is made up of four models: interface pattern, expert pattern, student pattern, and tutor pattern (Koedinger and Corbett,2006). In recent years more and more tutoring systems focus on creating learners' emotions in a tutoring environment, including emotional expression, empathy (Lester et al., 1999), and learners' affection recognition(Conati et al., 2002). Besides, there are other studies concluding that the introduction of emotions to study is very likely to arouse users' motivation. Emotions play a vital role in knowledge acquisition for humans (Vesterinen, 2001). They have been regarded as a considerably important factor to intrigue learners' motivation, whereas motivation plays a vital role in knowledge acquisition (Mao & Li, 2010). In this case, "Affective Tutoring Systems (ATS)" is developed to detect students' situations of learning and affection so as to give them timely emotional feedback and to correct their emotions of learning (Mao and Li, 2010). ATS is, in fact, designed based on the concept of ITS, aimed at mimicking real human reaction so as to adjust to students' affection and situation in an effective manner(Sarrafzadeh et al., 2004; Vicente, 2003). According to Gerald (2004), negative emotions will weaken the learning status, while positive ones do benefit learning achievement. Moreover, Ammar et al., (2010) argues that the establishment of facial expression may strengthen the affective tutoring system in terms of the relationship of ATS and users. This study has proved that affective computing is good for monitoring users' behavior in the learning process (Ammar et al., 2010; Lin et al., 2011a; Lin et al., 2011b; Tsai et al., 2010).

In early days, emotion recognition used to focus on mainly recognizing face and speech. Speech recognition detects mostly the frequency and energy of voices so as to generate a set of rules to identify emotions by means of statistics or machine learning. As for facial expression recognition, a great number of experts and researchers have conducted many relevant studies in these years. Among of them, “Facial Action Coding System (FACS)” developed by Ekman et al. (1978) may be the most well-known. This system identifies dozens of “action units (AUs)” based on facial muscles. It adopts facial contour beforehand to detect the positions of face, eyebrows, mouth, and nose. These positions are then served as points spreading into a plane so as to form an expression of features. Based on the movement of these feature points, each point’s displacement vector is carefully calculated. With respect to the recognition part, the collected data is added to various detectors such as SVM, Neural Network, and HMM for facial expression identification or hypothesis developed in accordance with psychologists’ definition.

Digital art is an emerging genre of arts. It comes from Technical art, integrating computers, network, and multi-media altogether to present various aspects. Lin et al. (2004) believes that artistic works shall be able to reach viewers’ inner feelings. In addition to the affection demonstrated by the work itself, viewers are supposed to have deeper thoughts (Lin, et al., 2012; Wang et al., 2011). Moreover, lecturers may try to integrate information technology into art courses and to overcome issues of network connection in order to increase their teaching performance on art and culture, improve their instruction, and exert the positive effects of education (Lu, 2009).

Research Method

System Architecture

This system is divided into two parts: (1) Course and Interactive mechanism; (2) Emotion and Learning Status Recognition mechanism. Moreover, the two main parts are divided into smaller modules seen as Figure 1.

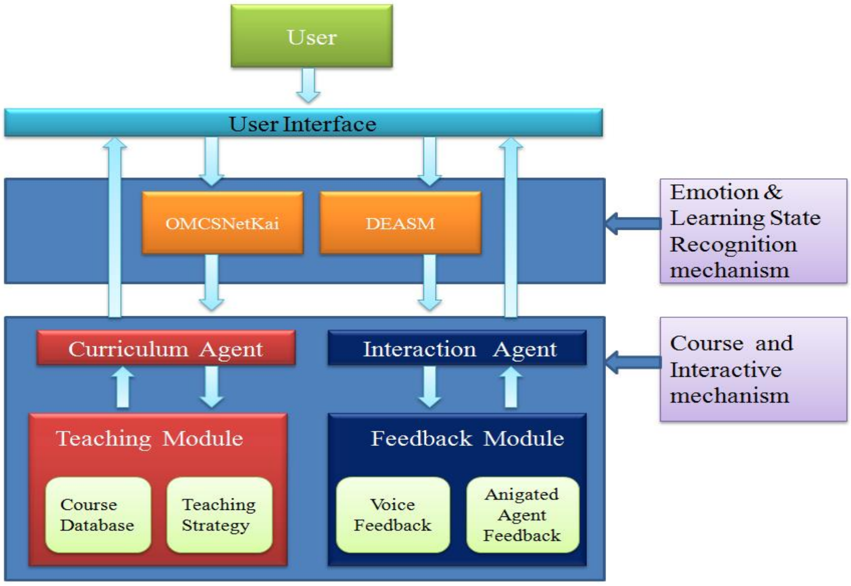

Figure 1 Flowchart of Affective Tutoring System

Intelligent Tutoring System

This mechanism of facial expression recognition and learning status recognition is created in accordance with the Detected Emotion based on Active Shape Model (DEASM) developed by this study. DEASM is the creation generated by Active Shape Model Library (ASMLibrary 5.0) SDK and the algorithm proposed by Ammar (2010). DEASM is applied to extract information of instant images via the webcam so that this study may match each frame with the active shape models to obtain the coordinates of feature points needed for the algorithm. Afterwards, this study conducts the algorithm of facial expression recognition to recognize users’ emotions. After extracting the necessary targeting feature points, this study conducts the definition of six spans of facial feature points (Di) proposed by Ammar (2010) to go with the six fundamental human emotions and develops the algorithm of facial expression recognition.

This study is aimed at developing an ATS on the basis of ITS, capable of detecting users' emotions and giving them proper feedback. ATS suggests that the system is able to recognize a user's learning and emotional status so that it may give the user a timely emotional feedback to help him/her back on track (Mao and Li, 2010). Despite the fact that many researchers have attempted to apply ITS to teach all sorts of fields such as algebra, geometry, mathematics, physics, and computer programming, rarely does it be applied to teach art courses, or even digital art. The following part is concerning the introduction of how this study makes use of the ATS it develops to teach digital art course (Lin et al., 2011a; Lin et al., 2011b; Tsai et al., 2010).

The interactive user agent module is divided into two subordinate modules: sound feedback and animation feedback. Based on six fundamental emotions, agents may react to users' emotions in various sounds and animation. For instance, if the user has an expression of sadness, the agent will comfort him/her by wearing a caring look and asking, "Are you alright?" In accordance to the six fundamental emotions defined by Ekman & Friesen (1978) plus the "Neutral" emotion, The snapshot of the system is shown in Figure 2.

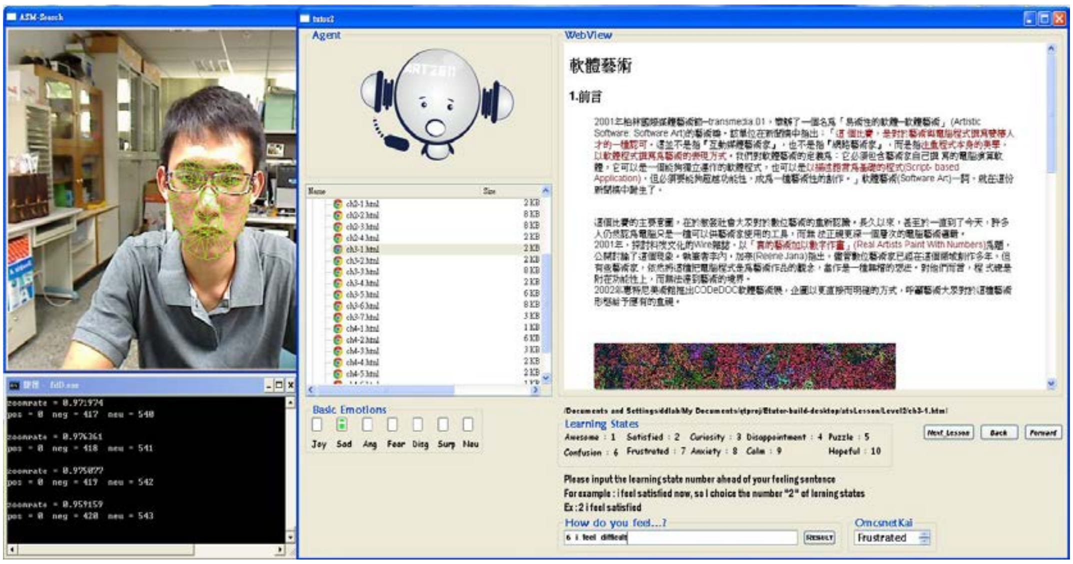

Figure 2: A snapshot of the system

System Design and Evaluation

This study intends to establish a more humane interactive mechanism by recognizing users' emotions so that learners may enjoy a more flexible process of knowledge acquisition. Therefore, this study designs its system and evaluation as follows: (1) concept model; (2) prototype design; (3) expert-based heuristic evaluation; (4) ATS—A combination of emotion recognition and feedback; (5) triangulation evaluation on the final system, including questionnaires, observation, and interviews. The flowchart of system design and evaluation is seen as Figure 3.

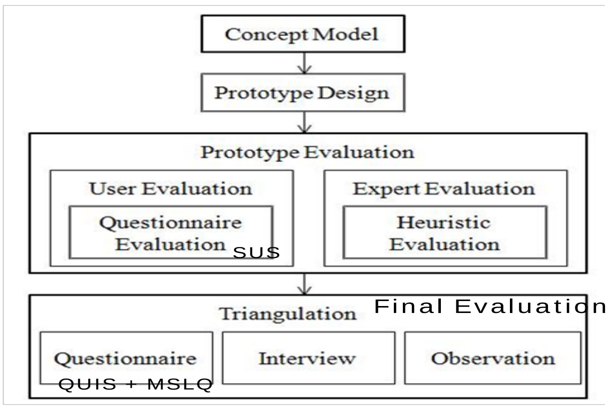

Figure 3 Flowchart of System Design and Evaluation

Prototype Design

Expert-based Heuristic Evaluation on the Prototype

After the cognitive walkthroughs, the heuristic evaluation process was performed then. Heuristic evaluation (Nielson & Molich, 1990) (Nielson, 1994) was developed by Jakob Nielsen according to usability exploring rules. These rules were called heuristics and used to evaluate whether the elements which made up the user interface were based on these principles. In Nielsen's research, it was proved that experts can usually check out around 75% usability problems and skilled experts were able to observe a lot of usability problems on their own. Also, based on Nielsen's advice, there should be four to six experts. In the research, we had five experts.Each expert spent one to two hours examining the prototype at least twice. First, experts grasped the procedure of the whole interactive interface manipulation and gained some knowledge about the work. Then, experts checked the usability problems of the entire artwork. Finally, experts discussed their evaluation results together, prioritized the problems, and offered solutions to them.

Expert-based Heuristic Evaluation on the Prototype

In the part of system estimation, it mainly evaluated system usability of the users on the research. We utilized the well-known questionnaire System Usability Scale (SUS) to evaluate the system usability. The questionnaire was revised with help from experts with significant experiences in the related fields. A 5-point scale ranging from 1 as strongly disagree to 5 as strongly agree was used for the measurement. The revised version of the SUS questionnaire is in table 1 (Brooke, 1996; Tullis, 2004; Lutes, 2006; Isman, 2010). The revision majorly focused on making SUS more suitable to artwork evaluation. SUS is a questionnaire to estimate users' subjective feelings of the system and further know their degrees of satisfaction. In the aspect of system usability evaluation, the SUS is an efficient, time-conserving, and labor-saving way of subjective estimate. After users finishing answering ten questions, the scale offers a formula which transfers the subjective feelings of users into the objective data information for analysis.

Table 1: SUS Questionnaire

System Usability Scale
I think that I would like to interact with this work frequently
I find the work unnecessarily complex
I suppose the work is easy to use
I think that I would need the support of a technician to help me use this work
I find the various functions in this work are well integrated
I suppose there is too much inconsistency in this work
I would imagine that most people may learn to use this work very quickly
I find the work not very user-friendly
I feel very confident while using the work
I need to learn a lot of things before I can get used to this work

Expert-based Heuristic Evaluation on the Prototype

By making use of the QUAN + QUAL Model, a better understanding can be provided for the phenomenon of interest (Creswell, 2008; Creswell & Clark, 2007; Gay, et al., 2009). Triangulation Evaluation consists of questionnaires, observations, and interviews. The final questionnaire was composed of QUIS and MSLQ. "Questionnaire for User Interaction Satisfaction (QUIS)" is issued to discover the subjective satisfaction of participants toward the user interface. This measurement tool can be used to measure satisfaction of the entire system, and to measure specific interface factors, such as screen visibility, terminology and system messages, learning factors, as well as functionality of a system. On the other hand, this study issues the "Motivated Strategies for Learning Questionnaire (MSLQ)" to discover how participants' learning motivation is stimulated after using ATS. MSLQ is developed by Printric et al. (1991) and divided into six aspects with 30 questions in total. They are 4 questions of inner motivation, 4 of outer motivation, 6 of work value, 4 of control belief, 8 of self-efficacy, and 4 of learning anxiety respectively. Moreover, this questionnaire enquires participants in the manner of the five-point Likert Scale.

Usability Evaluation Results on the Prototype

After conducting the SPSS reliability analysis, this study concludes that its SUS reaches a Cronbach's value of 0.792, exceeding the overall reliability value of 0.7. The overall mean of SUS is 75 and the standard deviation is 10.64. On balance, the result is determined as skewed left mesokurtic (skewness=-.492, kurtosis=.789), indicating that the cluster with high scores account for a high percentage among all users. In this case, most users are highly sensitive to the system usability of ATS.

Based on the statistic data, this study selects the first and second top scores appearing in this five points scale and puts these two percentages together. As it is seen in Table 2, the overall subjective feeling is 78.50%. In Q1, there are 65.0% of users willing to use such a learning system as ATS. Moreover, in Q2, 80.0% of users agree that this system is not complicated. In Q3, there are 90.0% of users consider this system easy to use, while in Q4, 40% of users think that they need extra assistance from the technicians to operate this system. In Q5, over 90% of users consider the system functions well-integrated. What's more, in Q6, 80% of users do not think the system contains many contradictions. In Q7, there are 85% of users believing they do not need much time to learn how to use this system and in Q8, over 90% of users think of using the system as not difficult. In Q9, 85% of users have strong faith in operating this system, while in Q10, 80% of users believe that they need to have some background knowledge prior to using this learning system. Based on the mean of SUS, 75.0, as well as the question analysis from Q1 all the way through to Q10, it is concluded that this system has good usability.

Table 2 Descriptive Statistics of SUS

Mean, standard deviation, skewness, and kurtosis					Question Percentage of the Five Point Scale(%)				
					1	2	3	4	5
Q1	3.80	.696	.292	-.734	0	0	35.0	50.0	15.0
Q2	3.85	.489	-.442	1.304	0	0	20.0	75.0	5.0
Q3	4.15	.587	-.004	.178	0	0	10.0	65.0	25.0
Q4	3.30	.923	.214	-.595	0	20.0	40.0	30.0	10.0
Q5	3.95	.394	-.531	4.985	0	0	10.0	85.0	5.0
Q6	4.00	.795	-.699	.807	0	5.0	15.0	55.0	25.0
Q7	4.30	.733	-.553	-.834	0	0	15.0	40.0	45.0
Q8	4.35	.813	-1.42	2.379	0	5.0	5.0	40.0	50.0
Q9	4.40	.754	-.851	-.609	0	0	15.0	30.0	55.0.
Q10	3.90	.852	-.930	1.012	0	10.0	10.0	60.0	20.0
Overall	4.00	.703	-.492	.789	0	4.0	17.50	53.0	25.50

Analysis of Questionnaire for User Interaction Satisfaction (QUIS)

In this study, the result of QUIS reliability analysis in terms of its six aspects is seen . Among the six aspects, except the reliability value of "terminology and system information" being 0.535, which is less than 0.7, the rest all reaches the general desired value 0.7.As it is shown in Table 3, the score of "user interface usability" is much lower than the mean. On the other hand, the reason why the score of "terminology and system information" is slightly lower than the mean is probably because the interface layout is not user-friendly enough. Besides, the interface contains more English explanation than Chinese. In this case, to students who are native Chinese speakers, they may have difficulty operating the system in a direct method. Nevertheless, the score of "learning operation system" and "system performance" is 6.17 and 6.40 respectively, indicating that this ATS is still acceptable to users. It is concluded that (1) the usability of ATS is good.

However, in the aspect of "overall user feedback," the non-experienced group scores 7.11, higher than the experienced group scoring 6.89. This may be the result that the non-experienced group has never experienced such a learning system before, their first experience is totally new and interesting to them. Therefore, it is concluded that (3) the interaction of ATS is indeed attractive to users. Table 4-6 demonstrates the result of descriptive statistics and T-test analysis of QUIS aspects.

Table 3 Descriptive Statistics of QUIS

	Experienced (22 people)		Non-experienced (18 people)		total(40people)		P-value (double -tailed test)
	average	Standard deviation	average	Standard deviation	average	Standard deviation	
Overall user feedback	6.89	1.01	7.11	0.49	7.05	1.03	0.415
Screen presentation	7.19	0.732	7.43	0.77	7.30	0.94	0.324
Terminology and system Information	6.51	0.47	5.97	0.40	6.27	0.91	0.000***
Learning operation system	6.50	0.70	5.76	0.41	6.17	1.106	0.000***
System performance	6.34	0.50	6.47	0.66	6.40	1.25	0.481
User interface usability	5.88	0.64	5.30	0.58	5.62	1.09	0.005**
Average	6.55	0.68	6.34	0.55	6.47	1.05	0.204

(P-value suggests the comparison between the experienced group with the non-experienced group.)
Notice: * means $p<0.05$, ** means $p<0.01$, and *** means $p<0.001$

Conclusion

This study is aimed at creating and developing a reliable process of design and evaluation plus the digital art course of Affective Tutoring System. Based on the study objectives and questions stated in the very beginning, this study has concluded the following conclusion after compiling the user feedback:

(1)ATS is easy to use. Moreover, the interaction is outstanding. Therefore, the compatibility of affective computing in the tutoring system is considerably good. (2)When interacting with ATS, users do achieve their desired objectives. Therefore, users are highly satisfied with ATS.(3)Since users have strongly positive feedback with respect to the affective recognition and agent feedback of ATS, it is indicated that the interaction of ATS is attractive to users. (4)Since users are interested in this informative digital art course, it is suggested that ATS is helpful in terms of increasing users' motivation in learning the digital art course.

This study attempts to follow the process of design and evaluation to establish a tutoring system based on the affective recognition and to teach digital art course via this system. This system combines two various recognition methods, OMCSNetKai and DEASM, to identify the user's emotional status while he/she is inputting words and to provide the user with a suitable course level as well as agent feedback. Therefore, the concluded feedback may serve as a reference for the system feasibility.

Acknowledgements

The authors would like to thank the National Science Council of the Republic of China for financially supporting this research under Contract No. NSC 100-2511-S-024-006, NSC 99-2511-S-024-005 and the anonymous reviewers for their valuable comments.

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ENHANCING READING COMPREHENSION THROUGH COGNITIVE AND GRAPHIC STRATEGIES: A CONSTRUCTIVISM APPROACH.

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Abstract

Graphic Strategy and several Cognitive Strategies (Story Structure, Questioning, Synthesizing, Visualizing and Inferencing) are used on narrative texts, following constructivism principle, to discern the increase in students' reading comprehension. A quasi-experimental study involved 45 students (experimental group) receiving treatment via graphic and cognitive strategies and another 45 students (control group) using classroom's common practice (conventional method). Paired T-test Analysis shows significant difference for both groups. However, mean score and effect size (eta square value) are larger in the experimental group (M=59.63, 0.78) than the control group's (M=55.34, 0.31). This indicates that the implemented strategies increased students' reading comprehension effectively compared to conventional method.

Keywords: Reading Comprehension; Cognitive Strategies; Graphic Strategy; Constructivism Approach.

1. Introduction

1.1 Reading Comprehension from Constructivist Perspective.

Reading activity merely involves decoding printed patterns into words and understanding the meaning, but reading comprehension is a complex deciphering meaning process which is very much influenced by the reader and their ability to accomplish the reading tasks (Bursk&Damer, 2007). Thus, the constructivist viewed reading comprehension as a dynamic and constructive meaning making process, involving reader-text interaction. The effectiveness of this meaning making process are heavily depends on readers' self-characteristic and their active role in the meaning making process. However, the contextual factor (why,
when, where a text is read) and the text genre, difficulty level and style of writing will also determine the reading comprehension output (Gunning, 2008; Bursk & Damer, 2007). Readers approach text with their prior knowledge (schemata), strategies used and other self-characteristics such as world view, beliefs, attitude, motives, values, motivation and linguistic ability (Gunning, 2008). The whole process engaged reader on a complex thinking process; recognizing, decoding, arranging, analysing, assessing, generalizing (Marohaini, 1999; Reutzel&Cooter 2004) and structured into the language used with the help of strategy. Therefore, the constructivist regarded readers as autonomous individuals integrating schemata and new information from text in producing meaning, where they actively select, create and refine hypothesis made in synthesizing information and interpreting meaning (Bruner, 1966)

Constructivism basic principle encourages students' self-exploration and learning control, incorporated with their existing knowledge (Koohang, 2009). Teachers are thus challenged to create conducive environment for students to think and explore,concurrently offer their guiding role (as facilitators, mentors and scaffolding provider) to support students' active roles in meaning making and constructing new knowledge (Murphy, 2002).In a reading comprehension process, constructivists stress on teachers' supportive roles to encourage the build of concept, values, activate schemata and to encourage students' active participation in high cognitive level activities. These high cognitive level activities, for instance problem solving, deep understanding, and metacognition (Murphy, 2002), helps improve students' cognitive structure. The constructivism basis emphasizes on knowledge mobility in accommodating these cognitive activities(Bruner, 1966). This resulted in transferral to several thinking levels during the reading comprehension process. The thinking levels, also known as the cognitive reading strategies, aid the reading comprehension process (Chamot& O'Malley, 1996) and thus help enhance performance.

2. Review of Literature

2.1 Reading Comprehension Strategies

Numerous studies on reading comprehension conducted over the decades have highlighted the importance of reading comprehension strategies. Studies finding also seemed to indicate a linear relationship between strategy use and reading comprehension performance. Students using strategies applied by efficient readers had performed better than those who did not (Fauziah, 2003).A strategy is viewed as a flexible plan or technique used by readers in the attempt to get information or make meaning from a text (Pearson, Roehler, Dole & Duffy, 1992). Graves et al. (2007) opined that efficient readers will use selective strategies intentionally to represent the reading process, develop comprehension and facilitate in achieving its objectives (Gunning, 2008; Fauziah, 2008).Yopp and Yopp (2006) reported on several researches resulted in comprehension increment when students are engaged with reading strategies used by efficient students. These strategies need to be learned, trained and gradually become a reading habit. Generally, the reading comprehension strategies could be divided into three main categories; metacognitive, cognitive and affective. This paper, however, only focuses on cognitive strategies, parallel to constructivism approach.

2.2 Cognitive Strategies

Williams and Burden (1997) described cognitive strategies as mental processes concerned with processing information applied for obtainment, storage, retrieval or use of information while Chamot and O'Malley (1996) defined such strategies as strategies that aided students in accomplishing the reading task. Oxford (1999) further explained that the strategies are note taking, summarizing, inferencing, using prior knowledge, predicting, analysing and using context clues.Dymock and Nicholson (2010) found that efficient readers utilize between five to nine cognitive strategies. The five major strategies are activating schemata, constructing and asking questions (prior and during reading), analysing text structure or story structure, visualizing and summarizing. Simultaneously, researchfindings by Reading Panel of America revealed seven major strategies employed by efficient readers are; using graphic organizers (GO), monitoring comprehension (a metacognitive strategy), inferencing, identifying text structure (for expository text) and story structure (for narrative text), constructing and answering questions (for expository text), synthesizing, and finally summarizing (retelling/rewriting the ideas precisely) (Cooper, 2006; Pressley, 2000).

Parallel to constructivism emphasis on cognition, we chose five cognitive reading strategies and five stages of cognitive activities to be embedded in the reading comprehension process. The Story Structure Strategy was chosen as the main cognitive strategy because a narrative text was used for the comprehension process. This strategy was integrated with the Graphic Strategy via Graphic Organizer (GO) called The Story Structure Map which contained story elements such as setting, characters, plots and themes as the subtopics. Based on the skeletal framework and the subtopics given, students are to complete the GO. Story elements or also known as story structure are defined as a set of rules developed for each story in which it creates a hierarchy and help students comprehend better (Dymock, 2007). Rajeswary (1998) also found that students with story structure knowledge are able to understand a story better despite of the story lacking ideal structure.Therefore, teaching story structure is an important aspect of narrative text comprehension (Reutzel&Cooter,2004).

Second cognitive strategy employed is Questioning Strategy, upon completion of Story Structure Strategy and GO construction by students.Teachers are encouraged to ask questions to facilitate students' mastery of basic story elements, implicitly teaching the students to generate questions via information integration(Cooper, 2006). These are the first stage questions and are to be answered in one sentence, similar to Question Answer Relationship(QAR) method (Bursck & Damer, 2007).

The third cognitive strategy, synthesizing, a high cognitive level strategy, needs to be employed simultaneously with the previous two.This strategy helps readers to have an in-depth understanding on the story structure namely the setting, characters, characters' issues, resolutions and the ending of the story (Cooper, 2006). Synthesizing strategy aids reader to evaluate information from the text and thus helps students achieve the third cognitive level in Barret's Taxonomy

The next strategy, Visualization Strategy, is used to achieve comprehensive understanding and global coherence of the text. This is parallel to Cooper's view where he believed that this technique is able to assist students' mental image development (visualizing strategy) based on their schemata and text information extract. Visualization becomes the medium for ideas representation in both narrative and expository texts (Pressley, 2000). This strategy involves assessment, summarizing and drawing conclusion from the text.

Finally, the fifth strategy employed is Inferencing Strategy. Inferencing, the second thinking level in Barret's Taxonomy is also regarded as a high thinking level. This strategy is significant in the meaning making process as it helps support information required by students in text understanding. Inferential comprehension occurs when a reader is able to read between the lines (the ability to blend the text literal content with prior knowledge, intuition and imagination for conjecture or to make hypotheses)(Pennel, 2002). Prior to this, Barret (1974) had identified 8 types of inferences; a) supporting details, b) the main idea, c) sequence, d) comparisons, e) cause-and-effect relationships, f) character traits, g) predicting outcomes and h) figurative language. Grasser et al. (1994) also founded twelve inference types evolve from the meaning making (reading comprehension) process using constructivism approach. The steps are making references, the role of structural case, cause, goal, themes, reaction towards character's emotions, consequences, pronoun initializers, instrumentation, the goal motives, situation and reader's emotion. Types 1 to 6 of the inferences were sparked during the reading comprehension process. The remaining six are generated after the process.

2.*3 Graphic Strategy*

Since this study uses narrative text which comes in hierarchal point, GO is the most appropriate material that can aid in hierarchical concept understanding. The use of this Graphic Strategy (through Graphic Organizer-GO) is integrated with the main cognitive strategy, the Story Structure Strategy.

GO is a text information spatial display that can be used as students study aids. GO communicates both vertical and hierarchical concept relations (Robinson, Katayama, Dubois,&Devaney, 1998) and it also uses two dimensional spaces to communicate conceptual relation and words' relative spatial locus (Katayama & Robinson, 2000). Graphic Strategy application means integrating visual-illustrated concept with information from text where GO's usage gives reader a clearer and substantial understanding. The nature of GO graphic illustration that co-appears with the text contributes to macrostructure understanding of text and enables easy retaining and retrieving information **(**Van Dijk & Kintsch, 1983; Chang, Sung & Chen, 2002; Xiangjing & Grabe, 2007). This also shows shift of approaches from traditional linear text presentation to graphical concept (Chang, Sung & Chen, 2002).

Researches on reading comprehension and memorization reported significant findings on GO in aiding readers text comprehension (Robinson et. al, 1998); Robinson & Skinner, 1996). Robinson, Katayama, Odom, Hsieh and Vanderveen (2006) also reported on several researches revealing students' better performance when they studied spatial display text information (GO notes) compared to linear text. GO notes not only assist students by directing their attention to important information, but, rather, help them notice important cross-concept relations that are vague when viewing linear notes. Several research reports concluded that self-constructed GO is more effective in the comprehension process (Xiangjing & Grabe, 2007) due to promotion of autonomous learning and enhancing learning depth (Chang, Sung, & Chen, 2001; Katayama & Robinson, 2000). However, GO used on different reading task produce different result (post-reading GO is more effective). The treatment duration and participants' education level also determine the effectiveness.

Those studies reported GO's strong point in representing the discourse structure of the text and therefore helps facilitate comprehension. Additionally, the research results indicated that students comprehend better with the help of GO, as demonstrated by several studies that used GO for pre-reading and a few more that utilized it for post-reading task. However, in our study, GO is used as during reading task and applied simultaneously with the Story Structure Strategy. Thus, the objective of this study is not to measure the effect of using GO alone, but also the effectiveness of all the five cognitive strategies and activities given as an intervention. The effectiveness will be measured through the pre and post-test results of Reading Comprehension Test among the students in experimental group, compared to the control group who did not receive any intervention.

3. Research Methodology

3.1 Participants

The participants were 90 Form Two students from two intact classes from one school in a district in Selangor, Malaysia. The school was selected through Cluster Random Sampling from a number of 39 secondary schools in the same district.

3.2 Design

The study involved 7 weeks of quasi experimental research, covering the administration of pre- and post-tests and also 5 weeks conducting 5 sessions of 350 minutes teaching learning process.The cognitive strategies, namely Story Structure (integrated with a Graphic Strategy), Questioning, Visualization, Inferencing, and Synthesizing, plus the five stages of cognitive activities are embedded in the experimental group reading comprehension lessons. While the control group receive a conventional method (normally practiced in the classroom).The design is quasi experimental with one group non-equivalent pre- and post-tests design. One control group of 45 students and one experimental group consists of 45 students involves in this study. Comprehension Test score is the dependent variable to be measured.

3.3 Materials

Both the experimental and control groups' narrative passage is a short story extracted from the compulsory literature text for Form Two, (for Malaysian Central Zone) as directed by the Ministry Of Education Malaysia (MOE). The length of the narrative text used is approximately 1840 words. One main Graphic Organizer (GO), the Story Structure Map is used by the students to help organize the story structure/elements along the text comprehension process. The skeletal framework of GO is adapted from Idol (1987) and constructed via computer application. The subtopics included in the Story Structure Map GO are setting (place and time), main characters, theme, subthemes, plot (beginning, climax/conflict, and ending) action and effect of characters. These subtopics are constructed from the story elements/structure.

3.4 Measures

Pre- and post-Reading Comprehension Tests administered to the sample of 90 students from two intact classes, 45 students in each class. The Reading Comprehension instrument was self-constructed by researchers based on Barret's Taxonomy (1974). Taxonomy is a hierarchical of cognitive/thinking level involved in a reading comprehension process. In this study, we utilize Barret's Taxonomy (the thinking level starts from literal, inferences, evaluation and the highest level is affective level).Barret'sTaxonomy is more appropriate in measuring narratives text comprehension thinking level as it measures affective aspects of the narrative text, namely the aesthetic aspect. This Reading Comprehension instrument was tested for reliability through Kuder Richardson (KR20) formula. The value obtained is 0.649 (0.7), which according to Majid (2005) is acceptable.

3.5 Instruction

Teachers would provide students opportunity and guidance to learn the cognitive strategies for further application in reading various textual types. Assistance should be given until students are skilful to utilize the strategies independently. This is in concordance to Gunning's (2008) idea of teaching strategies. Gunning's (2008) recommended direct explanation and 6 guided steps. The six steps are: a)introducing the strategies and their rationales, b)modelling or demonstrating the application of these strategies, c)conducting guided practice, teacher acts as a facilitator, d)students' self-practice (read various types of narrative texts), e)conducting assessment, and f) remodelling (if necessary). Teachers should observe students' ability to apply the targeted strategies, accompanied by written assessment in the form of graphical document, where students are expected to master the targeted strategies within a month.

The manual constructed is based on Gunning's guideline on teaching the reading strategy. However, only five out of six Gunning's steps were adapted for this study (from Step (a) to Step (e) only). The pre-test was given before the intervention starts. The five-week intervention of a Graphic Strategy, Cognitive Strategies and Activities, involved the running of the experimental manual for five sessions where each session comprises of double teaching periods of 70 minutes (35 minutes for 1 teaching period). The course of the whole manual took altogether 350 minutes.

The Fig. 1 below shows two pyramids. The pyramids are chosen to compare the strategies implemented (Fig. 1 (a)) with the reading comprehension taxonomy (cognitive level hierarchy involved in a reading comprehension process) (Fig. 1 (b)). The students' comprehension level starts from literal cognitive/thinkinglevel, followed by higher cognitive level comprised of inferential and evaluation (a combination of cognitive and affective). The ultimate goal is affective level where students achieve appreciation and deeper understanding towards the text. The implemented cognitive strategies stages also start with easy reading activities(Session 1) and end with a more complex activity when they reach comprehension level(Session 5), as indicated in Fig.1 (a).

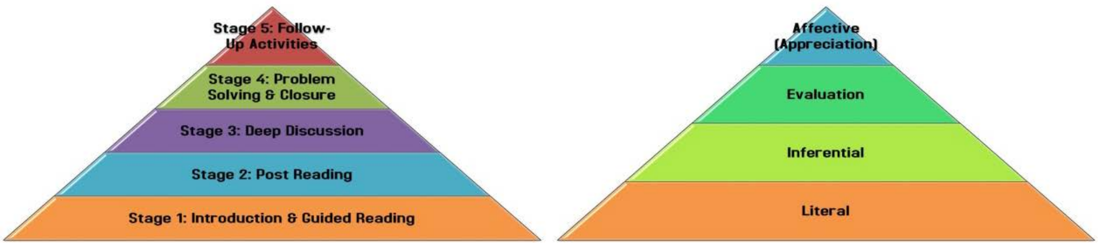

Fig. 1 (a) 5 stages of Cognitive and Graphic Strategies; (b) Barret's Reading Comprehension Taxonomy

Session 1 starts with introduction where the teacher explains the strategy that will be used for text comprehending. Next is the Guided Reading approach that starts with silent reading.This automatically embarks students on cognitive process of the meaning construction, which involved integration of new extracted ideas from textwith their existing knowledge (consciously or subconsciously)(Vanides, Yin, Tomita & Ruiz-Primo,2005). The Story Structure Map GO is introduced during the Guided Reading. This GO will propel students to organize and synthesize story structure/elements information through Story Structure Strategy.

The intervention continues with Post Reading Session(Second Session) with teachers demonstrating Questioning Technique. The questions asked are to check on students' understanding on story structure/elements, promptingthem one-sentence answers. At later stage, students will be able to apply this strategy as Self-Questioning Strategy.

In the third session (Deep Discussion), the discussion continues with teachers employing extracting information questions orally to the students (the 'what', 'why' and 'how' questions). This session emphasizes students' self-exploration with teachers' guidance asto reinforce students' understanding and ability to define authors' hidden message, thus produce new knowledge and finally interpret the text meaning (Machado, 2010). Students' cognitive abilities will be stimulated through these guided questions, thus develop deeper comprehension. In this session, the Visualization and Inferencing Strategies are used by students to aid the process.

The fourth session (Problem Solving and Closure) displays the teachers' guiding role in leading the students to reflect and think of the problem solving action by the narrative text characters. This reflective session enables students to evaluate the characters' action and its consequences and how the characters' action affects them as a reader. In this session, the cognitive strategy suggested is the Synthesizing and Inferencing Strategy. This activity can be executed in the form of group discussions

Finally the fifth session (Follow-up Activities), a role playinvolving students' performance on the role of narrative text characters is suggested. This is to help them appreciate narrative texts hence enable them to comprehend better. Finally, after the five weeks of intervention and the completion of whole activities and embedded strategies, both the experimental and control groups were administered a post Reading Comprehension Test.

4. Findings

A Paired-samples t-test was conducted to evaluate the effect of the Cognitive and Graphic Strategies intervention on students' Reading Comprehension Test score. There was a statistically significant increase on Reading Comprehension Test score in Experimental Group, from Pre-test mean (M=53.260, SD=6.4201) to Post-test (M=59.631, SD=9.1305), d(t)=44, t=12.346, $p \leq 0.005$ (two tailed). The mean increase was 6.3711, with 95% Confidence Interval (CI) ranging from 7.4111 to 5.3311.The eta square statistic indicated a large effect size= 0.78(78%). Comparing the eta square value obtained (0.780) to Cohen (1988) criteria, 0.01=small effect, 0.06=moderate effect and 0.14=large effect) the magnitude difference in the means was large (0.78), justifying that the intervention is very effective in enhancing reading comprehension performance. Please refer to Table 1.

Table 1: Paired T-Test Statistic of Reading Comprehension Test for Experimental Group

Test	N	Mean	SD	T	P
Pre-test	45	53.260	6.4201	12.346	0.005
Post-test	45	59.631	9.1305		

$p \leq 0.05$

A paired-samples t-test was also conducted to evaluate the effect of the conventional method towards students' Reading Comprehension Test score. There was also a statistically significant increase on Reading Comprehension in Control Group, from Pre-test (M=54.144, SD=8.5025) to Post-test (M=55.340, SD=8.9470, d(t)=44, t=4.522, $p \leq 0.005$ (two tailed). The mean increase however was only 1.1956 with 95% CI ranging from 1.7284 to 0.6627. The eta square statistic indicated a large effect size= 0.31(31%) according to Cohen (1988) criteria, the conventional method also contribute towards the increaseof the reading comprehension score among the control group.Please refer to Table 2.

Table 2: Paired T-Test Statistic of Reading Comprehension Test for Control Group

Test	N	Mean	SD	T	P
Pre-Test	45	54.144	8.5025	4.522	0.005
Post-Test	45	55.340	8.9470		

$p \leq 0.05$

However, in determining the effectiveness of either intervention or conventional methods, the attention should be drawn to the value of the eta square.As for the experimental group,the eta square value is (0.78) which means 78% effectiveness of the intervention compared to the control group (0.31), only 31% effectiveness of the conventional method. This shows that the Cognitive and Graphic Intervention is much more effective in enhancing the Reading Comprehension compared to the use of conventional method.

5. Discussion

Overall result of this study shows that the implemented strategies are able to increase the reading comprehension performance among the students studied.This is synchronized with positive past studieson graphic strategies used in reading comprehension (Chmielewski&Danserau, 1998; Griffin, Malone, & Kameenui, 1995). This is also parallel to those of the studies that support the advantages of the spatially-formatted GO,which lessen cognitive load, revealed easier and faster information retrieval compared to outline text (Katayama & Robinson, 2000) and helps in answering factual and inferential questions (Robinson & Skinner, 1996).Hypothetically, GOs are more searched and computationally efficient than linear displays, thus reducing the amount of search required to draw inferences. Our study has proven that GO has increased students' ability to answer the inference thinking questions.

The finding of this research also seconded the research result reported by Katayama, Odom, Hsih and Vanderveen (2006) who found that providing students with skeletal GO frameworks helped them outline frameworks for learning across-concept connections, therefore increasing their comprehension level. Robinson et al (2006) reported a meta-analysis study result on GO by Moore and Readance, revealed that student-constructed GOs had an effect size of (0.38), compared with (0.15) for teacher-constructed GO. In our study, the effect size value of the intervention is 0.78 (78% effective). This applies to the experimental group Reading Comprehension Score, who constructed their own GO from the skeletal framework given.

In contrast, Katayama and Robinson (2000) indicated that a partial graphic organizer functioned better than a skeletal GO due to less overload, more engaged participation, and more encoding process provided by the partial GO. Katayama and Robinson also concluded that using a skeletal GO was not as effective as using outlines or conventional notes because high level of concentration needed to complete a skeletal framework.

As for the cognitive strategies, our research result shows that the implemented strategies has helped student comprehend better, as signified by the enhancement in the reading comprehension test score. This finding is parallel to Dymock's (2007) and Rajeswary (1998), stating that the utilization of Story Structure Strategy contribute to better understanding thus enhancing comprehension. Finally, our finding on students' ability to answer inferential questions complements Grassers et al (1994) study which showed that constructivism approach usedin reading comprehension is able to inculcate the inferential thinking among students,thus heightened their comprehension performance.

6. Conclusion

Every reading comprehension process highly demands the integration of readers' ability, schemata, other self-characteristics, and strategized action to achieve goal. The implemented strategies and deep cognitive activities embedded in the process, are thus able to increase the students' reading comprehension performance. Through students'self-exploration and teacher's guiding role as the main elements in constructivism learning, this study has proven that the graphic strategy, cognitive strategies and activities has resulted in enhancing the Reading Comprehension performance among the students studied.

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ENRICHING MULTIMEDIA EXPRESSION WITH TANGIBLE OBJECTS: THE LEARNING BENEFITS FOR PRESCHOOLERS

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Abstract

The pedagogical benefits of tangible objects are abundant. However, the adaptation of tangible objects into multimedia learning for preschoolers is still remained absent. In view of this, this paper is produced with objective to discuss the advantages of using tangible objects by way of literature review. For tangible objects embraced in multimedia realm, multimedia objects can complement them meaningfully by providing fascinating multimedia expression and effects like games and versatile clues for preschoolers to know what kind of interaction is expected for tangible objects during the course of learning. A relevant prototype named *TangiLearn* has been developed for a case study. Its finding is briefly reported.

multimedia; multimedia object; tangible object; tangible multimedia.

Introduction

Developing a truly beneficial multimedia learning system for preschoolers need extra considerations. Preschoolers are in a category where much behavior is described by its own specific characteristics. They have limited vocabulary, limited degree of motor acuity (Huang, Smith, Spreen, & Jones, 2008; Read, MacFarlane, & Casey, 2002), and their reasoning facilities are not yet fully developed. They are at the "preoperational state" of cognitive development structure where their cognitive state develops through senses stimulated by external concrete stimuli (Piaget, 1952, 1972). Although the efficacy of the multimedia systems nowadays is confirmed in many different lines of research (Vickneasvari, 2007; Chen, 2005), they may not be equally suitable for preschoolers who have very varied needs and limitations described above. For example, virtual reality (VR) has been established for sometimes as a tool efficient for many aspects, including education (Hole & Schull, 2009; Chen, 2005). However, navigating a scene in VR is apparently a formidable task for preschoolers. Many systems are overwhelmed by a large quantity of instructions that often exceed the learning abilities of the children (Mohamad, Majid, Souriyavongsa, Chin, & Ong, 2011). As such, we observe a learning gap between the preschoolers and multimedia system.

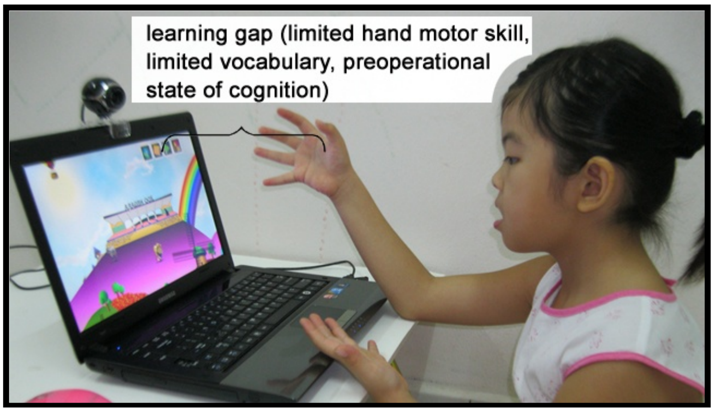

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Fig. 1 Gap between multimedia learning system and preschoolers

A new paradigm shift in multimedia system that truly adapted to their characteristics, hand motor skills, and underlying cognitive developmental abilities has to be sorted out. As tangible objects surrounding children are characterized by offering full range of sensory qualities, they can serve as an excellent candidate to bridge the learning gap.

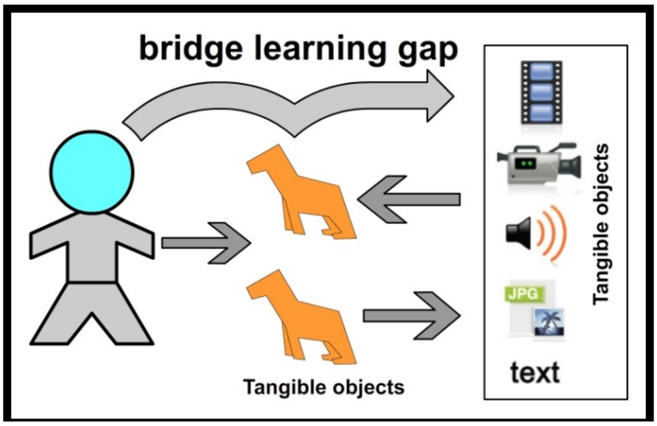

Fig. 2 Tangible multimedia bridges learning gap

However, some may doubt about the advantages and pedagogical possibility of tangible objects in multimedia realm. To convince them of the need of such adaptation, we thus produce this paper with an objective to discuss the learning benefits of using tangible objects by way of literature, and then discuss why the merging of tangible objects and multimedia objects is required. We propose to name such multimedia "tangible multimedia learning system", or in short, tangible multimedia. Prior to actual experimental research (Chau, Toh, & Zarina, 2011), we have conducted a relevant case study and this paper also provides brief report of the case study.

The Learning Benefits of Incorporating Tangible Objects for Preschoolers

Tangible object denotes an intuitive and natural ways of learning (Ishii & Ullmer, 1997). Even though the so-called "natural" way is difficult to measure objectively, and is subject to interpretation (Forlines, Wigdor, Shen, & Balakrishnan, 2007), one can be aware that it has something to do with the engagement of primary senses of the human, particularly hands. With tangible objects, the preschoolers will have to directly hold objects with one or both hands, point, grasp, move, and release. Klemmer, Hartmann, and Takayama (2006) said "A natural place to start is with our hands, as they are simultaneously a means for complex expression and sensation …" (p. 143). Morsella and Krauss (2004) said, if hands are prevented from learning, various cognitive operations will be degraded. Indeed, hands are crucial for children in learning (Klemmer, Hartmann, & Takayama, 2006). Children learn through hands as natural motor response in human daily living, just like toddlers, they like to touch things, and without realizing, they learn.

Tangible objects bring tangibility experience into learning. With tangible objects, the children can concretize the abstract concepts that they never see before. According to Papert (1991), children learn most when they are engaged with concrete activities meaningfully to them. Zuckerman & Resnick (2003) asked, "How do we 'concretize the abstract'? A physical, tangible interface can help. Children can touch it, can tinker with it ….." (p. 811). In defining the term "abstract", Manches (2010) said, "abstract is in the sense of being disconnected from perceptual experience" (p. 72). It is only the concrete objects that can give perceptual experience. Tangible objects can give rise to mental images in the children mind, thus making abstract concepts more visible, accessible and learnable (Piaget, 1962; Hengeveld, Hummels, & Overbeeke, 2009; Antle, Droumeva, & Ha, 2009). This idea is also reflected in Montessori's education where she stated that "Children build their mental image of the world, through the action and motor responses; and, with physical handling, they become conscious of reality" (Burnett, 1962, as cited in Marco, Cerezo, Baldassarri, Mazzone, & Read, 2009, p. 105). Empirical researches showed that children were able to perform symbol manipulation tasks with concrete physical objects when they failed to perform using abstract representations (O'Malley & Fraser, 2004). For example, Hughes' (1986) research found that young children, who were unable to solve an addition problem presented symbolically, were able to do so when the same question was presented with concrete referents (Manches, 2010). Similar outcomes produced in research conducted by Canobi, Reeve, & Pattison (2002) on additive composition on 50 children aged 5 to 6 using physical objects. There exists a theoretical viewpoint called "embodied cognition". It gives different view between concrete and abstract. Accordingly, concrete and abstract are inseparable. Abstract thinking is actually grounded in perceptual and sensory experiences (Manches, 2010), and this further supports the need of using tangible objects for concrete learning in multimedia realm.

Tangible objects are a logical choice for spatial activities (Xie, 2008). Piaget (1968) stated, "A world without objects would not present the character of spatial homogeneity and of coherence in displacements that marks our universe" (p. 3). Spatiality is human innate ability to interact with concrete objects in physical space (Sharlin, Watson, Kitamura, Kishino, & Itoh, 2004). In our context, spatiality means spatial information such as depth and position of physical objects required in the holistic processing of working memory system (Xie, 2008). Picture, on the other hand, can be recognized, but have no substantial spatial organization (Piaget, 1968). Patten and Ishii's (2000) comparative research on space usage in a TUI (Tangible user interface) and GUI (Graphical user interface) showed that TUI users outperformed GUI users in the location recall task. In their research, many of the TUI users were found to use the spatial relationship between testing blocks and surrounding to assist them to recite the blocks content. Xu (2005) contended that GUI blocks human natural abilities (Xu, 2005). Spatiality in our context also means space for hand gestural operation. Tangible objects evoke space for trial-and-error activity, combine and recombine things, and perform spatial organization with more degree of freedom. All these open up window for enhancing the understanding of the preschoolers (Kelly, Singer, Hicks, & Goldin-Meadow, 2002; Manches, O'Malley, & Benford, 2009). In a study conducted on 84 children, Kelly, Singer, Hicks, & Goldin-Meadow (2002) discovered that children who need to gesture retain the mathematical knowledge better than children who only speak, but not gesture. Alibali and DiRusso (1999) in a research on 25 children discovered that children count objects most accurately if they gesture when counting.

Tangible objects offer the only way for tactile emotional experiences. Klemmer, Hartmann, and Takayama (2006) said "... they (hands) allow for complicated movement but their skin also has the highest tactile acuity of our extremities" (p. 143). Touch can convey additional meaningful information about its context (Wimmer, 2011) not accessible visually such as the softness and weight of materials. This can be evidenced from a situation where without the aid of visual, a person can recognize an object merely through touching (Jetsu, 2008). Learning merely through visual and auditory channels, like in the way the digital multimedia systems nowadays deliver information, the children cognition process to make sense of the concepts outside of children's immediate context will be weaker. Cognition does not exist only in mind, but also during interaction between the materials and mind (Crook, 1992).

Fig. 3 Engagement of vision and touch via tangible object

Another important advantage of using tangible objects is their potential of supporting the working memory of a learner (Manches, 2010). This may be due to the fact that tactile information helps children to offload some cognitive burden and mental operation in learning (Manches, 2010; Antle, Droumeva, & Ha, 2009). This can be evidenced from the capability of abacus experts. Using various memory tasks, Hatano and Osawa (1983) tested 3 abacus experts and found that they had a very large memory span of numerical digit strings and arithmetic abilities than the average. Accordingly, due to long use of abacus, the experts have internalized a mental model called "mental abacus" that mimics the structure of an abacus to keep visuo-spatially a number comprising long digits. Chao, Haxby, & Martin (1999) called this mental model the "tool of mental sight" (Marco, Cerezo, Baldassarri, Mazzone, & Read, 2009).

Complementing tangible objects with multimedia

If the preschoolers are to learn the real world, tangible objects are obviously a good choice. However, the sole adoption of tangible objects in learning imposes certain constraints that hinder learning. One such constraint is the behavior of tangible objects that is governed by the laws of physics. As a natural form of material that have substance, that are permanent and of constant dimensions (Piaget, 1968), tangible objects cannot be passed trough, made disappear, moved on their own, or have their gravitational forces degraded. The manipulation of tangible objects is continuous, where its effects are gradual rather than discrete (Manches, O'Malley, & Benford, 2009), hence, the preschoolers may not be able to observe the outcomes clearly.

Another constraint is that actions performed on tangible objects are not traceable. Tangible objects do not provide any means for children to revisit any record of the previous solution for revision purposes, compare the past and present action, and to examine the relationship between different solutions for the tasks that they are attempting (Manches, 2010). There is suggestion of using video recording and written log of action. However, such suggestion is not viable because replay and search for relevant video files consume time whereas the demand of writing for written log exceeds the linguistic ability of young children (Manches, O'Malley, & Benford, 2009).

Multimedia expression overcome the aforesaid constraints by providing various multimedia effects such as pop up message, animated feedback, hints, quizzes, games, and versatile clue so that the preschoolers know what kind of action or interaction expected for the tangible objects. Through animation, invisible abstract concepts or materials in "intangible" form (like water molecule, chemical reaction) can be made visible, and behavior of tangible objects changed against physics laws (making the effects on objects discreet, colliding objects made passed through).

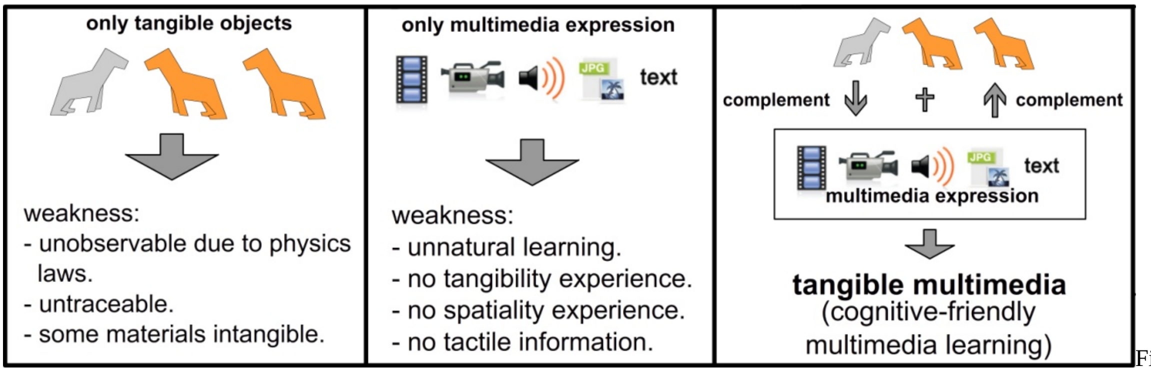

Fig. 4 Tangible and multimedia objects complement each other

Our proposed tangible multimedia is different from many tangible systems that aimed for facilitating human-computer interaction. Tangible multimedia in our context is that tangible objects complement digital multimedia objects for the purpose of making the multimedia contents tangible. For example, actual tangible spoon is used to represent virtual spoon in an animated movie. Via such real-life objects, digital multimedia objects are "externalized" meaningfully, and thereby gain their "tangibility". For this reason, tangible objects are rightfully cognitive-friendly system to preschool whereas tangible systems are more as interaction-friendly system to users.

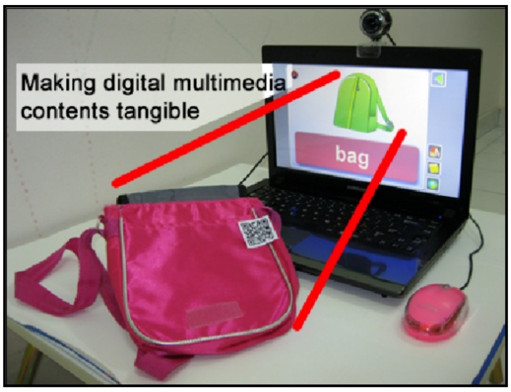

Fig. 5 Making digital multimedia objects tangible

Findings of case study for *TangiLearn*

Evidence for the pedagogical benefits of the tangible objects is abundant. This drives us to develop a prototype of tangible multimedia, *TangiLearn* for preschoolers (Chau, Toh, & Zarina, 2012a). To gather preliminary evidence to support the assumption that tangible multimedia is beneficial to preschoolers, a one-day case study on six preschoolers aged six from a kindergarten in Kuala Lumpur has been conducted (Chau, Toh, & Zarina, 2012b). Unstructured observation and questionnaires were utilized. The tangible and multimedia objects binding were implemented using Quick Response (QR) code marker and *ActionScripts* 3.0 library.

TangiLearn was a learning environment consisted of many virtual and tangible learning objects, such as animals and household items placed randomly in front of computer (Figure 6).

Fig. 6 Randomly-placed learning objects in *TangiLearn* using QR marker in case study

The participants were required to grasp a tangible object, and align it to the webcam to play corresponding animations and videos about the object on the computer screen. With this, the learning activities commenced. Upon completion of learning session, the participants would need to answer the quiz by identifying and picking up the correct tangible object.

The study revealed that 4 participants rated *TangiLearn* “enjoyed very much” and 3 participants rated that the quiz was very easy. Through observation, we noticed a more natural form of learning between the participants and multimedia. They grasped the tangible objects firmly and spent some time tinkered with them. We believed that the good performance of the participants in quiz, which require recitation of key terms learned in the system, were attributed to iterative tangibility sense of learning experiences.

A few technical problems arose during the case study. The most obvious problem was related to the issue of physical alignment of markers. Most of the participants have difficulties in orientating the visual markers to the camera precisely. By average, they took 35 seconds to get the visual marker recognized. Besides, they were very curious about the markers, thus they tended to tear them down for fun. The markers were huge, and thereby blocked some parts of the tangible objects. We also observed that using such markers, the participants could not move the tangible objects too close or too far from the camera. All these problems have to be addressed in the full-scale experimental research.

Problems encountered above prompted us to explore alternative technology for implementing the tangible-multimedia binding. Considering the choice of technology should rest on its usefulness to the students as learning aids, we plan to deploy RFID and sensors technology in the final experimental research. Because of its cost, they were not deployed in the case study. For the purpose of reducing the need of precise alignment, RFID tags and reader are deployed for objects recognition. To do this, RFID tag is inserted into a tangible object. When the tangible object is moved towards the radio wave field generated by a compatible reader, the chip in the tag will transmit the stored information to the reader, thereby establishing mutual communication that allows the computer to identify the object (Figure 7).

Fig. 7 Implementation of RFID technology

To further enhance the tactile attribute of digital objects in physical space, a type of sensor called force sensor is utilized. The force sensor is designed in a way that the sensor is glued on the tangible objects. The more the preschooler grasps and presses the sensor via the tangible objects, the more the digital multimedia objects in *TangiLearn* will react, such as movie clip moves further in the learning scene. We also plan to use various types of sensors and controller (e.g. slider, wii mote controller) in *TangiLearn*. With excessive use of RFID and sensors technology, it is expected that the aforesaid learning benefits of tangible objects in multimedia realm can be garnered in *TangiLearn*.

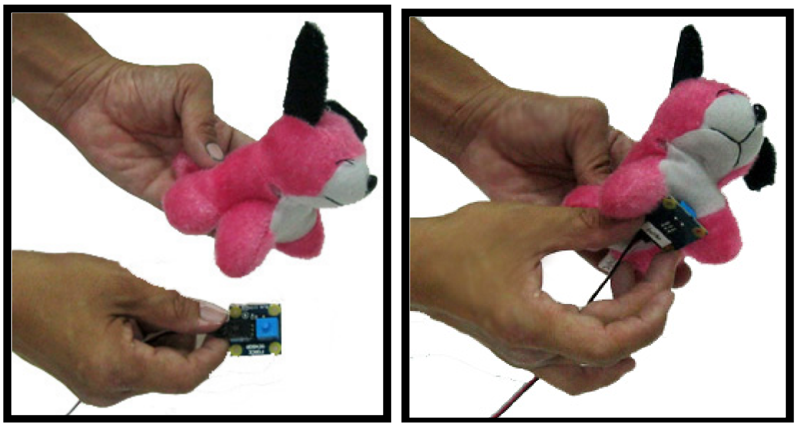

Fig. 8 Implementation of force sensor technology

Conclusion

In this paper, we discuss how tangible objects are beneficial to preschoolers by way of literature review. Taking the strength of physical sensation, *TangiLearn,* a manifestation of tangible multimedia, is designed. Evidence of improving self-report of enjoyment and learning outcomes in the case study reflect the need of such system for preschoolers. In the case study, we were also informed of the change required for the technical implementation of the *TangiLearn* system, from QR code to RFID technology.

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EVALUATION OF THE EFFICIENCY OF SECONDARY EDUCATION İN EU AND OECD: A COMPARISON OF SLOVENIA AND CROATIA

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Abstract: The paper joins the efforts of other scholars in investigating secondary education efficiency by applying a non-parametric methodology. In this respect, the paper's purpose is to review some previous researches on measuring the efficiency of public (secondary) education sector as well as some conceptual and methodological issues of a non-parametric approach. Most importantly, the Data Envelopment Analysis (DEA) technique is presented and then applied to a wide range of EU and OECD countries, with a special focus on Slovenia and Croatia, to evaluate the technical efficiency of secondary education. The empirical results show that technical efficiency in secondary education varies significantly across the great majority of EU and OECD countries. Many EU countries, including Slovenia and Croatia, show a relatively high level of technical inefficiency in their secondary education as they respectively only rank in the last two quartiles among selected countries. Therefore, taking advantage of the significant room to rationalise public secondary education spending without sacrificing while also redirecting resources to the tertiary education sector is recommended for both countries.

Keywords: secondary education, technical efficiency, DEA, Slovenia, Croatia, EU, OECD

Introduction

Education is one of the most important government expenditure items in the most developed economies and there is a rationale for this amount. Indeed, the public sector mainly finances and manages the Croatian and Slovenian educational systems, and this is also the case in most European and emerging market economies. In the 2001–2008 period, the overall proportion of GDP given over to education in the EU-27 remained stable at around 5%. This stable European average hides disparities between countries, some of which experienced significant changes during the period. In Bulgaria, Cyprus and Iceland, the proportion of GDP allocated to education increased by over 20% between 2001 and 2008 and by more than 30% in Malta and Ireland over the same period. Significant growth – above 10% – also occurred in the United Kingdom. The stability in the overall figures for 2001–2008 also masks spending disparities at the different levels of education. Expenditure rose by more than 5% on pre-primary and tertiary education as a proportion of GDP in the 2001–2008 period. In contrast, expenditure on secondary education decreased slightly (Eurostat, 2012, 87). However, due to the relatively high amount and importance of this type of government expenditure, the measurement of its efficiency should be high on the policy agenda of every government.

Many empirical studies on the performance and efficiency of the public sector (at national level) that applied non-parametric methods (e.g. data envelopment analysis – DEA) find significant divergence of efficiency across countries. Studies include notably Gupta and Verhoeven (2001) for education and health in Africa, Clements (2002) for education in Europe, St. Aubyn (2003) for education spending in the OECD, Afonso et al. (2005, 2006) for public sector performance expenditure in the OECD and in emerging markets, Afonso and St. Aubyn (2005, 2006a, 2006b) for efficiency in providing health and education in OECD countries. Gunnarsson and Mattina (2007) assess the efficiency of public spending by comparing expenditure on health, education and social protection in Slovenia. De Borger and Kerstens (1996) and Afonso and Fernandes (2008) find evidence of spending inefficiencies for the local government sector. In addition, Afonso et al. (2008) assess the efficiency of public spending for redistributing income. Other authors (e.g. Mandl et al., 2008; Jafarov and Gunnarsson, 2008) have tried to improve on the work of Afonso et al. (2005). Moreover, Johnes and Johnes (1995), Grasskopf and Mourtray (2001), Johnes (2006), Castano and Cabanda (2007), Jafarov and Gunnarsson (2008), Cherchye et al. (2010), Obadić and Aristovnik (2011) and Aristovnik (2012) have focused on measuring efficiency in the education sector.

Since very insightful, cross-country analyses, particularly for the secondary education sector, are rarely used for policy analysis, we will apply the DEA approach to several EU (plus Croatia) and OECD countries, with a special focus on Slovenia and Croatia in the rest of the paper. DEA is chosen here because it is more reliable for measuring technical efficiency as it can be applied to multi-input and multi-output variables. The analysis includes 31 EU (plus Croatia) and OECD countries in 1999–2007 period. The paper is divided into three parts. After presenting some literature review of previous theoretical and empirical studies in this section, research methodology and the results of the DEA analysis are provided in the second part. Finally, the paper ends with a conclusion.

Empirical Analysis

Methodology and Data

A common approach to measuring efficiency is based on the concept of the efficiency frontier (production possibility frontier). A popular non-parametric technique that has recently started to be commonly applied to (public) expenditure analysis is Data Envelopment Analysis (DEA). DEA is a non-parametric frontier estimation methodology originally developed by Farrell (1957) and popularised by Charnes et al. (1978). To measure efficiency, *DEA* is the choice here because it does not require us to specify the functional form or distributional forms for errors. In essence, it is more flexible than the parametric approach. Further, *DEA* has been extensively used to measure public sector efficiency in many countries by many researchers and, like Ouellette and Vierstraete (2004), Verma and Gavirneni (2006), Hauner (2007), Adam et al. (2011) point out, DEA has been so popular because it is easy to draw on diagrams and easy to calculate. Apart from the above reasons, *DEA* is chosen here because it is more reliable for measuring the technical efficiency as it can be applied to multi-input and multi-output variables.

As an example, consider a situation that has F DMUs, with each of them having M inputs and N outputs. Let X_l^f be the level of input *l* at DMU *f* and let Y_k^f be the level of out *k* at DMU *f*. Without loss of generality, it will be assumed that the inputs and the outputs are defined in a manner such that lower inputs and higher outputs are considered better. The relative efficiency of DMU *f*, denoted by w_f, is computed by solving the following linear program (Verma and Gavirneni, 2006):

$$Maximize\ w_f = \sum_{k=1}^{N} \beta_k Y_k^f$$

Subject to:

$$\sum_{l=1}^{M} \alpha_l X_l^f$$

$$\sum_{k=1}^{N} \beta_k Y_k^f - \sum_{l=1}^{M} \alpha_l X_l^f \leq 0 \, \forall f = 1, 2, \ldots, F$$

$$\alpha_l, \beta_k \geq 0$$

The basic idea in this approach is that, through the use of weights α and β, the sets of inputs and outputs are converted to a single “virtual input” and a single “virtual output”. The ratio of the virtual output to the virtual input determines the efficiency associated with the DMU. In addition, when the efficiency of a DMU is being computed the weights are determined in such a way that its virtual input is set equal to 1. The resulting virtual output for that DMU determines its relative efficiency. The technique is an attempt to find the “best” virtual unit for every real unit. If the virtual unit is better than the real one by either making more output with the same input or making a similar output with less input then we say that the real unit is inefficient. Thus, analysing the efficiency of N real units becomes an analysis of N linear programming problems.

In the majority of studies using DEA the data are analysed cross-sectionally, with each decision-making unit (DMU) – in this case the country – being observed only once. Nevertheless, data on DMUs are often available over multiple time periods. In such cases, it is possible to perform DEA over time where each DMU in each time period is treated as if it were a distinct DMU. However, in our case the data set for all the tests in the study includes average data for the 1999-2007 period (including PISA 2006 average scores) in order to evaluate long-term efficiency measures as the secondary education process is characterised by time lags in thirty-one EU (plus Croatia) and OECD countries. The program used for calculating the technical efficiencies is the DEA*Frontier* software. The data are provided by the OECD, UNESCO and the World Bank's World Development Indicators database.

The specification of the outputs and inputs is a crucial first step in DEA since the larger the number of outputs and inputs included in any DEA, the higher will be the expected proportion of efficient DMUs, and the greater will be the expected overall average efficiency (Chalos, 1997). Common measures of teaching output in education used in previous studies are based on graduation and/or completion rates (see Johnes, 1996; Jafarov and Gunnarsson, 2008), PISA scores (see Afonso and St. Aubyn, 2005; Jafarov and Gunnarsson, 2008), pupil-teacher ratio and enrolment rate (see Jafarov and Gunnarsson, 2008). Moreover, the literature shows that the specification of the inputs is generally in the form of domestic (public or total) expenditure (in % of GDP) (for education) or the number of hours in school (see Afonso and St. Aubyn, 2005). Nevertheless, these studies also demonstrate that DEA is an effective research tool for evaluating the efficiency of the education sector given the varying input mixes and types and numbers of outputs.

Table 1: Input and output/outcome set for the DEA

Model	Inputs	Outputs/Outcomes
I	Expenditure per student, secondary (% of GDP per capita) [1]	School enrolment, secondary (% gross) PISA average (2006) [3] Teacher-pupil ratio, secondary
II	Expenditure per student, secondary (% of GDP per capita) Teacher-pupil ratio, secondary[1]	School enrolment, secondary (% gross) PISA average (2006)
III	Teacher-pupil ratio, secondary	PISA average (2006) School enrolment, tertiary (% gross) [2]
IV	School enrolment, secondary (% gross) [2]	PISA average (2006) School enrolment, tertiary (% gross)

Sources: [1]UNESCO; [2]World Bank; [3]OECD.

Hence, similar to the earlier empirical literature (particularly Afonso and St. Aubyn (2006)), in this analysis the data set to evaluate secondary education efficiency includes input/output/outcome data, i.e. (public) expenditure per student (secondary) (% of GDP per capita), teacher-pupil ratio (secondary), teacher-pupil ratio (secondary) or school enrolment, secondary (% gross), school enrolment, tertiary (% gross) and the PISA 2006 average score. Thirty-one countries are included in the analysis (selected EU (plus Croatia) and OECD countries). Different inputs and outputs/outcomes have been tested in four models (see Table 1).

Empirical Results

This subsection shows the empirical application of the Data Envelopment Analysis (DEA).[25] Summary statistics relating to the DEA analyses are displayed in Table 2. When looking at the education results[26] by using Model I (see Table 1) and applying the DEA efficiency frontier technique to Slovenia, Croatia and a select group of EU/OECD countries to measure the efficiency of secondary education, ten countries are seen as the most efficient. These most efficient countries include Greece, Ireland, Slovakia and Romania, although their secondary expenditures per student (in % of GDP) are very low and averaged out at less than 19% (the EU/OECD average is 23.8% in the considered period). One can also see that some countries come very close to the frontier (e.g. Denmark and Sweden), while other countries are further away and therefore less efficient (e.g. Italy and Portugal) (see Table 3). Some less efficient countries should significantly decrease their input (secondary expenditure per student) (e.g. Denmark from 36.0% to 25.7%) and/or increase their outputs/outcomes, i.e. school enrolment (e.g. Austria and Latvia), average PISA scores (e.g. Bulgaria and

[25] All the calculated results are available from the authors on request.

[26] All of the results relate to DEA with an output orientation, allowing for variable returns to scale (VRSTE). An output orientation focuses on the amount by which output quantities can be proportionally increased without changing the input quantities used. Using an input orientation approach leads to similar efficiency results as those presented in the text.

Denmark) and teacher-pupil ratio (e.g. Japan and Lithuania) in order to become efficient.[27] According to Model I, Slovenia is ranked 19th (its benchmark countries are Finland and New Zealand) and should decrease its secondary expenditures per student (in % of GDP) by about 2 percentage points and increase its average PISA scores by more than 10 points to become an efficient country. On the other hand, Croatia is only ranked 28th and should increase its average PISA scores by almost 19 points to be located on the efficiency frontier.

Table 2: Summary Statistics

	Average	**St. Dev.**	**Min.**	**Max.**	**SLO**	**CRO**
Expenditure per student, secondary (% of GDP per capita)	23.777895	4.7288054	15.0563 (ROM)	36.011203 (DEN)	27.66749	24.897357
School enrolment, secondary (% gross)	103.7513	12.73161	79.74 (MEX)	133.0922 (BEL)	100.48	88.3425
School enrolment, tertiary (% gross)	59.02336	15.04901	22.7644 (MEX)	87.75778 (FIN)	69.51333	37.8975
PISA average (2006)	490.3095	32.99171	408.601 (MEX)	552,8498 (FIN)	505.8935	479
Teachers per 100 pupils. --Secondary	9.0969	1.4873	5.2672 (MEX)	12.0387 (POL)	9.0954	9.4227

Sources: World Bank, 2010; UNESCO, 2010; OECD, 2010; own calculations

In terms of the efficiency scores for Model II, again ten of the analysed countries are labelled as efficient (see Table 3), although New Zealand and Poland are now replaced by Japan and Sweden in the efficient group. The average output efficiency score is 1.09119, which means that the average country could increase its outputs/outcomes by around 9.1% if it were efficient. The worse performers are again Italy and Portugal with well above average secondary education expenditures and below average PISA scores (less than 490) and school enrolment (less than 103.6%). Indeed, both countries should increase their outputs by more than 14.4% in order to become efficient. When comparing Slovenia and Croatia, the results of the DEA analysis for Model II again suggest a relatively high level of inefficiency in secondary education, particularly in Croatia. However, both countries have worse rankings, indicating the existence of significant room to rationalise public spending without sacrificing, while also potentially improving their secondary education outputs and outcomes (see Table 3). With respect to individual performance indicators, Croatia ranks in the last quartile (Slovenia is in the third quartile) for secondary education school enrolment and in the last quartile (Slovenia is in the second) for average PISA scores. In order to become efficient, both countries should reduce their (above average) teacher-pupil ratio (by about 0.5 teacher per 100 pupils) and increase the school enrolment rate by 4.8 percentage points in Croatia and 8.7 percentage points in Slovenia.

Table 3: DEA results for public secondary education efficiency in selected OECD and EU (plus Croatia) countries

No.	**Country**	**Model I**		**Model II**		**Model III**		**Model IV**	
		VRSTE	Rank	VRSTE	Rank	VRSTE	Rank	VRSTE	Rank
1	Austria	1.06329	17	1.10092	26	1.10092	15	1.08414	14
2	Belgium	1.00000	1	1.00000	1	1.07782	10	1.08288	13
3	Bulgaria	1.06865	18	1.09144	24	1.32790	29	1.30686	31
4	*Croatia*	*1.11404*	*28*	*1.14205*	*29*	*1.15418*	*24*	*1.01889*	*4*
5	Czech R.	1.04964	14	1.06915	18	1.10171	16	1.06565	9
6	Denmark	1.01937	11	1.03932	13	1.10320	17	1.10320	19
7	Estonia	1.06238	16	1.05353	15	1.06237	8	1.05299	6

[27] The average output efficiency score for secondary education (Model I) is 1.090, meaning that the average country could increase its outputs/outcomes by about 9.0% if it were efficient. The results also confirm our expectations that new EU member states are less efficient than EU-15 states in secondary education.

8	Finland	1.00000	1	1.00000	1	1.00000	1	1.00000	1
9	France	1.10143	26	1.06957	19	1.08887	13	1.11470	23
10	Greece	1.00000	1	1.00000	1	1.19124	28	1.16980	30
11	Hungary	1.07605	21	1.07402	21	1.12018	20	1.10369	20
12	Iceland	1.05791	15	1.05832	16	1.11989	19	1.11130	22
13	Ireland	1.00000	1	1.00000	1	1.08607	12	1.07857	12
14	Italy	1.17293	31	1.15750	31	1.15750	27	1.15956	29
15	Japan	1.02600	13	1.00000	1	1.00000	1	1.05373	7
16	Korea	1.00000	1	1.00000	1	1.01351	5	1.00000	1
17	Latvia	1.10043	25	1.11722	27	1.13990	23	1.11922	24
18	Lithuania	1.08209	22	1.00000	1	1.00000	1	1.13076	25
19	Mexico	1.10619	27	1.06962	20	1.32791	30	1.00000	1
20	Netherl.	1.00000	1	1.00000	1	1.02583	6	1.06163	8
21	N. Zealand	1.00000	1	1.00079	12	1.05411	7	1.05244	5
22	Norway	1.09658	24	1.08237	23	1.08512	11	1.13126	26
23	Poland	1.00000	1	1.04851	14	1.10506	18	1.08884	16
24	Portugal	1.15753	30	1.14408	30	1.15467	25	1.15949	28
25	Romania	1.00000	1	1.00000	1	1.33009	31	1.09676	18
26	Slovakia	1.00000	1	1.00000	1	1.13924	22	1.06873	10
27	*Slovenia*	*1.06972*	*19*	*1.09258*	*25*	*1.09282*	*14*	*1.07670*	*11*
28	Spain	1.07095	20	1.07475	22	1.15666	26	1.15641	27
29	Sweden	1.02507	12	1.00000	1	1.00000	1	1.09620	17
30	UK	1.08686	23	1.06297	17	1.06297	9	1.08648	15
31	USA	1.12153	29	1.12466	28	1.12448	21	1.10489	21
	EU15 average	1.07732		1.08030		1.10991		1.10408	
	New EU member states	1.10027		1.09059		1.13409		1.13274	
	Non-EU average	1.08489		1.08432		1.12436		1.10715	
Number of efficient countries		10		10		4		3	
Mean		1.09030		1.09119		1.12755		1.11390	
Std. dev.		0.05071		0,051077		0,088666		0,060124	

Note: Relative efficiency scores (Models I-IV; see Table 1). Thirty-one countries are included in the analysis (EU-27, OECD and Croatia). Slovenia and Croatia are presented in italic.
Sources: World Bank, 2010; UNESCO, 2010; OECD, 2010; own calculations

When testing the efficiency of secondary education with Model III, only four of the thirty-one countries analysed within the formulation for secondary education presented in Table 3 are estimated as efficient. These countries are Finland, Japan, Lithuania and Sweden. Other countries under consideration could improve their efficiency scores by decreasing their input (teacher-pupil ratio), in particular in Poland (by about 3.5 teachers per 100 pupils) and Czech Republic (by about 1.7). However, even more importantly, a significant increase in outputs/outcomes is needed in the form of school enrolment (tertiary) (in particular in Mexico and Czech Republic) and in the form of average PISA scores (in the USA and the Republic of Korea). In general, the output/outcome scores could on average be almost 13% higher. Similar to the previous model, Slovenia and Croatia are classified (in Model III) in the second and last quartiles, respectively. These DEA ranks also suggest that Slovenia's and Croatia's efficiency outputs/outcomes in secondary education should respectively be 9.3% and 15.4% higher than those under efficient conditions. Indeed, both countries should significantly improve their school enrolment (tertiary) to become efficient (Croatia by 44 percentage points, Slovenia by almost 12 percentage points).

In the final efficiency model (Model IV), only three countries (Finland, Korea and Mexico) are found technically efficient under VRSTE. However, Mexico is found to be efficient due to its extremely low (secondary) enrolment rate (79.74) and therefore this result should be interpreted with caution. The worst efficiency performers are Bulgaria and Greece due to their relatively poor average PISA scores (in both Bulgaria (416) and Greece (464)) and school enrolment rate (tertiary) (in Bulgaria (43.7%)). The results of the model also show Croatia becoming highly efficient in comparison to Slovenia. This efficiency outcome is a result of its relatively low level of input, i.e. its (secondary) school enrolment rate (88.3%) in Croatia. Nevertheless, similar to Model III, the DEA analysis shows that both countries should significantly increase their output ((tertiary) school enrolment rate) if they are to be efficient. The best benchmark countries for these two countries are Finland and the Republic of Korea, with the former country showing the highest (tertiary) school enrolment rate and the highest result of average PISA scores among the selected group of countries (see Table 3).

To summarise, the presented empirical analysis makes it obvious that the secondary education sector in many of the considered countries suffers from relatively low technical efficiency, including in Slovenia and Croatia. The inefficiency is particularly evident in selected new EU member states (plus Croatia) and some less developed OECD members, i.e. emerging market economies (see Table 4). However, contrary to our expectations, some highly developed countries such as the USA and Norway also have poor efficiency results. The empirical results also show that Slovenia and Croatia are ranked in the third and last quartiles (considering all four models), respectively, reflecting relatively high levels of inefficiency in their secondary education. Obviously, both countries use too many scarce public resources to produce relatively average (in Slovenia) or even below average (in Croatia) output/outcome. Therefore, taking advantage of the significant room to rationalise public secondary education spending without sacrificing, while also redirecting resources to the tertiary education sector, is recommended for both countries.[28]

Speaking about the efficiency of secondary education in Croatia and Slovenia, it can be also concluded that both countries appear to perform inefficiently due to their high spending, but Croatia is also weaker in its outcomes than Slovenia. This low ranking of Croatian secondary education is due to the low enrolment rates and relatively low PISA scores (in mathematics). For example, Estonia, Poland, Slovakia, Latvia and Latvia have lower education expenditure but better PISA 2009 results than Croatia. Namely, the average Croatian PISA result is below the expected value for a given level of public spending on education. Average class sizes in secondary education are comparatively small. In addition, Slovenian schools employ the highest number of professional support staff per pupil in the OECD (OECD, 2011, 7).

Table 4: The relative efficiency of secondary education system in selected OECD and EU (plus Croatia) countries (Distribution by quartiles of the ranking of efficiency scores in all four models)

quartile	***quartile***	***quartile***	***quartile***
Finland	Slovakia	UK	Norway
Korea	Estonia	*Slovenia*	*Croatia*
Netherlands	Lithuania	Austria	Spain
Japan	Poland	Iceland	Latvia
Belgium	Romania	Mexico	USA
New Zealand	Czech Republic	France	Bulgaria
Ireland	Denmark	Hungary	Portugal
Sweden	Greece		Italy

Note: Relative efficiency scores (models I-IV; see Table 1). Thirty-one countries are included in the analysis (EU-27, OECD and Croatia). Slovenia and Croatia are presented in italic.
Sources: World Bank, 2010; UNESCO, 2010; OECD, 2010; own calculations.

Conclusions

According to the empirical results, Slovenia and Croatia suffer from relatively low technical efficiency in their secondary education as they are only ranked in the third and last quartiles among thirty-one OECD/EU countries, respectively. The inefficiency is particularly problematic in Croatia where the poor results mainly stem from low enrolment rates (secondary and tertiary) and low PISA scores. On the other hand, in Slovenia the relatively good output/outcome is achieved at relatively higher costs. Indeed, public spending on secondary education is relatively high in both countries, particularly in Slovenia, without achieving respectively better outputs/outcomes than other comparable states. Therefore, both countries should pursue a number of initiatives to enhance the efficiency of their secondary education sector. In this respect, the secondary education system in

[28] For instance, Slovenia is the only OECD country where spending per student at the tertiary level is less than that at lower levels of education (OECD, 2011).

both countries should be modernised to reduce operating costs by merging and closing selected schools that serve too few students, and extending catchment areas, while taking other socio-economic considerations into account. Surplus teaching and non-teaching staff should be rationalised by not replacing retiring staff in full. Indeed, reducing the number of secondary teachers through natural attrition and implementing a selective hiring freeze on new teachers is needed in the future. In this respect, taking advantage of the significant space to rationalise public secondary education spending without sacrificing, while also redirecting resources to the tertiary education sector is recommended for both countries.

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EXAMINATION OF TECHNOLOGY IN TURKISH SOCIAL STUDIES CURRICULA

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Abstract

This study is designed in descriptive model because it aims to analyze 4th, 5th, 6th and 7th grade social studies curricula in a technology focused view. In this context, document analysis technique was used which is a qualitative research method. Learning areas, acquisitions and skills in social studies curricula are considered in evaluation process. In conclusion, it was seen that in social studies curricula, Science,Technology and Society learning is directly technology oriented and this learning area has strict connections with others. Technology oriented activities are also implemented as needed in other learning areas. Besides, it was determined that there are 23 technology oriented acquisitions in 4 th, 5 th, 6 th and 7 th grade social studies curricula in Turkey. Six of them are in the 4th grade, six of them are in the 5th grade, five of them are in the 6th grade and six of them in the 7th grade. In this context, technology oriented acquisitions formed 13,2% of whole acquisitions in curricula (total 174). In skill dimension “using information technologies” skill is technology oriented and it is towards the effective usage of technology.

Kewords: Social studies, curriculum, technology, technology literacy

1. Introduction

People invent different tools and techniques to meet their main requirements and to make things easier since their existence in the world. (Günay and Arıduru, 2001). Using different tools and more importantly invention skills distinguish people from other beings (Şenel, 1995; Childe, 2007, p.20; Öztürk, 2008, p.40). Technology is based on this characteristic. Technology has been defined in different ways by various scientists. In broad terms, it can be defined as a process that people make modifications in the nature for the aim of meeting different desires and needs (Commoner, 1996; AAAS, 1993; NRC, 1996; ITEA, 2000; NAE and NRC, 2002; Pearson and Young, 2002; Garmire and Pearson, 2006; International Technology Education Association, 2007). It emerged with early humans’ inventions of different tools that they could not do with their indefensible and deficient bodies; and life became more qualified through those tools. Tools used for a specific purpose and humans’ activities towards that purpose (Heidegger, 2010) are included in the context of technology. Technology represents inventors’ views and cultures because it is created by that people (Maguth, 2009), and it has effects on human while it is shaped by them (ITEA, 2007).

The relationship between technology and education has been of the interest since the beginning of humanity and it can be said that technology education began primitively with teaching the use of those tools to others. First people taught their children through shapes which they draw on sand by a stick, how they caught animals to eat, which animals they had to avoid, which plants were edible and which were poisonous. People are to convey information like lighting a fire and making clothes with animal hides to their children through samples and advices, because they cannot transfer those information through inheritance to next generation (Childe, 1988, p.22). Parallel with the technological developments, there is a change in education, and students have opportunities to learn in their pace (Thornton, 2006). Traditional face to face teaching is replaced with written materials (Çetin et.al., 2004, p.145) and informatics and those materials have reached to a level in which they are replaced with teacher. In Industrial Age domestic production was replaced with mass production and the requirement towards people who have tool using skills and who produce for society (Oktay, 2007, p.17).

Science and technology do not shape only the education, but also they define a new labor force; free market economy, bank networks, multinational firms and as a result the concept of globalisation has rised with it (Şahin 2001; Yılmaz and Horzum, 2005). Thus, humans’ activities go beyond the scope of national state and they gain international characteristics. On the other side, while human can get information about anything they search; special information about people like credit card numbers, employee info and etc. can be accessible.

Besides, at the end of the "Genom" project human can get a gene identity card (Bökesoy and Arda, 1993). Humans' gene map will be defined with this identity card and besides, their social status can be determined with it. For instance, humans' orientations can be defined with DNA codes and those codes can be considered when s/he will look for a job, marry or register to anywhere (Collins, 1999; ITEA, 2007). Technology is very important for human lives and it has both positive and negative effects, thus teaching knowledge, skills and attitudes towards technology are important not only for development of countries bu also for the world's future. However, in formal education process technology education is only offered recently.

Parallel with technological developments that underlie on issues like widespread of nucleeer guns, genetically modified plants, Internet's hegemony, global warming and AIDS which remain on the international agenda (Weiss, 2005), governments have accepted that the necessity of reconstruction of educational systems (Means, Olson ve Ruskus, 1997, p. 1). Japanese success on technology and skill based education have forced other countries, especially the USA, to make changes on their educational systems in the context of technology (Chafy, 1997). In the 21st century, countries' power and statute are determined by their level in solving socio-economic, cultural and political problems with availing the advantages of science and technology (Kellani, 2009). In todays' world, countries tend to have prevalence on other areas to the degree that their hegemony on science and technology. This shows the importance of technology in states' competitions once more (1). Besides, international organizations like UNESCO and World Bank stated that developing countries could eliminate the poverty when they would aware the importance of technology (Brewer and et.al., 20005). When we analyze Deweys' views, it can be seen that he highlighted the importance of technology as a tool that is used by modern people to increase their skills. Besides, Dewey considered technological development level as a criterion when he classified societies as modern and non-modern (Dewey, 1964). Technology is especially an idea and a product of human brain (Erkan, 2006) and, it is so important in life that individuals and societies without technology are interpreted as being out of life (Kabakçıbaşı and Odabaşı, 2004). This is more important for todays' people who can communicate anywhere by cell phones and can make sort of works with a click and, it is necessary for them to get knowledge about technological world and use it for making life easier (Bacanak, Karamustafaoğlu and Köse, 2003). Technology education is also necessary to notice technological danger (Kabakçı and Odabaşı, 2004), to meet expectations of employer in professional life (Machin and Reenen, 1998), to be able to choose and use best products for their purposes at home and work and it improves the chances to effect governmental decisions about the usage of technology (International Technology Education Association, 2007).

Technology takes place as an individual course in some educational systems, and governments never exclude it from their curricula. In modern world, technology education is not a phenomenon just related with technical schools, it extends across effective and economic usage of tools (Lewis, 2000) and issues like the role of technology in modern societies (Şenel and Gençoğlu, 2003), and its' social aims (Chafy, 1997; Pavlova, 2005) are evaluated critically during this process. Technology is generally offered as an individual course in primary and secondary schools and connections with other learning areas are established. On the other hand, it is emphasized that technology education should be included pre-school education (Turja, Ulpe and Chatoney, 2009). The role of the technologies on sustainable development is also pointed (Elshof, 2009; Filho, Manolas and Pace, 2009; Middleton, 2009; Pavlova, 2009; McGarr, 2010) and the momentum towards inclusion of technology in primary school curricula, and it shows the acceptance of its' importance and educational role in lots of countries (Hill, 1997; Raizen, 1997; Stables, 1997; Fleer, 2000; Mawson, 2003; Sade and Coll, 2003; Ankiewicz, de Swardt and de Vries, 2006; Filho, Manolas and Pace, 2009). In Turkey, tecnology education is included in compulsory education with Science-Technology and Tecnology-Design courses. Besides, technological issues are included in other courses like social studies. Social studies course is accepted as a preparation process of democratic citizenship and, questions like "how can we keep up with rapid changes in technology? and how can we arrange relationship among people from different cultures in the context of technology?" are included in scope of this course. In this context, it is seen that social studies course focuses especially on the social dimensions of technology. When we analyze social studies curriculum which has been implemented since 2005, together with requirements towards more comprehensive connections (Özensoy, 2009), issues are associated with effects of scientific and technological developments on social change. Thus, the level of the relationship between technology and social studies is important. The aim of this study is to evaluate the social studies curriculum while focusing on technology and to explain the relationship between them. Following questions are answered in study in accordance with this aim:

1. What are the technology focused learning areas in 4 th, 5 th, 6 th and 7 th grade social studies curricula?
2. What are the technology focused acquisitions in 4 th, 5 th, 6 th and 7 th grade social studies curricula?
3. What are the technology focused skills in 4 th, 5 th, 6 th and 7 th grade social studies curricula?

2. Method

This study is designed in descriptive model because it aims to analyze 4th, 5th, 6th and 7th grade social studies curricula in a technology focused view. In this context, document analysis technique was used which is a qualitative research method. Learning areas, acquisitions and skills in social studies curricula are considered in evaluation process. Researchers analyzed the technology related items in curricula individually and common findings are presented in conclusion.

3. Findings

Findings about technology focused evaluation of 4 th, 5 th, 6 th and 7 th grade social studies curricula are presented following with learning area, acquisition and skill subtitles.

3.1. Learning Areas

Learning areas in 4 th, 5 th, 6 th and 7 th grade social studies curricula are Individual and Society; Culture and Heritage; People, Places and Environments; Production, Distribution and Consumption; Science, Technology and Society; Groups, Institutions and Social Organizations; Power, Governance and Society and Global Connections. Among those learning areas Science, Technology and Society is directly technology oriented. Explanations in curricula related with this learning area are as follows;

> In this learning area 4 th and 5 th graders will (MEB, 2006a);
>
> Comprehend that scientific and technological developments are based on creative, critical and scientific thinking and the effects of scientific and technological developments on social life and get skills about using technology in information process. Besides, while students will learn how technologies are connected with their daily life, they will discuss the damage of some technologies on natural environment. They will notice that original products are produced by law and consider the principles of academic honesty.
>
> "Science, Technology and Society" learning area is connected with other learning areas. Thus, social studies curricula include experiences related with the issues of science, technology and society.
>
> In this learning area 6 th and 7 th graders will (MEB, 2006b);
>
> Comprehend the results and effects of social sciences sub-disciplines on daily and social life, and teacher asks them to give an opinion about the future life based upon scientific and technological developments of the 21st century.
>
> They will notice recent scientific research and experiences are protected by law while they are discussing the effects of copyright and patent on scientific developments.
>
> They will give examples about contributions of civilizations on science and technology in the process which began with the invention of simple tools. In this way, they will summarize the creation process of scientific heritage up to now and they will notice the parallelism between creative, critical, scientific thinking and developments in science and technology.

When we analyze the social studies curriculum in the context of Science, Technology and Society learning area, it is seen that students are asked to understand the relationship between science and technology and to comprehend the social differences based upon science and technology. Besides, as it is emphasized in curriculum, this learning area is connected with other learning areas closely. In this context, during the learning process of other areas as, it is required to analyze the effects of science and technology on social life. Technology has effects on all dimensions of social life. Aforementioned connections in curriculum are important to develop students' awareness about the effects of technology and to educate them as technologically literate citizens who can use technology properly in their life.

3.2 Acquisitions

Technology focused acquisitions in 4 th, 5 th, 6 th and 7 th grade social studies curricula are presented in Table 1 as following;

Table 1. Technology focused acquisitions in 4 th, 5 th, 6 th and 7 th grade social studies curricula

Acquisitions	Class Level	Learning Area	Unit
1. Classify technologic products according to their usage area.	4	Science, Technology and Society	So Glad to Have

2. Know certain time measuring devices and techniques that human use.	4	Science, Technology and Society	So Glad to Have
3. Comprehend the development process of technological products which they use.	4	Science, Technology and Society	So Glad to Have
4. Compare past and present considering the changes on life and the environment that made by technological products.	4	Science, Technology and Society	So Glad to Have
5. Design original products considering needs of her/his environment.	4	Science, Technology and Society	So Glad to Have
6. Use technological products without harming themselves, the others and the nature.	4	Science, Technology and Society	So Glad to Have
7. Make correlations between inventions and the technological developments.	5	Science, Technology and Society	Dreams Come to True
8. Discuss the effects of inventions and technological developments on social life.	5	Science, Technology and Society	Dreams Come to True
9. Aware of the common characteristics of inventors and scientists.	5	Science, Technology and Society	Dreams Come to True
10. Present the evidence-based importance that Atatürk gave towards science and technology.	5	Science, Technology and Society	Dreams Come to True
11. Know and follow appropriate periodicals about science and technology.	5	Science, Technology and Society	Dreams Come to True
12. Discuss the effects of communication and transportation technologies on economic relationship between countries.	5	Science, Technology and Society	Dreams Come to True
13. Based on research and findings of social sciences, give examples to effects of the social sciences on social life.	6	Science, Technology and Society	Electronic Century
14. Bounce ideas about potential effects of scientific and technological developments on future life.	6	Science, Technology and Society	Electronic Century
15. Notice the relationship among medical inventions and developments and human life and social solidarity.	6	Science, Technology and Society	Electronic Century
16. Advocate the requirement of legal supplement of products which have copyrights and patent.	6	Science, Technology and Society	Electronic Century
17. Based on applications and products, notice the importance Atatürk gave to rationalism and science.	6	Science, Technology and Society	Electronic Century
18. Give examples to the contributions of first civilizations towards scientific and technological developments.	7	Science, Technology and Society	Science in Time
19. Based on the first examples of writing, notice usage areas of writing and its' importance in information transfer process.	7	Science, Technology and Society	Science in Time
20. Evaluate the scientific and technological contributions of scientists who lived in Turkish and Muslim states.	7	Science, Technology and Society	Science in Time
21. Notice the effects of developments between 15th and 19th centuries in Europe on today's scientific background.	7	Science, Technology and Society	Science in Time
22. Correlate freedoms of thought, expression and science with scientific development.	7	Science, Technology and Society	Science in Time
23. Based on examples from past and today, evaluate the effects of production	7	Science, Technology and Society	Economy and the Social Life

technologies on social and economic life.

As we can understand from Table 1 there are 23 technology oriented acquisitions in the 4 th, 5 th, 6 th and 7 th grade social studies curricula in Turkey. Six of them are in the 4th grade, six of them are in the 5 th grade, five of them are in the 6th grade and six of them in the 7 th grade. In this context, technology oriented acquisitions formed 13,2% of whole acquisitions in the curricula (total 174). It was seen that those acquisitions were oriented to knowing and classifying technology, comprehending its' development in historical process, comparing technologies from past to today and predicting towards future, understanding the effects of technology on social life and based on their daily life giving examples about those effects, using technology in ethic and accurate ways.

3.3. Skills

"Using information technologies" ranks among main skills of the 4 th, 5 th, 6 th and 7 th grade social studies curricula. Details about these skills are explained in curricula as follows (MEBd):

1. Using computer under directions.
2. Recording, formatting and reusing information that are gained from different sources.
3. Presenting formatted information on computer environment.
4. Preparing multimedia reports by using texts, graphics, color and voice effects.
5. Gaining ability to access to information by using phone and television networks.
6. Using properly the technological products that have access in daily life.

Conclusion and Discussion

We are increasingly dependent on the technology; in spite of this we are ignorant of the nature and history of the technology that sustains us. As citizens of a democratic country, we are disengaged from decisions that help to shape our future. We need to train our students as technologically literate individuals and it requires some changes in our educational system. Looking at findings, we can say that despite the growing importance of technology in social studies curricula in Turkey it is not enough. To have an impact about technology and this should also influence what happens in every classroom.

In conclusion, it was seen that in social studies curricula, Science, Technology and Society learning is directly technology oriented and this learning area has strict connections with others. Technology oriented activities are also implemented as needed in other learning areas. Besides, it was determined that there are 23 technology oriented acquisitions in 4 th, 5 th, 6 th and 7 th grade social studies curricula in Turkey. Six of them are in the 4th grade, six of them are in the 5th grade, five of them are in the 6th grade and six of them in the 7th grade. In this context, technology oriented acquisitions formed 13,2% of whole acquisitions in curricula (total 174). In skill dimension "using information technologies" skill is technology oriented and it is towards the effective usage of technology. In Bologna Decleration, which was published by European Union in 1999, inclusion of technological developments in educational process was suggested. Thus, the need emerges towards designing new curricula which will be technology oriented. By force of transfer from industrial arts to technology education, people need to be technologically literate to place in a technology based society Technology education is included in the framework of curricula in many countries and the first objective of this education is to develop technological literacy (Waetjen, 1993; de Vries and Tamir, 1997; Verner and Betzer, 2001; Zuga, 2004; Canavan and Doherty, 2007, p. 292; Solomonidou and Tassios, 2007, p. 116; Rossouw, Hacker and de Vries, 2010). In this context, we can say that together with technology oriented acquisitions and skills, social studies curricula can contribute students to comprehend the effects of technology on social life in different dimensions and to be technologically literate.

In social studies curricula it was stated that Science, Technology and Society learning area should be connected with other learning areas. This statement can provide students with opportunities to evaluate technology in the context of other social disciplines like history, geography, archeology, economy, law, political sciences and philosophy. For instance, future elections can be done through technology, people can organize and contact with government in digital environments; because of this reason, technology literacy should be related with political sciences inevitably. In this context, linking technology with political sciences in social studies and making practices about it will provide students to be technologically literate and also to be active citizens of the future. Synder (2008, p.147) mentioned that together with developments in the political system, technology has gained importance in means of how we can learn to use information and communication technologies and how we can communicate with others. Thus, it is important for social studies educator to use technology and digital materials for the purpose of teaching students to be active citizens of democratic society. The relationship between Science, Technology and Society learning area and other learning areas is functional and necessary for this reason.

According to Mason and et.al. (2000), students can learn to use technology in context and thus, ICT is among inseparable parts of social studies. In other words, students should use technology in all courses, not only in computer course. Social studies have a critical role in this situation. Especially in the 21st century together with frequent usage of concepts like e-government, e-individual, e-citizenship, digital citizenship and cyber citizenship, integrating technology into social studies has gained more importance. In Turkey, social studies curriculum is included with technology oriented acquisitions and skills. However, it is not enough and here the important thing is to give these acquisitions and skills effectively to students. Thus, activities about these learning areas and teachers who teach students are more important. Research about these activities and teachers' competencies can provide to determine the problems in practice and to take necessary steps about this issue.

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EXAMINING FRESHMEN BELIEVE CONCERNING ICT USAGE IN K-12 AND UNIVERSITY SETTINGS

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Abstract

Information and communication technology usage in school settings has increased significantly. Most of the teacher education colleges realized this situation and change their education programs and give technology and educational technology classes to their students. In this research it is aimed to reveal pre-service teacher believe concerning ICT usage in K-12 and university settings. Results show that gender, internet connection and compute usage do not affect ICT usage believe.

Keywords: ICT usage, freshmen, believe,K-12;

Introduction

New millennium learners communicate, collaborate and learn in different ways. Dede (2005) state contemporary learning style contain studying with multimedia, appreciating different communication styles, working, analyzing and synthesizing data from multiple resources, active participation to learning process. As can be understood from the definition of new learners learning style, new learner learn in different ways and they are different from elder person. Thereby teachers, who educate new millennium learners, should educate as teachers that know how to use new technologies and that use these technologies in productive ways. Today's educational system was intended to teach in the era, which was not appearing, and generation has changed but educational system did not (Prensky, 2001). Goverments realized this need and they have changed the quantities and amount of educational investment. Prensky (2001) state new learner characteristics as they can work multitasking, they prefer multimedia than text, they can process information rapidly and they name technology as friend not evil. If teachers, who educate digital natives, know the digital native abilities, educational process becomes productive. To educate sufficiently pre-service teachers, who are also digital native, regarding technology, pre-service teachers opinion and idea should be comprehended and interpreted, in addition to digital native's characteristics.

Information and Communication Technologies (ICT) is the main part of the new society (Meng & Li, 2002). Humans lives have affected from ICT transform and humans started to use ICT in almost every action. People have brought ICT and computer technology in the center of their life (Mills, 2006). Electronic devices, internet and computer has become pervasive and transformed humans daily actions and habits (Littlejohn, Margaryan & Vojt, 2010). While people's social environment changes, it transforms school environments and computer and other technological tools has integrated to school environments.

Schools either private or public provide technological tools, computer and various software and students can interact with computer and use different software and so they can learn how to use these technologies (King, 2002). Similar other schools, education colleges offer some courses related computer and software and offer some other courses how to use technology in classroom. By this way pre-service teachers can learn skills, which are required in their professional life. ICTs are believed as tools which shape teaching and learning activities and can enhance their teaching activities (Keser & Özcan, 2011). To use technological devices in effective way require educating teachers trained how to use technological tools and how to use them in educational settings. Increasing in the use of ICT and other technological tools in learning environments has caused to change in in-service teacher education, colleges and universities offer more courses related ICT, technology and educational technology (Sang, Valcke, Braak & Tondeur, 2010). The easiest way to form upcoming generations is educating pre-service teachers (Huanga, Lubinb & Gec, 2011).

Gender difference in technology usage has become an attractive issue recently. Li & Kirkup (2007) investigate both culture and gender difference on using technology and they found male Chinese students use more internet than female Chinese students and men reported more confidence in using internet. Vekiri &

Chronaki (2008) state that computer and other technologies are dominant activities for most boys' acitivites and male students have more self-efficacy concerning computers. Meelissen & Drent (2008) state that boys reported more positive judge regarding self-efficacy in ICT usage. Imhof, Vollmeyer & Beierlein (2007) reported male students chat more than female students, they play more online games, the shop online more often, they share more files and they do more internet research.

Method

This study seeks to define is there any difference freshmen's belief's concerning ICT usage in K-12 and university settings by gender, ownership of connection to internet at home and freshmen's computer usage status in their high school settings. Study population was all freshmen's who attend one of the Turkish college of education. In order to obtain research data a survey was developed by researchers. Survey contains two main sections. First section of survey consists of nine questions concerning demographic characteristics of the participants. The second section questions are concerning freshmen's beliefs usage ICT in K-12 and college settings. Paper survey administered voluntarily and after explaining the aim of the research freshmen were asked whether they would like to participate to study or not. Freshmen, who stated would like to participate, were given survey and one week was provided to complete survey. After one week, 425 freshmen returned to survey. To analyze freshmen's demographic data frequency analyze was done, and to analyze differences freshmen's belief's concerning ICT usage in K-12 and university settings by gender, ownership of connection to internet at home and freshmen's computer usage status in their high school settings independent samples t-test was run.

Findings

In this section participants demographic data and t-test results regarding difference freshmen's belief's concerning ICT usage in K-12 and university settings by gender, ownership of connection to internet at home and freshmen's computer usage status in their high school settings. Participants demographic data can be seen in table 1. And gender differences freshmen's belief's concerning ICT usage in K-12 and university settings in can be seen in table 2, ownership of connection to internet difference can be seen in table 3 and freshmen's computer usage status differences can be seen in table 4.

Table 5 Participants demographic characteristics (N=425)

		Female	Male
Where do you come from?	Rural Area	14.5%	28.1%
	Urban Area	85.5%	71.9%
Personal Monthly Income	0 - 100 $	54.2%	54.7%
	101 - 200 $	29.5%	28.8%
	201 - 300 $	7.6%	10.8%
	301 - 400 $	4.0%	3.6%
	401$ and more	4.8%	2.2%
Do you own a laptop?	Yes	43.9%	39.4%
	No	56.1%	60.6%
Do you own a cell phone?	Yes	98.2%	99.3%
	No	1.8%	0.7%
Do you own data plan for your cell phone?	Yes	55.9%	53.5%
	No	44.1%	46.5%
Do you own Internet access at home?	Yes	72.8%	50.0%
	No	27.2%	50.0%
Did you use computer in your high school classroom?	Yes	63.7%	56.3%
	No	36.3%	43.7%

As can be seen in table 1, most of female participants (85.5%) and most of the male participants (71.9%) came from urban area, most of the female participants (83.7%) and most of the male participants (83.5%) have monthly income less than $200. When looked at the laptop ownership 43.9% of the female and 39.4% of male participants have their own laptop. Almost all of the male and female participants have their own cell phone, but just 55.9% of the female and 53.5% of the male participants have data plan for their cell phone. When we look at the internet access at home status almost one third of the female participants have internet access at home just half of the male participants have internet access at home. And 63.7% of the female participants used computer during their high school education and 56.3% of the male participants used computer during their high school education.

Table 6 T-test results related gender differences in freshmen's belief's concerning ICT usage in K-12 and university settings

	Female	Male	t	df	Sig. (2-tailed)
desktop computer in my classroom	4.19 (0.86)	4.20 (1.12)	-0.086	420	0.93
laptop computer in my classroom	4.15 (0.88)	4.15 (1.12)	0.052	421	0.96
tablet (computer) in my classroom	3.62 (1.05)	4.06 (1.08)	-4.064	417	0.00
cellular phone in my classroom	2.79 (1.31)	3.10 (1.49)	-2.152	416	0.03
mobile device in my classroom	3.34 (1.17)	3.66 (1.17)	-2.655	416	0.01
smart board in my classroom	4.22 (0.95)	4.28 (1.04)	-0.52	416	0.60
camera in my classroom	3.51 (1.18)	3.46 (1.30)	0.377	421	0.71
data projector in my classroom	4.37 (0.85)	4.28 (1.07)	0.874	422	0.38
slide projector in my classroom	4.33 (0.81)	4.25 (1.09)	0.799	423	0.42
overhead projector in my classroom	3.96 (1.05)	3.99 (1.13)	-0.258	420	0.80
desktop computer in University	4.09 (0.93)	3.94 (1.24)	1.389	420	0.17
laptop computer in University	3.99 (0.99)	3.80 (1.28)	1.68	420	0.09
tablet (computer) in University	3.44 (1.14)	3.26 (1.33)	1.502	417	0.13
cellular phone in University	3.91 (1.13)	3.68 (1.34)	1.816	417	0.07
mobile device in University	3.77 (1.01)	3.55 (1.25)	1.986	418	0.05
smart board in University	3.74 (1.12)	3.55 (1.38)	1.519	420	0.13
camera in University	3.56 (1.10)	3.18 (1.37)	2.994	420	0.00
data projector in University	4.05 (0.91)	3.91 (1.23)	1.367	420	0.17
slide projector in University	4.08 (0.89)	3.87 (1.24)	1.959	420	0.05
overhead projctor in University	3.67 (1.13)	3.49 (1.41)	1.474	421	0.14

Table 2 summarize the t-test results, which run to compare female and male freshmen's beliefs concerning whether technological tools can be used in their future classroom and their university courses. According to results male participants have more positive believe concerning tablet computer usage in their future classroom (M=4.06, SD=1.08) than female participants (M=3.62, SD=1.05); $t_{(417)}$=-4.064,p=0.00. Male participants have more positive believe concerning cellular phone usage in their future classroom (M=3.10, SD=1.49) than female participants (M=2.79, SD=1.31); $t_{(416)}$=-2.152,p=0.03. Male participants have more positive believe concerning mobile device usage in their future classroom (M=3.66, SD=1.17) than female participants (M=3.34, SD=1.17); $t_{(416)}$=-2.655,p=0.01. Concerning usage of other seven tools in their future classroom there was no difference between male and female believe.

According to results there was a significant difference between male and female participants believe concerning usage of camera in university classroom. Female participants have more positive believe concerning camera usage in university classroom (M=3.56, SD=1.10) than male participants (M=3.18, SD=1.37); $t_{(420)}$=2.294,p=0.00. Concerning usage of other nine tools in their university classroom there was no difference between male and female believe.

Table 7 T-test results related internet access ownership differences in freshmen's belief's concerning ICT usage in K-12 and university settings

	Yes	No	t	df	Sig. (2-tailed)
desktop computer in my classroom	4.19 (0.86)	4.21 (0.89)	-0.194	280	0.85
laptop computer in my classroom	4.15 (0.84)	4.16 (0.97)	-0.033	279	0.97
tablet (computer) in my classroom	3.61 (1.04)	3.63 (1.08)	-0.125	276	0.90
cellular phone in my classroom	2.86 (1.30)	2.62 (1.32)	1.325	274	0.19
mobile device in my classroom	3.37 (1.12)	3.27 (1.30)	0.597	274	0.55
smart board in my classroom	4.18 (0.98)	4.33 (0.87)	-1.131	275	0.26
camera in my classroom	3.50 (1.16)	3.53 (1.24)	-0.236	279	0.81
data projector in my classroom	4.32 (0.86)	4.48 (0.82)	-1.397	280	0.16
slide projector in my classroom	4.29 (0.84)	4.44 (0.73)	-1.431	281	0.15
overhead projector in my classroom	3.91 (1.06)	4.08 (1.00)	-1.19	279	0.24
desktop computer in University	4.10 (0.95)	4.07 (0.88)	0.281	279	0.78
laptop computer in University	4.07 (0.95)	3.78 (1.08)	2.248	278	0.03
tablet (computer) in University	3.51 (1.13)	3.25 (1.14)	1.69	276	0.09
cellular phone in University	3.88 (1.15)	4.00 (1.09)	-0.822	275	0.41
mobile device in University	3.75 (1.03)	3.82 (0.96)	-0.457	277	0.65
smart board in University	3.68 (1.14)	3.9 (1.071)	-1.442	278	0.15
camera in University	3.59 (1.08)	3.47 (1.19)	0.814	279	0.42
data projector in University	4.03 (0.89)	4.11 (0.97)	-0.578	278	0.56
slide projector in University	4.09 (0.90)	4.04 (0.88)	0.454	279	0.65
overhead projctor in University	3.65 (1.13)	3.72 (1.15)	-0.461	279	0.65

Table 3 summarize the t-test results, which run to compare freshmen who have internet access and who have not, beliefs concerning whether technological tools can be used in their future classroom and their university courses. According to results there was no significant difference in freshmen believe who have internet access at home and who have not, concerning ICT usage in future classroom.

According to results there was a significant difference between participants have internet access and participants do not have internet access believe concerning usage of laptop computer usage in university classroom. Participants who have internet access at home have more positive believe concerning laptop computer usage in university classroom (M=4.07, SD=0.95) than participants who do not have internet access at home (M=3.78, SD=1.08); $t_{(278)}=2.248, p=0.03$. Concerning usage of other nine tools in their university classroom there was no difference between participants who have Internet access at home and participants who do not have internet access at home.

Table 8 T-test results related computer usage in high school settings differences in freshmen's belief's concerning ICT usage in K-12 and university settings

	Yes	No	t	df	Sig. (2-tailed)
desktop computer in my classroom	4.33 (0.86)	3.94 (0.82)	3.693	278	0.00
laptop computer in my classroom	4.29 (0.87)	3.91 (0.84)	3.542	277	0.00
tablet (computer) in my classroom	3.68 (1.08)	3.49 (1.00)	1.461	274	0.15
cellular phone in my classroom	2.76 (1.31)	2.86 (1.32)	-0.634	272	0.53
mobile device in my classroom	3.33 (1.15)	3.35 (1.22)	-0.188	272	0.85
smart board in my classroom	4.27 (0.96)	4.14 (0.94)	1.102	273	0.27
camera in my classroom	3.48 (1.23)	3.54 (1.12)	-0.415	277	0.68
data projector in my classroom	4.45 (0.81)	4.24 (0.90)	2.041	278	0.04
slide projector in my classroom	4.38 (0.83)	4.25 (0.78)	1.242	279	0.22
overhead projector in my classroom	3.98 (1.09)	3.90 (0.96)	0.636	277	0.52
desktop computer in University	4.11 (0.98)	4.05 (0.85)	0.552	277	0.58
laptop computer in University	4.04 (1.01)	3.89 (0.96)	1.25	276	0.21
tablet (computer) in University	3.41 (1.19)	3.47 (1.04)	-0.436	274	0.66
cellular phone in University	3.91 (1.13)	3.90 (1.15)	0.1	273	0.92
mobile device in University	3.81 (1.02)	3.7 (1.00)	0.882	275	0.38
smart board in University	3.70 (1.22)	3.81 (0.92)	-0.797	276	0.43
camera in University	3.49 (1.18)	3.68 (0.97)	-1.346	277	0.18
data projector in University	4.10 (0.92)	3.98 (0.90)	1.061	276	0.29
slide projector in University	4.15 (0.89)	3.96 (0.90)	1.736	277	0.08
overhead projctor in University	3.65 (1.19)	3.71 (1.03)	-0.473	277	0.64

Table 4 summarizes the t-test results. T-test was run to identify differences between freshmen beliefs that used computer in high school settings and freshmen beliefs that did not use computer in high school settings. Freshmen who used computer in high school settings have more positive beliefs (M=4.33, SD=0.86) concerning desktop computer usage in their future classroom than freshmen who did not use computer in high school settings (M=3.94, SD=0.82); $t_{(278)}=3.692, p=0.00$. Freshmen who used computer in high school settings have more positive beliefs (M=4.29, SD=0.87) concerning laptop computer usage in their future classroom than freshmen who did not use computer in high school settings (M=3.91, SD=0.84) ; $t_{(277)}=3.542, p=0.00$. Freshmen who used computer in high school settings have more positive beliefs (M=4.45, SD=0.81) concerning data projector usage in their future classroom than freshmen who did not use computer in high school settings (M=4.24, SD=0.90) ; $t_{(278)}=2.041, p=0.04$. Concerning other seven tools usage in their future classroom freshmen believe did not show differences by computer usage status in their high school settings. Other t-test results concerning ICT tools usage in their university class can be seen in table 4. Freshmen believe concerning ICT usage in university class did not change by computer usage status in their high school settings.

Results and Discussion

In this research; freshmen believe concerning ICT usage in K-12 and university settings was tried to reveal. According to findings; most of the participants came from urban area, most of the participants have monthly income less than $200, while almost half of the participants have their own laptop, more than the half of the participants have Internet access at reside location. Another finding concerning demographic data, almost all of the participants have cell phone, just half of the participants have data plan for their cell phone.

Concerning t-test results by gender, internet access ownership and computer usage in high school settings, freshmen believe concerning ICT usage in K-12 and university settings did not show big differences. For each three independent variables, freshmen believe differ in few ICT tools. Depending on findings;

Colleges and faculty can use indifferences among freshmen believe. Thus colleges can reduce awareness of pre-service teachers.

Pre-service believes concerning ICT usage in both settings relatively high and if pre-service teachers are encouraged concerning ICT usage and educational usage of ICT. Pre-service teachers can acquire more knowledge and skills concerning ICT.

Recommendations for the future researcher;

Research can be design to research differences between pre-service teachers technological literacy level and believe concerning ICT usage in K-12 and university settings

Research can be design to research differences between pre-service teachers millennial learners characteristics and believe concerning ICT usage in K-12 and university settings
Research can be design to research differences between pre-service teachers various (computer, media, etc.) literacies level and believe concerning ICT usage in K-12 and university settings

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EXTENDING THE TECHNOLOGY ACCEPTANCE MODEL TO INVESTIGATE IMPACT OF EMBODIED GAMES ON LEARNING OF XIAO-ZHUAN(小篆)

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Abstract

This research focuses on topic of e-learning of Xiao-zhuan through digital Embodied games as a brand new way of creative learning method for Xiao-zhuan. TAM, Technology Acceptance Model, is the methodology in this research. Theory of perceived playfulness is also adopted to analyze the learning of Xiao-zhuan. Subjects in this research are 45 sophomores of the Department of Chinese Literature in National Taiwan Normal University. This research adopts questionnaire survey method, then refers to students' paper scores on the test. The results of this research are as follows: Firstly, "Perceived Usefulness" has the significant influence on "Learning Effectiveness" and "Attitude toward Using the Embodied games". Secondly, "Perceived Ease of Use" has the influence on "Perceived Playfulness". Thirdly, "Perceived Playfulness" has the significant influence on "Attitude toward Using the Embodied games".

Keywords: Xiao-zhuan(小篆), Interactive games, Technology acceptance model, Playfulness.

Introduction

Xiao-zhuan is a complete writing characters after the Ching Dynasty (221 B.C.-207 B.C.) unified as one nation. It has two thousands and two hundreds history, and according to the development of Chinese characters, Xiao-zhuan plays the key role of continuing the progress. If learners can have basic knowledge about the formation of Xiao-zhuan, it will only take half the work, but twice the effort in learning Chinese characters. For the beginning Chinese character learners (including beginning learners in Taiwan and Chinese as second language beginning learners), the pictograph specialty of word forms of seal character always helps Chinese character beginning learns quickly get into the Chinese characters world. For example, this word '川' in Xiao-zhuan is written as '' which is transformed by the shape of the zigzag river. For people who already learned three thousands five hundreds to four thousands five hundreds Chinese characters (including primary school and junior high school students), the structure teaching of six categories of Chinese characters must use Xiao-zhuan to define and explain. The reason is very simple, it is because *Hsu* Shen edited the first dictionary, the *"Shuo Wen Jie Zi"* (說文解字, A.D.100-A.D.121), by using the Chinese radical as dictionary section headers in Eastern Han Dynasty. In this dictionary, it analyzed the structures, sounds, and meanings of Chinese characters by using Xiao-zhuan as, and it shows the importance of Xiao-zhuan for the structures of Chinese characters. For the university and college learners whose major are related to art, Xiao-zhuan (or known as seal character) is one of the chirography of Chinese calligraphy, so when the learners have certain level about learning calligraphy, they must learn the structures of word form of seal character in order to expend self chirography categories. To learn the structures of word form of seal character must begin with the Xiao-zhuan in order to have a better foundation, especially for the artists who love seal carving(篆刻). For the university and college learners whose major are related to Chinese literature, learning Xiao-zhuan must give a better understanding about the structures of Chinese characters, and it helps to know the speciality of Chinese characters structures which is based on the shape. To sum up, Xiao-zhuan did not disappear in the mighty torrent of history, and it has its pivotal position and significance on the learning progress of Chinese characters, calligraphy and seal carving.

By and large, learners of word forms of Xiao-zhuan mostly start formt the book, *Shuo Wen Jie Zi*. The linkage of sentence patterns of "*Shuo Wen Jie Zi*", 540 radicals(部首) unified 9353 words included. The 540 radicals at "*Shuo Wen Jie Zi*" as the learning cut-points to learn Xiao-zhuan. The qualities of editions of "Shuo

Wen Jie Zi" have influence on the learning effects so it is important to have good one. According to the researcher's study on the book of "*A study on digital content value-added applications of Paleography"*, in light of compaing the 540 radicals, the book of "*Shuo Wen Jie Zi*" which was published from Jigu bookstore(汲古閣) is the best version (Lo, F. C., 2010). As mentioned above, this reasearch choose "*Shuo Wen Jie Zi*" which was publized from Jigu bookstore as the textbook of learning Xiao-zhuan. In addition, the researcher published an article "*The research on glyph recognition of teaching skills based on Xiao-zhuan."* in a journal. The character and structure of word form of seal character of Jigu bookstore was analyzed for learners to realize the fondation knowledge of word forms of seal character (Lo, F. C., 2012). With the advent of digital times, the leanign skills tend to mutiple. The module of webcam with Embodied games was developed by Professor Hong to employ in this research. Xiao-zhuan as the materials of Embodied games for university students to learn.

Research background

2.1 Technology acceptance model (TAM)

Davis et al. (1989) developed the TAM by adapting the Theory of Reasoned Action (TRA). This model was to interpret and predict the influential factors used in IT. The TAM demonstrated in Figure 1. TAM offers a theoretical foundation to understand external variables have influence on user's beliefs, attitude and intention to the situation of technology used . The two significant individual factors are "Perceived Usefulness(PU)" and "Perceived Ease of Use(PEU)" to the technology acceptance behavior. Davis (1989) designed the TAM to predict computer use based on the three primary factors as following. Firstly, the "Behavioral Intention to Use" can predict the use of computers. Secondly, the "Perceived Usefulness" is the most important factors of computer intention to use. Thirdly, the "Perceived Ease of Use" is the second decisive factors of computer intention to use.

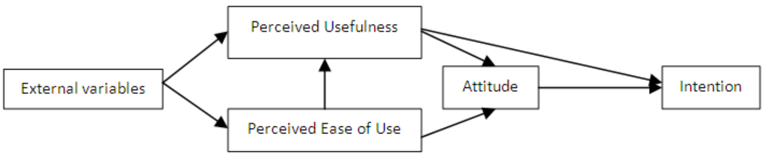

Figure 1. Technology Acceptance Model (TAM) (Davis, 1989)

Chiu and Fang (2005) found abundent literature in explaining and predict the use of Information Technology (IT) by TAM (Davis,1989；Davis etal.,1989；Haynes and Thies,1991；Mathieson,1991；Adams et al.,1992；Bagozzi et al.,1992；Taylor and Todd ,1995；Igbaria et al.,1995；Szajna,1996；Hendrickson and Collins,1996；Chau,1996；Morris and Dillon,1997；Gefen and Straub,1997；Thompson,1998；Teo etal.,1999；Lederer et al.,2000；Lin and Lu ,2000；Moon and Kim,2001). Some scholars were adopt "Perceived Ease of Use" and "Perceived Usefulness" to interpret the intentation of users to use technology (Straub et al.,1995). Chang et al.(2009) revised the TAM to add "Perceived Playfulness" to enhance the interpretation ability and the research results presented the positive effects. .Hong et al.(2011) analyzed the intention of uses to browse the websites in light of the National Digital Archives Program (NDAP), TAM is the theoretical foundation in research. The results reveled interface design is the key to uses to browse the websites. This issues should be considered to enhance the use intention.

As aforementioned TAM related-research indicated the "Perceived Ease of Use" and "Perceived Usefulness" of technology products will influence the user's acceptance of products. In this aspect, "the Embodied games of Xiao-zhuan" can be regarded as the digital technology prodcts. Its "Perceived Ease of Use" and "Perceived Usefulness" will also influence students' learning effects at the Departments of Chinses Literature.

2.2 Playfulness

Playfulness is a spontaneous attitude toward individual. The individual performance on game situation will be influenced by the "Perceived Playfulness" (Lieberman, 1975; Barnett, 1990). Therefore, "Perceived Playfulness" is the intrinsic motivation which was influenced by individual spontaneity. The individual who is equipped with "Perceived Playfulness" will create more stimulating, enjoyable and entertaining contexts (Barnett, 2007) to learn happily. Compare with uninterested users, they interested users would have show positive attitudes and strong motivations to interact with Information Technology (IT) (Chang et al. 2009). Hong et al. (2009) thought Playfulness steering is an emerging approach to educational game design. The playfulness design of an evolutionary game is influenced by the degree of uncertainty, flexibility in decision making, the level of challenge, equal conditions for fair play, opportunities to compete/cooperate, and the level of interactivity. Finally, the Perceived playfulness is the vital keys of digital education game. To sum up, in terms of current research results, the games (e.g., digital games) inspired the demonstration of “Perceived Playfulness” to improve knowledge learning.

2.3 Embodied game

In this study, we used the Embodied Interactive Video website (http://www.eivg.org) which was built by digital learning lab leading by professor Hong to precede the development of Embodied games of Xiao-zhuan. The teaching of Xiao-zhuan combining digital technology and Chinese language includes the integration of disciplines and the interdisciplinary collaboration. Hope that the use of Embodied games’ teaching method, students can get in the field of Xiao-zhuan forms and calligraphy. By using digital interactive teaching and learning environment, learners can learn radicals of Xiao-zhuan in a relaxed learning environment. A good Embodied game can cause students’ playfulness and joyfulness and create the willingness of active learning. The Xiao-zhuan Embodied games also provide competitive learning, for passing the game, for getting the place in the competition; students want to learn Xiao-zhuan actively.

Research Methodolody

3.1 Research Framework and Hypothesis

The research foundation was the TAM supported by Davis (1989) (see Figure 1). According to the demension of TAM, the“Attitude” was revised to **“**Attitude toward Using the Embodied games (ATUEG)”. The Embodied games of Xioa-zhuan in this research were students’ homework. Each student must to use Embodied games of Xioa-zhuan as an aided learning tool. The “Intention” in Davis’ TAM was omitted from this research. For midterm variables, the “Perceived Usefulness (PU)” and “Perceived Ease of Use (PEU)” from Davis’ TAM are adopted in this research. Finally, the TAM diagram also added the variable “Learning Effectiveness (LE)”. This research adopted students’ paper scores on the test to examine the “LE”.

Besides, the TAM in this research also referred to the revised version from Chang,C. T. et al.(2009) to add the “Perceived Playfulness” to suitable for this research. Therefore, the independent variables of revised TAM in this research are PU, PEU and “Perceived Playfulness (PP)”. In terms of research hypothesis, three dimensions (variables) have significant influence on ATUEG and LE. According to the mention above, the Research Model and Research Hypothesis are shown in Figure. 2.

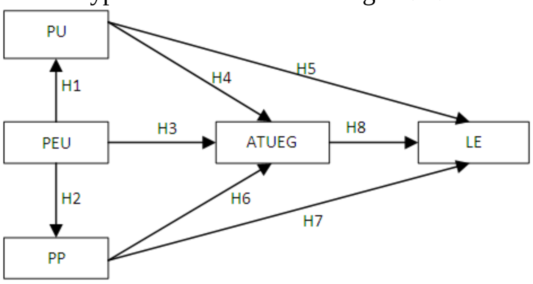

Figure 2. Research structure

Hypothesis 1(**H1**) : PEU has significant positive effects on PU.
Hypothesis 2(**H2**) : PEU has significant positive effects on PP.
Hypothesis 3(**H3**) : PEU has significant positive effects on ATUEG.
Hypothesis 4(**H4**) : PU has significant positive effects on ATUEG.
Hypothesis 5(**H5**) : PU has significant positive effects on LE.
Hypothesis 6(**H6**) : PP has significant positive effects on ATUEG.
Hypothesis 7(**H7**) : PP has significant positive effects on LE.
Hypothesis 8(**H8**) : ATUEG has significant positive effects on LE.

3.2 Subjects and Samples Collection

The subjects in this research were sophomores in National Taiwan Normal University enrolled in Chinese Philology. The questionnaire consisted of two sections, the first of which was intended to elect demographic information on the respondents. The second section was designed to many dimensions (variables) in this research, including PU, PEU, PP, and ATUEG.

The questionnaire used in this research was he five-point Likert Scale (strongly agrees = 5, agrees = 4, undecided = 3, disagrees = 2, strongly disagrees = 1). The subjects respond to the questionnaires according to their perceptions and situations. 45 questionnaires were returned, including 40 valid specimens and 5 invalid specimens. Gay and Airasian (2003) addressed the formal specimens of questionnaire survey take up the 10 percent of population at least. If the numbers of population is less than 500, the specimens takes up 20 percent at least is better. Neuman (2003) argued the number of population is less, the specimens takes up 30 percent at least is better. Now, the sophomores of the Department of Chinese Literature in National Taiwan Normal University were 130. According to the Neuman's opinion, the 30 percent of 130 are 39, the valid specimens in this research were 40, and it is suitable for the demand of analysis specimens.

Retrieve 40 valid specimens, for genders, 67.5 percent were female and 32.5 percent were male. In terms of grades, the majority of subjects were sophomores (80%). For subjects, the majority of subjects can surf the internet at home (98%). For subjects who take the credits of courses related to information technology (IT), all subjects takes the courses related to IT before. The majority of subjects were takes 1-4 credits (95%).

Results

4.1 Reliability & Validity Analysis

In reliability analysis, Cronbach's alpha coefficient is employed to measure the internal consistency and reliability of multiple item scales. Cronbach's α for a questionnaire between 0.35 to 0.70 is acceptable, and between 0.70 to 0.80 is highly acceptable (Nunnally and Berstein, 1994). The questionnaire consisted of 20 items and was divided into four dimensions, including PU (7 items), "Perceived Ease of Use" (3 items), PP (7 items) and "Accept Attitudes" (3 items). The analysis results of Cronbach's alpha coefficient were summarized at Table 1. Four various dimensions of the questionnaire measurement were designed to calculate Cronbach's α coefficient. The mean (m) and Standard Deviation (SD) of each items also presented (see Table 1). In the present study, the Cronbach's Alpha for each dimension, reaching the acceptable level of reliability (over 0.74), indicating that the questionnaire was equipped with consistency and reliability.

In validity analysis, this research adopts expert validity to examine and revise questionnaires. The value of KMO (Kaiser-Meyer-Olkin) and Bartlett Sphericity Test were measured in this research. The KMO was addressed by Kaiser-Meyer-Olkin (1974). KMO>0.8 indicated meritorious, KMO>0.7 indicated middling, KMO>0.6 indicated mediocre and KMO>0.5 indicated unacceptable. Bartlett (1950) addressed the Sphericity Test to examine whether the data have common factors., the significant level (p.) < 0.05 indicated there is a significant common factor. In short, the results of reliability and validity analysis of this research are shown in Table 1 below：

Table 1 Summary table of reliability and validity analysis

Dimension	KMO value	Bartlett's test of sphericity	Cronbach's α
Perceived Usefulness	0.894	261.212	0.948
Ease of use	0.678	26.101	0.746
Playfulness	0.899	166.570	0.920
Acceptant Attitude	0.676	56.903	0.852

4.2 Effect Analysis on Learning of Xiao-zhuan

The procedure of this research based on the implementation of Chinese Philology course. The paper book instruction was proceeded to instruct the 540 radicals of Chinese characters of Xiao-zhuan. In the midterm semester, the pretest scores of Embodied games of Xiao-zhuan were acquired in advanced. The full marks are 30. Next, learners use Embodied games of Xiao-zhuan to precede the individual learning. Finally, the final paper scores were acquired to assess the learning effectiveness. The full marks are 30. The paired-samples *t* test was calculated to compare the mean midterm exam scores and final exam scores, these results are summarized in Table 2 and Table 3.

Table 2 Paired Sample Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Midterm	20.93	40	4.660	.737
	Finalterm	24.20	40	3.353	.530

Table 3 Paired Samples Test

Pair 1	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference: Lower	Upper			
Midterm-Finalterm	-3.275	5.223	.826	-4.945	-1.605	-3.966	39	.000

As aforementioned table 2 and 3, the paired mean differences of the mean on the midterm exam scores and final exam scores is -3.275(20.93-24.20), the t =-3.966, df=39, the significant level is p<0.05. Students' performances on final exam are better than midterm exam (there is a significant differences between the mean scores of midterm exam and final exam). In terms of the 95% Confidence Interval of the Difference (-4.945, -1.605), the value of 0 is not concluded so null hypothesis (H_0 : $\mu1=\mu2$) was rejected and accept alternative hypothesis (H_1 : $\mu1\mu2$) indicated the midterm exam scores and final exam scores have significant differences. The scores of final exam demonstrate positive results.

4.3Path analysis

In order to explore the relationships among PU, PEU, PP and ATUEG. The SPSS statistic package for Windows 19.0 was used in this research to conduct the path analysis of regression to retrieve standardize regressions coefficient as the path coefficient (see Figure 3 below).

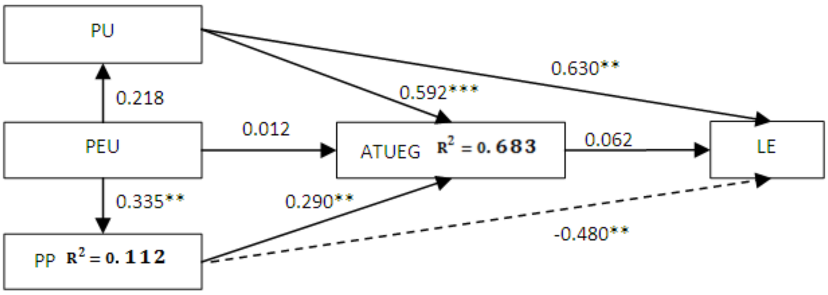

Figure 3. Path analysis chart of the research results (**implies that p<0.05, ***implies that p<0.01)

Error of estimate :

PU : R^2=.112 $S_e=\sqrt{1-R^2}=\sqrt{953}=.976$

PP : R^2=.112 $S_e=\sqrt{1-R^2}=\sqrt{888}=.942$

ATUGE : R^2=.683 $S_e=\sqrt{1-R^2}=\sqrt{317}=.563$

LE : R^2=.224 $S_e=\sqrt{1-R^2}=\sqrt{776}=.881$

As mentioned above, the variable interpretations (R^2) of the explain levels indicated the results among ”Perceived usefulness”, “Perceived Ease to Use” and PP to explain the variables of ATUEG are 68.3% and the results among PU, ATUEG and PP to explain the variables of LE are 22.4%. Some factors have effect on the ATUEG, PU, PEU and PP.

In addition, the effect analysis of Regression Path Analysis aims to explain the direct effect, to explain the indirect effect and total effect on Path Analysis Model (see Table 4 below).

Table 4. Path Analysis

		dependent variable: endogenous variable			
independent variable		PU	PP	ATUEG	LE
exogenous variable					
PU	direct effect	.218	.335	.012	.086
	indirect effect	-	-	-	.001
	total effect	.218	.335	.012	.087
endogenous variable					
PEU	direct effect	-	-	.592	.037
	indirect effect	-	-	-	.630
	total effect	-	-	.592	.667
PP	direct effect	-	-	.290	-.480
	indirect effect	-	-	-	-
	total effect	-	-	.290	-480
ATUEG	direct effect	.592	.290	-	.062
	indirect effect	-	-	-	-
	total effect	.592	.290	-	.062

According to the table 4, two results are summarized.

Firstly, PEU had effect upon LE.

direct effect : PEU→ LE : .086

indirect effect : PEU→ PEU→ LE : .218*.630=.137

indirect effect : PEU→ PP→ LE : .335*(-.480)=-.160

indirect effect : PEU→ ATUEG→ LE : .012*.062=.001

total effect : .086+.137+(-.160)+.001=.064

Secondly, PEU had effect upon “Acceptant Attitude”.

direct effect : PEU→ATUEG : .012

indirect effect : PEU→ PU→ATUEG : .218*.592=.129

indirect effect： PEU→ PP→ATUEG：.335*.290=.010

total effect：.012+.129+010=.241

4.4 Results of Hypothesis Testing

Based on the results of path analysis and hypothesis testing, results in this research are provided.

Firstly, PU has direct effect on ATUEG, PP and LE, the β coefficient are 0.592($p<0.05$) and 0.630($p<0.05$). Therefore, the hypothesis 4 and hypothesis 5 are supported. However, the ATUEG has no significantly direct effect on "Learning effectiveness" ($\beta=0.062$, $p>0.05$). Hypothesis 8 is not supported.

Secondly, PEU has no significantly direct effect on the ATUEG ($\beta=0.012$, $p>0.05$). Hypothesis 3 is not supported. PEU has no significantly direct effect on PU ($\beta=0.218$, $p>0.05$). Hypothesis 1 is not supported; however, PEU has a significantly direct effect on PP. Hypothesis 2 is supported.

Thirdly, PP has direct effect on the ATUEG and PP. The β coefficient is 0.290 ($p<0.05$); therefore, the hypothesis 6 is supported. PP has direct effect on LE; however, the effect is negative and the β coefficient is -0.480 ($p<0.05$). That means the more PP students have, and the less LE students do.

Table 5 summarize the results of path of relationship, path analysis and the supported or not are summarized.

Table5. A study of whether the hypotheses, β coefficients and significance of constructs are supported or not

Hypothesis: Path of Relationship	β coefficient	Supported or not
H1:PEU → PUs	0.218	Not supported
H2:PEU → PP	0.335**	supported
H3:PEU → ATUEWG	0.012	Not supported
H4:PUs → ATUEWG	0.592***	supported
H5:PU →LE	0.630**	supported
H6:PP →ATUEG	0.290**	supported
H7:PP → LE	-0.480**	supported
H8:ATUEG → LE	0.062	Not supported

Note. (**implies that p<0.05, ***implies that p<0.01

Discussion and conclusion

The purpose of research was to offer students of Department of Chinese Literature with the interactive e-leaning system of Xiao-zhuan and adopted TAM to understand learners' attitude toward the acceptance attitude and effects on learning of Embodied games and E-leaning System of Xiao-zhuan.

Four results of this research are stated as followings. Firstly, PEU has the positive significant influence on PP. Secondly, PU has the positive significant influence on ATUEG and LE. Thirdly, PP has the positive significant influence on ATUEG. In addition to above-mentioned results of research, this research also found that PEU has no positive influence on PU and ATUEG. However, PP has the significant negative influence on LE. The results inferred that this aforementioned negative influence has much to do with the learning habits of students of the Department of Chinese Literature which has a long history. The reading paper book is still the traditional learning ways so these students are accustomed to reading paper books to promote their grades and effects on Xiao-zhuan. They did not totally accept and adopt the new ways of e-Learning. According to the path analysis in this research, these students at the Department of Chinese Literature demonstrated the PU has positive attitudes towards Embodied games of Xiao-zhuan. Moreover, their grades of Xiao-zhuan have significantly improvements. As a result, we believe that Embodied games of Xiao-zhuan still facilitate the LE.

Based on the research, some limitations include the following. Firstly, Only 40 valid specimens are analyzed and investigated so the number of specimens is insufficient. The further research can cooperate with Departments of Chinese Literature from other schools. The regions can be extended to other areas such as north, south or east Taiwan to warrant further research. Much more also can be known about the regions or genders' effects on the interactive e-learning system of Xiao-zhuan. Secondly, Embodied games of Xiao-zhuan, are just one sample of e-learning, at the Character Course, at the Department of Chinese Literature, National Taiwan Normal University. It is not fully explain the other types of learning situation at the Department of Chinese Literature. Subsequent researches can focus on other related e-learning of the Department of Chinese Literature. Thirdly, the methodology of this research focuses on TAM and education theory of perceived playfulness is included. Subsequent researches may be able to integrate some other education theories. Fourthly, webcam was utilized to precede the Embodied games of Xiao-zhuan of this research. If the multiple interactive interfaces (ex: touch screens, mouse click etc.) are added in the future, the effects of perceived playfulness on Embodied games of Xiao-zhuan will be enhanced. In addition, if high-quality Embodied games on the cloud services platform are developed well, then we can expect that PP will have the significant positive influence on LE in the future.

E-learning is the modern teaching trend. If traditional academic courses at the Department of Chinese Literature intend to combine with e-learning successfully, the Information Literacy and IT related course should be increased to precede the integration between courses. We believe that the results of this research on the

Embodied games of Xiao-zhuan can be a good e-learning research sample of the Department of Chinese Literature to combine IT with course teaching.

Acknowledgements

Our special thanks go to the financial assistance sponsored by 99 Academic Year of Academic Research Promote Project in the National Taiwan Normal University (Project Number：T10007000170, Implementation Period：February, 15, 2011 to February, 14, 2012)

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E-LEARNING FOR ENGLISH SPEAKING SKILL AND THE EXPERIMENT

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Abstract

The paper discusses an effect measurement of improvement in English speaking skill by memorization of English sentence using ICT. For the objective, we prepared thirteen tasks for each task group A and B. Both task group A and task group B consist of thirteen tasks. We let each student speak each of those twenty-six tasks of Japanese sentence in English as pre-test and post-test. All the speech was recorded. Each speech was assessed by an native English male in terms of fluency and similarity. The result showed that the effect of fluency was observed for task B.

Keywords: E-learning, Language education, Evaluation, Speaking skill

Introduction

In the e-learning developed here, the computer selects a learning task from task set of Japanese short sentence and displays it on the screen. The student use the e-learning system as the following: He/she promptly translates the Japanese short sentence into English, displays the correct answer and memorizes the answer. By repeating the procedure, the student soon become to be able to speak every Japanese task of the task set in English. When the student learns the task, he/she can do it by either watching the Japanese sentence or listening to the Japanese sound. This paper aims to find the effectiveness of improvement on speaking skill by letting a student do the English sentence memorization using the e-learning as experiment.

There are many perspectives of memorization on language speaking skills. Some argue that there is a direct correlation between memorization of short English sentences (Kitagawa, 2003), and others argue that speaking skills ought to include an ability to interact with others on top of pure linguistic skills(Nakamura, 1993). This research discussed here is closer to Kitagawa's (2003) since we regard memorization of short English sentences as a method of improving one's speaking skills. It is also similar to the perspective of Pawley et al.(1983) that states that memorizing numerous clauses and phrases will lead to fluency.

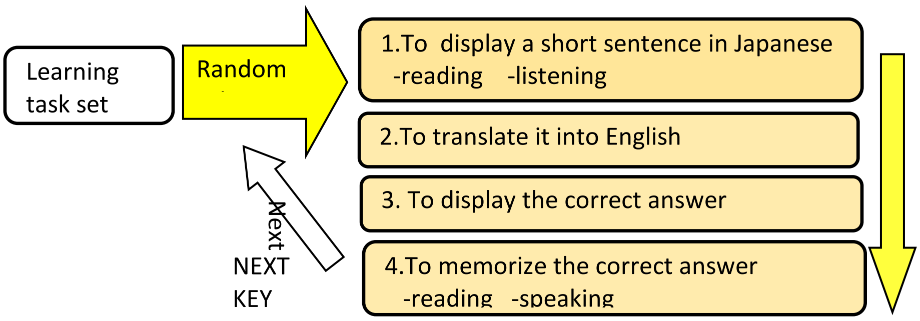

Fig.1. Learning flow

System and the Learning screen

The procedure of English sentence memorization is shown in Fig,1. Learning task set is stored in the computer. According the user's request, the computer selects a task at random and displays it on the screen as

Fig.2 computer screen

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shown in Fig.2. The student watches Japanese short sentence or listens to the Japanese then promptly and orally translates into English. Consecutively he/she let the correct answer display on it then memorizes it.

Experiment planning

The task material used for memorization and the pre/post test is as to the topic of 'International Conference venue'. We used, as the experiment, the task of three level from Level 1 as the relatively easy task to Level 3 as the relatively difficult task. The followings are the example of Level 1 and Level 2. The parenthesized part shows *situation*.
Level 1: (One scene of the presentation of papers. Pointing at the image of the slide) This chart shows the procedure of the experiment.
Level 2:(One scene of presentation of a paper.) We repeated the experiment many times, but the major results are shown in this chart.
The configuration of the proposed experiment planning is shown in Fig.2. In this figure, task A served as the object of memorization.

How to proceed the experiment

The experiment discussed here follows the procedure: {pre-test}->{Memorization learning shown in Fig.1} ->{post-test}. In the detail, the experiment was planned as (a) thru.(f) below and as shown in Fig.3.
student- We used seven university students designated a,b,c,d,e,f and g in this paper. Their score of TOEIC was between 500 and 600.

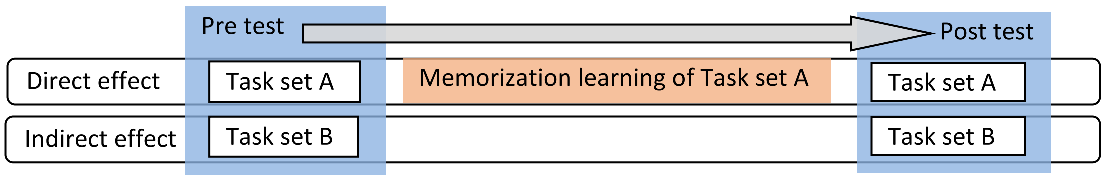

Fig. 3. Direct/indirect effect of learning

Determination of Level- We determine the learning level as the corporative work with the student.
Pre-test- Each of task set A and task set B in a Level consist of thirteen tasks. As the pre-test, we present each of twenty-six Japanese short sentences to the student one by one. For each task, the student speaks it in English then we record the speaking.
Learning objective and the method- We let the student know that the objective of the learning is to memorize the English sentence in order to be able to speak the Japanese sentence in English as soon as the task was presented. The student learns the task thirty to sixty minutes every day in a single room. We left detailed allocation of time and the learning method to each individual.
Learning period- We asked, after the learning, whether or not the student has memorized almost all the task then we, as the corporative work with the student, determined whether or not he/she terminates the learning.
Post-test- If we determined the termination of learning, we perform the post-test. The content of the test is the same as pre-test.
If a student ended step (f) in Level 1, we also consider and determine whether or not the student should examine the task set in Level 2.

Evaluation and the analysis

In step(c) in the previous section, we obtained many sound data uttered by students. An English native speaker assessed each sound data in two terms: *fluency and similarity*.

As for *fluency*, we used five-step of assessment, where score five corresponds to "almost fluent as non-native speaker" and score one corresponds to "not fluent at all".

Assessed result for *fluency* in task B is shown column (c) to (d) in Table 1. Based on the raw data, we obtained Z value in column (e). The Table shows that, of fifteen cases, eleven cases, case1,2,4,5,6,7,8,11,12,13, has a significant indirct effect. Consequently the degree of significance gets 0.73.

The experiment above shows that there occurs learning effect of *fluency* in English speaking skill in more than seventy percent case. The direct effect is abbreviated here. We can say that the indirect effect is made by learning activity of memorization through listening to and/or speaking English thus the English speaking skill got activated.

Through the experiment shown above, we got a new task to be solved that whether the indirect effect is caused by ICT assistance or it is caused by listening activity and so on.

On the other hand, all the sound data was assessed in *similarity* too. *Similarity* here means that how much similar is the spoken English to the correct answer. The assessment was done in five-step, where score five corresponds to "Even though the wording or grammar is different from the correct answer, the meaning is almost the same" and score one corresponds to "The meaning is almost incorrect". However it got clear that only four cases got the significant improvement.

Table 1. The experiment on indirect effect of English speaking skill

(a) case	(b) Student, Level, learning period	(c) s_p	(d) s_q	(e) Z-value
1	Student:a, Level:2, 2 days	1.31	2.08	-2.25*
2	Student:a, Level:3, 4 days	1.23	2.15	-3.21***
3	Student:b, Level:2, 2 days	1.85	2.31	-1.48
4	Student:b, Level:3, 6 days	1.54	2.00	-1.89*
5	Student:c, Level:1, 2 days	2.15	2.92	-2.62**
6	Student:c, Level:2, 4 days	2.54	3.00	-1.65*
7	Student:c, Level:2, 4 days	1.88	2.54	-2.00*
8	Student:d, Level:2, 2 days	2.39	3.08	-1.92*
9	Student:e, Level:2, 2 days	2.00	2.39	-1.21
10	Student:e, Level:1, 2 days	3.31	3.62	-1.00
11	Student:e, Level:3, 4 days	2.46	2.92	-1.91*
12	Student:f, Level:1, 2 days	1.61	2.31	-2.26*
13	Student:f, Level:2, 3 days	1.31	1.77	-2.07**
14	Student:g, Level:1, 2 days	2.69	3.31	-1.81*
15	Student:g, Level:2, 2 days	2.23	2.00	0.70

note

(b) The learning time of each day is thirty thru. sixty. The detail was left to each individual.

(c) s_p : average score of pre-test

(d) s_q : average score of post-test

(e) Z-value for average difference

*p<0.05 **p<0.01 ***p<0.001

Findings

Using ICT, we performed an experiment of the effect of English sentence memorization on speaking skill improvement. In the experiment, the sound records as pre/post-test done before/after the learning were assessed in order to verify the indirect effect. As a result, we obtained that English speaking skill was improved by the learning in more than seventy percent.

As future task, how much effect on the improvement ICT will have must be verified.

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GENDER DIFFERENCES IN HELP-SEEKING AND SUPPORTIVE DIALOGUE DURING ON-LINE GAME

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Abstract

Gender difference plays an important role of helping-seeking and supportive behavior while the players encounter win or lose situation that will affect the cooperation in the on-line game. Our research team developed a game called Strike Up, and used it to investigate the help-seeking and supportive behaviors displayed by children in the cooperative/competitive scenarios. In Strike Up, players must calculate numbers in a strategic fashion so that they can move their flags to the destination faster than their opponents. Game players' help seeking and supportive types in on-line discussion were categorized by Kappa method and data was analyzed by Kappa method, then Chi-square test was employed to examine the gender difference in different types of dialogues. The discourse analysis indicated that boys exhibited used more negative semantics. Girls appeared to display a more communal or cooperative orientation, as they used more positive, socially supported language. At the beginning of the game, boy were less willing to seek help than girls, yet, at the end, as the pressure of the competition mounted, male players became more eager to find assistance from teammates and were seen to adopt more help-seeking behaviors. The results can be implicated to increase the competition in game design to foster the help-seeking and supportive social behavior.

Keywords: gender differences, help-seeking, social support, discourse analysis, interactive behavior.

Introduction

Social constructionists contend that knowledge is developed and sustained through social processes, and knowledge and social actions are intricately linked. Berge and Colins (1995) point out the following: "Talk and discussion provide an opportunity to articulate and explain one's own thing and perhaps to modify one's own ideas, beliefs or self-presentation in response to feedback from others. Incorporation of new data, the testing of arguments, and using one's judgment and reasoning helps move a person toward new perspectives and higher levels of thinking" (p. 183). Weinberger, Stegmann and Fisher (2007) have focused on the acquisition of knowledge and the idea that learners may share knowledge by contributing their ideas through discourse (knowledge sharing), and that other learners integrate these ideas into their own lines of reasoning. Fraser et al. (2005) proposed that social–emotional skills, which involve information processing skills, enhance confidence in one's social skills. It is suggested that playfulness can be enhanced during mathematical games to improve social skills, especially when one seeks to show colleagues the mechanisms of problem solving (Nunokawa & Fukuzawa, 2002; Hanna, 1995). Situations in which colleagues offer reciprocal support in an effort to find possible solutions to a problem will promote their interest in game playing (Nunokawa, 2005). There is some evidence that collaborative discourse and argumentation make learning gains more permanent (Nussbaum, 2008). In line with those excerptions, help-seeking plays an essential role particularly important in computer-based interactive learning environments (Bartholomé, Stahl, Pieschl, & Bromme, 2006), this study generate a game named Strike up which needs the players involve in a cooperative and competitive situation to test their social emotion change.

Research on gender differences in computer game playing suggests that boys have historically been seen as more successful (Greenfield, 1999) and enthusiastic (Mitchell, 1985) than girls, particularly in competitive game play. Carbonaro, Szafro, Cutumisu, and Schaeffer (2010) use an interactive game adventure authoring tool to measure gender difference and find that females scored significantly better than males on higher-order thinking skills. From social cognitive psychology, gender differences appear to be important in help-seeking and support behaviors (Wester et al., 2007). To date most research on help-seeking is restricted to e-learning settings. Due to essential differences between the help-seeking process in e-learning interactive settings and in cooperative-competitive game of these findings would be inappropriate. Thus, there is a need to conduct research on help-seeking in the cooperative-competitive game as an understanding in its own right. As such, this study investigates gender differences in educational game play through exploring following two questions: 1) the

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different types of help-seeking and supportive behaviors of boys and girls, and 2) the changes in help-seeking and supportive behavior as play proceeds.

Research Contents and Hypotheses

Vygotsky emphasized dialogue. He argued that all cognitive functions originate in social interactions, and that learning is not simply the assimilation and accommodation of new knowledge by learners (Fosnot & Perry, 2005; Vygotsky, 1978). From his perspective, creating meaning involves a process of sharing various perspectives and experiences in communities of practice (Fosnot & Perry, 2005; Vygotsky, 1978). Therefore, learning is derived from rich conversation with other people who have similar or different perspectives based on their own life experiences (Jonassen, 1999).

Help-seeking and support in game playing

In Vygotsky's socio-cultural view, mental functioning develops as the learner internalizes and transforms the contents of social interaction (Vygotsky, 1978b, 1981). From a coactive systems viewpoint, individual action emerges as the product of coactions among components, and is not the linear outcome of components acting independently (Mascolo, 2005). Therefore, in coactive game playing, mutual benefits are maximized as learners work together to complete common tasks in a supportive, reduced-stress climate. Thus, learning partners have played an important role in previous interventions that incorporated learning through playing (Homles, 2007). Shih (2007) studied the avoidance of help-seeking in upper elementary school students, and observed that if the goal structure was very clear to the students, more adaptive help-seeking tendencies would be displayed. Nevertheless, from a psychological point of view, a partner’s unwillingness to share information with others in social interactions is hardly surprising, given that the transmission of information is often regarded as a loss of power (Kimmerle, Cress, & Hesse, 2007). In addition, giving information is associated with extra time and additional effort. Specifically, it is suggested that the exchange of explanations about strategies learned will increase the level of student interest in the content (Webb & Mastergeorge, 2003). To understanding the willingness to help-seeking or supportive from players’ dialogues at different stages, the hypothesis to guide this study is:

<u>Hypothesis 1</u>: Players’ would have more willingness to seek help and support others while they encounter highly competitive stage.

Gender difference in help seeking and supportive game behavior

Under cooperative conditions in game playing, group members will help each other to some extent in rearing and guarding the player mates (Pen & Weissing, 2000; Weibull & Salomonsson, 2006). Some evidence suggests that boys are much more enthusiastic in computer game than females (Connolly, Boyle, Stansfield, & Hainey, 2007; Gorriz & Medina, 2002). In addition, boys' speech is often directive, and is frequently used to assert power and influence over others (Archer, 1992; MaCcoby, 1998). In contrast, girls tend to engage in more intimate social interactions, turn-taking, and cooperative endeavors (Meece, Glienke, & Burg, 2006). Taken together, boys have been characterized as having a more competitive style of interaction, while girls have a more communal or cooperative orientation (Eagly, 1987; Hartmann & Klimmt, 2006; Leaper, 1994). However, it is also important to note that there are many instances in which girls and boys behave similarly (Underwood, 2004). As those different assertions, the research hypothesis to guide this study is:

<u>Hypothesis 2</u>: Female players would have more willingness to seek helps and support others than those male players.

Game Design

Collaboration has been shown to increase students’ knowledge of a wide range of subjects, including biology (Lazarowitz & Karsenty, 1990), mathematics (Fuchs et al., 1997; Webb, 1991), narrative composition (Daiute & Dalton, 1993), and computer programming (Web, Ender, & Lewis, 1986). Based on affordance theory (Gibson, 1977), this study was designed to examine the information-exchange dilemma between game players. Therefore, the game design for this research to analyze players’ contribution behaviors represents a particularly stringent test of tools that foster computer-supported cooperation and competition.

To investigate children’s behaviors in a competitive situation, a new game that requires cooperation among participants was developed as a research tool for this study. The game Strike Up was adapted from WEST, which was originally developed at the University of Illinois and subsequently revised, based on *Game Design Principles* by Kiili (2005), to increase player engagement. Although the essential elements in WEST were kept intact, some alterations were made to adapt the game for use in this study. The learning theme was changed to four arithmetic operations. In Strike Up, students must calculate numbers to move their flags to the game journey’s destination. In the game’s competitive mode, players of Strike Up have two choices of mode, 2 vs. 2 vs. 2 or 3 vs. 3. The children must take turns to ensure equal distribution of opportunities for each player. All participants can contribute positively, because the game is designed for children to generate their own strategies according to the rules of game.

Dice were replaced with playing cards (1-9), plus bonus cards (10, J, Q, K) that perform killer functions to increase game complexity. Each card dictates different game conditions. Number Cards are used to indicate numbers used in arithmetic operations, while certain cards are designated as special Function Cards. Some cards limit or increase players’ use of four mathematical symbols (＋;－; ×; ÷). For example, mathematical parentheses “( )” may be added to adjust game complexity for different players. In terms of game difficulty, the original bumping range was enlarged from 0 to 5 to increase the opportunity of being bumped back and the difficulty of arriving at the destination (Figure 1). In this scenario, based on students' dialogue, competitive and cooperative behaviors are overt and therefore easy to measure.

Strike Up is an internet-based game. Students can enter the game environment by connecting at home or by going online elsewhere. Besides playing the game, players can also interact with other players by entering design dialogue areas, as depicted in Figure 1.

Figure 1 The Strike Up game scene

Research Design

Social constructionists recognize that meaning is constructed through language in context, and this is of particular relevance to this study. Attention to language is the social constructionists' acknowledgement of the significance of discourse (Young & Collin, 2004). Discourse advances thinking and is central to the process of knowledge construction. As ideas are shared and assessed, feedback is received and interpreted, emerging problems are solved, and joint decisions are made (Hennessy & Murphy, 1999). Cognitive presence represents the analysis, construction, and confirmation of meaning and understanding within a community of learners through sustained discourse (Garrison & Anderson, 2003). Through discourse, ideas, solutions, and decisions are made explicit and visible; partners share information and plan together, and engage in joint reasoning, evaluation and decision-making (Mercer, 1995).

Studies have found that different types of verbal interaction support different types of learning (Cohen, 1994). The resulting protocols that guide interaction are briefly discussed below. Discourse is characterized as messages about other messages (de Souza, 2005). Discourse is a process whereby interlocutors explore existing signification artifacts in order to express what they mean (de Souza, 2005). According to Osgood's classification (Osgood & Tanaha, 1965； Osgood, May, & Miron, 1975), language meanings can be grouped into three types: evaluation, potency and activity. Evaluation messages ('good–bad') are related to the judgment of abilities, for example, "you are very smart" or "you are very lousy." Potency messages ('strong–weak') are related to inspiration or discouragement, for example, "you are close to working it out." Activity messages ('do–undo') are related to instructions for doing more or thinking more, for example, "you can try it again."

The study involved playing Strike Up as a competition. The participants in this study were students from three schools. Each school sent twelve students, and students from the same schools were organized into three teams, based on gender. During the competition, verbal communication was forbidden. All communication had to be carried out through the embedded dialogue facility. The game dialogue and processes were recorded, and were subsequently examined for gender differences in the conversation content and cooperation modes. According to the theoretical framework below, this study classified the cooperation modes into Tables 1 and 2 (See Tables 1 and 2).

The connotative meaning of words can be reduced in dimension by factor analytic procedures. Principal component analysis of the students' dialogue extracted three components, which corresponded to the Evaluation, Potency, and Activity dimensions of Osgood and Tanaka (1965) and Osgood et al. (1975). The present study used a content analysis method to analyze children's conversations during the game. After classification of their conversations, a quantitative analysis was conducted. Differences in play based on gender were explored through six discourse types (Table 1).

Table 1 The different types of help-seeking and supportive dialogue

Semantics / Interactive behavior	**Activity**		**Evaluation**		**Potency**	
	Positive	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
Help-seeking	**1.1**	**1.2**	**3.1**	**3.2**	**5.1**	**5.2**
Supportive	**2.1**	**2.2**	**4.1**	**4.2**	**6.1**	**6.2**

Table 2 The classification categories and examples of help-seeking and supportive dialogue

Semantics			Content	Examples
Activity	1.1	**Positive Help-seeking**	Directly request assistance	Help me. Help me count.
	1.2	**Negative Help-seeking**	Use provocative words	Are you able to figure that out for me?

	2.1	**Positive Supportive**	Directly provide assistance	(9-6)/1*2+1 (8+4)*8-1/2 Look carefully at where the steps of the short-cut derive the bigger sum.
	2.2	**Negative Supportive**	Use challenging words	Why can't you do addition and subtraction before multiplication and division? If you count it wrong again, I will hit you.
Evaluation	3.1	**Positive Help-seeking**	Use praise to gain assistance	Your mathematical ability is the best.
	3.2	**Negative Help-seeking**	Use self-criticism to gain assistance	I am lousy at math, or, I am stupid.
	4.1	**Positive Supportive**	Use praise to provide less assistance	You are great; I only have to tell you a little for you to figure it all out.
	4.2	**Negative Supportive**	Use negative criticism to provide less assistance	You can't figure it out. I really want to scold you (stupid!).
Potency	5.1	**Positive Help-seeking**	Express confidence by using self-assertive words	This question is so easy for me to count.
	5.2	**Negative Help-seeking**	Use discouraging and/or unfortunate words	This one is difficult. My card no. is very low.
	6.1	**Positive Supportive**	Use encouraging and/or motivational words	Keep going, the right answer is very close.
	6.2	**Negative Supportive**	Use discouraging and/or unfortunate words	Hurry up! There is no time for you to count. You got bad luck. You really are a joker's sister.

Data collection and analysis

In this sense, social support can be defined by the perception of support. These concepts are best measured by observations and reports, by indices of satisfaction, or by scores of perceived support (van Dam et al., 2005). Interpretive discourse analysis (developed from the perspective of an insider) can be used to explore issues (e.g., those relating to role extension) implicit in texts arising from computer data mining, interviews, diary notes, questionnaires, institutional documents, and throughout the literature. Data are subjected to analysis at various stages in the research process. The processes of transcription and participant checking constitute further acts of interpretation. More formal analysis involves deliberately engaging in the act of interpretation and making sense purposefully through the exploration of themes and discourse in various categories (Boyes, 2004). Help-seeking and support related to game playing are accomplished through language. Approaches to language and textual analysis take many forms, and are closely related to issues of representation. To collect conversational data during game playing, students must type their thoughts in the "dialogue area." This text can then provide the data for discourse analysis.

A content analysis research method was used in this study. Before the analysis, all players' dialogue was stored in the computer game, which provided a large amount of dialogue data to be analyzed. Content analyses were focused on the following: (1) semantics; (2) the relationship between gender and semantics; (3) interactive behavior; (4) the relationship between gender and interactive behavior; (5) the relationship between time and semantics; and, (6) the relationship between time and interactive behavior. In order to obtain consistency between the analyzers, the Kappa method was applied to examine the coefficient of discourse sentence analysis (Fleiss, 1971). The resultant kappa value was .709, which indicated that the analysis of the two focus groups (4 members in each group) reached significant consistency. Thus, all discourse could be classified into the 12 categories shown in Table 1.

Research findings

Data from 36 participants was collected in the Strike Up game. Researchers used a total of 382 sector dialogues. Their contents were analyzed according to the three dimensions: semantic activity, evaluation, and potency. Furthermore, each classification was divided into help-seeking and supportive interactive modes, and was encoded by positive and negative valences. The researchers also observed whether there were any changes in dialogue content as play time increased. Because the game was run three times and took a total of 75 minutes, the timeframe of analysis was divided to three 25-minute segments to check whether there were semantic changes as the game proceeded. The results of this study are illustrated as follows:

Semantic use in general

Through the analysis of gender and semantic frequency cross-reference (see Table 3), the category of positive supportive activity was found to have the highest frequency (23.6%). Examples of this category are: "Look carefully at where the stairs are," "Look carefully!" or "8+4*8-1/2=39.5" (direct formula). These are the statements that demonstrate direct assistance or are more directive-oriented. The second-highest frequency rate, 20.9%, was in the category of positive supportive potency. The statements that exemplified this type were encouraging words such as "Keep going!" Finally, 15.7% of the overall statements were classified as a positive help-seeking activity, which demonstrated direct assistance seeking.

Each of these three types was positive. Overall, 67% of the statements showed a positive tone. This result demonstrates that the participants in this study tended to construct linguistic expressions filled with positive encouragement and assistance.

Gender differences in semantic usage

There were significant differences in semantics between the two genders ($\chi2 = 19.706$, $p < .05$). Table 3 shows that the proportion of statements in the categories of positive and negative supportive potency, were higher in girls than in boys. This suggests that girls tended to express encouraging types of words, such as "Go" or "Hurry up," more than boys did. Boys had a slightly higher frequency of negative supportive evaluation wording than the girls. This suggests that boys tend to use "You are stupid" types of sentences more frequently. Statements classified as positive supportive evaluation were not observed in this study. This means that neither boys nor girls in this study said anything that could be classified as praising another's abilities.

Table 3 The percentage in each classification by gender

Classification			Girl		Boy		Total	
Semantics	Interactive model	Trend	Count	%	Count	%	Count	%
Activity	Help-seeking	Positive	33	8.6	27	7.1	60	15.7
		Negative	2	0.5	2	0.5	4	1
	Supportive	Positive	37	9.7	53	13.9	90	23.6
		Negative	6	1.6	8	2.1	14	3.7
Evaluation	Help-seeking	Positive	5	1.3	2	0.5	7	1.8
		Negative	4	1	6	1.6	10	2.6
	Supportive	Positive	0	0	0	0	0	0
		Negative	7	1.8	18	4.7	25	6.5
Potency	Help-seeking	Positive	9	2.4	10	2.6	19	5.0
		Negative	26	6.8	17	4.5	43	11.3
	Supportive	Positive	48	12.6	32	8.4	80	20.9
		Negative	21	5.5	9	2.4	30	7.9
Total			198	51.8	184	48.2	382	100

Interactive behavior in general

Overall, the percentage of interactive behaviors providing assistance (62.6%) was higher than those seeking assistance (37.4%). This demonstrated that the children in this study tended to offer help more often than they asked for help.

Gender differences in interactive behavior

There were no statistically significant differences in interactive behavior between girls and boys ($\chi2 = 1.066$, $p = .302$). As shown in Table 4, the percentages of supportive and help-seeking dialogue were very similar between girls and boys.

Table 4 The percentages of interactive behavior by gender

Interactive Behavior	Girl		Boy		Total	
	Count	%	Count	%	Count	%
Help-seeking	79	20.7	64	16.8	143	37.4
Supportive	119	31.2	120	31.4	239	62.6
Total	198	51.8	184	48.2	382	100.0

Semantic changes over time

The time frame for analysis was divided into three periods, each of which lasted for 25 minutes. The interactive dialogue between the players was recorded in the system. The results of Chi-square testing revealed that there were no significant differences in semantics among the three time periods ($\chi 2$ = 43.261, $p < .05$). As shown in Table 5, greater amounts of dialogue were recorded in the first and second periods (counts of 128 and 161, respectively) than in the third period (93). This trend was observed in most of the semantics classifications. The exception was in positive supportive words, where the first time period had a lower count than the second and the third time periods, with a ratio of 17.2/25.5/29.0. This means that direct assistance seeking increased towards the middle and end of the game.

Table 5 The percentages of each semantic classification by time period

Classification			First section		Second section		Third section	
Semantics	Interactive model	Tendency	Count	%	Count	%	Count	%
Activity	Help-seeking	Positive	7	5.5	29	18	24	25.8
		Negative	2	1.6	0	0	2	2.2
	Supportive	Positive	22	17.2	41	25.5	27	29.0
		Negative	5	3.9	3	1.9	6	6.5
Evaluation	Help-seeking	Positive	4	3.1	2	1.2	1	1.1
		Negative	5	3.9	2	1.2	3	3.2
	Supportive	Positive	0	0	0	0	0	0
		Negative	11	8.6	11	6.8	3	3.2
Potency	Help-seeking	Positive	6	4.7	8	5.0	5	5.4
		Negative	17	13.3	21	13	5	5.4
	Supportive	Positive	35	27.3	33	20.5	12	12.9
		Negative	14	10.9	11	6.8	5	5.4
		Total	128	100	161	100	93	100

Interactive behavior change with time

There were no statistically significant differences in interactive behaviors among the three time periods ($\chi 2$ = 2.910, $p > .05$). The ratios were very similar for the three time periods. This suggests that participants tended to provide assistance at a consistent level from the beginning of the game to the end.

Table 6 The percentage of interactive behavior by time period

Classification	First period		Second period		Third period	
Interactive Behavior Model	Count	%	Count	%	Count	%
Help-seeking	41	32.0	62	38.5	40	43.0
Supportive	87	8.0	99	61.5	53	57.0
Total	128	100	161	100	93	100

Discussion

An article, by Clark and Sampson (2008), addresses a broad array of social factors for creating open discussion. The article specifically focuses on the generation of new ideas in small groups, and finds that rudeness—disagreeing with others in a direct and confrontational way—is less effective in generating new ideas than polite disagreement.

Boyle and Connolly (2009) assert that "understanding the relationship between gender and computer games is extremely important for creating computer games that will function as effective educational tools." This study examined gender differences in dialogue during game playing. In particular, male and female players and their semantic usage in help-seeking and supportive behaviors, and changes in interactive behaviors as the game progressed, were analyzed. The following conclusions are offered:

1. *Interactive behavior in general*: Positive words are very important to motivate teammates to attain the goal state (Custer & Aarts, 2005, 2007). Context-sensitive help functions are especially susceptible to gaming behavior directed at better performance (Bartholomé et al., 2006). In the present study, children tended to use directive or ordering language in the cooperative-competitive game. However, more positive than negative statements were observed in general. The context of this game can generate a public-goods dilemma (De Cremer, Snyder, & Dewitte, 2001) that accelerates the speed of play to complete the game, which is mainly the result of increasing interpersonal trust as playing time increases.
2. *Gender differences in interactive behavior*: Men and women differ in emotional arousal; women have been reported to use positive expression more frequently (LaFrance, Hecht, & Paluck, 2003; Schirmer, Kotz, & Friederici, 2005). In this study, girls tended to use more encouraging statements than boys, and boys tended to use more negative expressions, such as words with scolding connotations, in playing the game. In the sense, the research hypothesis 2 was supported.
3. *Gender differences in playing stages*: Help-seeking among adolescents has been described as a necessary ingredient in successful coping (Grinstein-Weiss, Fishman, & Eisikovits, 2005). Children's coping includes help-seeking for academic problems, yet they do not always seek help when it is needed, and help-seeking generally declines during early adolescence (Grades 5–6) (Marchand & Skinner, 2007). That result seemed only proved at age related study, from game playing perspective, the other observations of this study show that boys' helping

seeking behavior was less at the beginning stage, in contrast, relatively high help-seeking behavior while the other team surpassed. Thus, the research hypothesis 1 was supported.

Concluding Remarks

In summary, the context of the Strike Up game can be helpful in group cooperative and competitive learning. The interactive discussions supported by the context of the Strike Up game also help to improve children's social abilities. The analysis of our study data found that the meaning dimensions described by Osgood and Tanaka (1965) and Osgood et al. (1975) could be confirmed, even some 40 years later in a totally different subject population. We also verified that the activity dimensions explained most of the dialogue. The findings further demonstrated that positive semantic words were nearly identical in female groups of subjects. Self-monitoring of expressive behavior comprises self-observation and self-control, and is guided by situational cues for social adequacy (Gangestad & Synder, 2000). Girls in this study displayed better self-monitoring behavior than boys, from their conversation while playing the game. Thus, the use of internet digital games as a stimulus material for the semantic classification of help-seeking and supportive behaviors in experiments can be considered very reliable.

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GENDER DIFFERENCE OF SOCIAL BEHAVIOR IN THE COOPERATIVE- COMPETITIVE GAME

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Abstract

Individual behavior will be different at uncertain conditions, this study is to identify the social behavior change of children while they play a cooperative and competitive game. An evolutionary game named Strike up was developed for the study which involves the players to practice advance arithmetic through five card number calculations and strategies. A case study method is employed, during the game, participants' dialogues were video-taped and its content was later analyzed and interpreted by triangulation. The results of this study suggest that (1) at the beginning, individualistic behavior displayed frequently in the boys' team and dominating behavior was displayed at the final stage in the boys' team. (2) female players tended to express more egalitarian behavior than altruistic, dominating, or individualistic behavior at the beginning. In addition, female players were more willing to altruistically help other comparing to the male players at the final stage.

Keywords: Game behavior, Social behavior change, Coop-competition game.

Introduction

People are naturally motivated to pursue self-interest, but cooperate readily when self-interest coincides with collective interest. Some people may be tempted to free-ride on the cooperation of others, and hence profit from cooperative benefits without contributing. Such opportunistic behavior may easily undermine the effectiveness of cooperative action, and poses a challenge to evolutionary of cooperative behavior, especially in exchange situations where one has the choice between a self-interested strategy versus a strategy that benefits the whole group, but at a personal cost. This cooperation dilemma has sparked researchers in many scientific domains to pool their efforts in order to understand why costly prosocial behavior persists despite the high levels of uncertainty intrinsic to many social exchanges. Hence this research stresses the importance of extrinsic incentives that align self- and collective interest prompting people to act prosocially to reap personal benefits from cooperative interactions (e.g., Bornstein, 2003).

Games offer highly promising learning opportunities because in many computer games, *game play* teaches players lessons that can be applied to other aspects of their life (Hamalainen, Manninen, Jarvela, & Hakkiner, 2006). Researchers have developed a series of different games, such as the ultimatum game, the trust game, the dictator game, and the Prisoner's dilemma, to investigate choices and decision making in social interactions and negotiations. Previous research investigates novel forms of interaction to encourage collaboration, and techniques of gathering user for designing educational games (Bekker et al., 2003). In brief, game play is one kind of social learning (Bandura, 1986), in playing the game, social behavior can be changed along with the interaction increased.

A great deal of games children play generally influences social behavior (Green & Rechis, 2006). In game playing, individuals who attribute others' actions as hostile (rather than benign) tend to react with blame and anger when they are hurt (de Castro et al., 2002). That is, during the game process, players would mutually help or display hostile behaviors to sustain their enjoyment during play. Moreover, if they show appreciation or apology even mutual helps with others, the game would continue longer (Kendall, 1993). In the sense, to improve players' performance, games should be developed in a community of caring through cooperative learning (Donohue, Perry, & Weinstein, 2003), and sometimes generate hurting in the competitive situation.

This study developed a game which composites complex arithmetic practice to examine the interaction patterns in a cooperative and competitive climate. In terms of the purpose, this study is to identify the types of social behavior change in children during mathematical game play, which involve cooperative and competitive contest.

Research Contents and Questions

Research suggests that classroom environments may influence child behavior (Donohue, Perry, & Weinstein, 2003). Both antisocial behavior and prosaically behavior alike have important implications for social and school-related adjustments of children (Frey, Nolen, Edstrom & Hirschsten, 2005). In game playing, players interact and learn how to take-turns, share resources, display feelings, take another's perspective , and, perhaps most importantly, manage conflicts (Parker et al., 1995; Rubin et al., 1998). Thus, social cognition changes appear to play an essential motivational role in game playing behaviors (Frey et al., 2005; Green & Rechis, 2006).

Social behavior change in a game

Social Exchange Theory postulates that social behavior is about working toward maximizing one's own rewards and minimizing one's costs (Burgess & Huston, 1979). In time, individuals begin to rely on social exchanges and the future benefits or opportunities. Participants operating within this type of exchange relationship focus on reciprocity and therefore operate under the norms of equivalence (Laursen & Hartup, 2002). In other sense, the beliefs individuals have about other people's goals and intentions are important predictors of behavior in playing a game (Frey, et al., 2005). Individuals who attribute others' actions to hostile intent tend to react with blame and anger when they are injured, compared to those who infer, benign intent (de Castro et al., 2002).

In game playing, if it is required for players to mutual assistance directly that implies that there are repeated interactions between the same two individuals (or groups of individuals), and that both have resources that are attractive to one another (Trivers, 1971) such that both parties receive direct benefit from exchange (Hammerstein & Leimar, 2006), referred to as "conditional cooperation". Frey and his colleagues (2005) proposed four categories that reflect behaviors of game participants during decision making: (1) dominating behavior: whereby players select self-high outcome to dominate other members in a team or pair; (2) individualistic behavior: whereby players select self-high outcome to gain the greatest advantage; (3) egalitarian behavior: whereby players select equal-high outcome but self-high outcome is second choice; and (4) altruistic behavior: whereby players select equal-high outcome but self-low or equal-low outcome are second choices. To the current research, the conceptualization of Frey and his colleagues (2005) in regard to game participants' behavior types is adopted as the condition of game change. Then, the **research question 1** can be postulated that "*Will the players' socially competent behavioral change when they are grouped to play a coop-competition game?"*

Gender difference in social behavior change

Games vary in the ability of other players to reciprocate, the number of players, the number of iterations, the ability of outside observers to reward and punish selfish behavior, payoffs from cooperation versus defection, and the reputation of other players (for a review, see Fehr & Fischbacher, 2003). They also differ in terms of stable individual differences of players, such as their age, sex, and culture (Henrich et al., 2005). By the elementary school years, boys spend considerably more time in coalitional activities than girls, and girls spend more time in dyadic activities, on average, than boys (Benenson et al., 1997). There is also an evidence to suggest that girls are more sensitive to any inequalities in their relationships and inequalities among females in general, both in terms of material resources and social status (Ahlgren & Johnson, 1979; Winstead, 1986). The pattern suggests that, in comparison to boys, girls show greater interpersonal engagement and knowledge about the significant other in dyadic relationships (Markovits et al., 2001). To be sure, there are evolutionary models of sex differences in social behavior (Geary et al., 2003; Wrangham & Peterson, 1996). Then, the research question 2 of this study can be postulated that "*Is there any significant difference of behavior change between girls and boys in the game*?"

Research Design

In a broader sense, game theory is pertinent to virtually every dynamic interaction between sentient beings (Wilson, 2006). Within this framework, several games have been developed to examine subjects' behavior in cooperative scenarios, which differ in complexity according to the number of participants and repetitions of social exchange. In a dynamic game design, the game scenario should provide players to constantly evaluate and adjust the competition/collaboration strategies (Menasche, Figueiredo, & Silva, 2005; Sigmund and Nowak, 1999), thereby engaging themselves in logical thinking (Menasche et al., 2005). In order to answer the two research questions, this study employed an evolutionary game, named Strike up which is one type of educational game (Hong et al, 2009), to examine the social behavior change of the players.

Game design

Specifically, the developmental activities may enable girls and boys to form cohesive and competitive coalitions and thus work out in-group dominance relations (Geary et al., 2003) or with more series competition in game playing. In the present study, researchers developed an evolutionary computer based game, named *Strike Up*, a game played between two or many teams, with the game context and/or strategy changing every turn (Hong et al., 2009). In this game, six children were divided into two competing teams. The objective for each team is to move their flags from the start point to the end point (326 steps to the goal). The game interface is shown in Figure 1.

Figure 1 Game interface details.

As shown in Figure 2, the numbers of steps to be taken at each round is dependent on what was randomly drawn from the deck of virtual poker card shown on the screen. Five cards from 1 to 9 are retrieved by each player at each turn, and five card numbers can be used for counting the steps he or she can move The five card numbers counting approach is limited to use +, －, ×, ÷ once in a turn. In order to move forward to win the game, the players have to calculate out the maximum value or best value to step forward. Because punishing norm violators is often considered a stabilizing act that sustains long-term cooperation (Boyd & Richerson, 2002), it is considered designing a scheme consistent with social rationality. 10 J Q K cards are function cards perform *support* or *set up* functions. Children can use function cards to get bonus points or to 'tackle back' other opponents.

Figure 2 Game interface while playing.

The feature of this game design corresponds to Menasche and his colleagues' (2005) principles, which includes: (1) Games are played among teams; (2) Player interaction continues as time elapses; (3) Players can choose from different game modes; (4) Player decisions are associated with valuable movements; and (5) Players adjust game strategies according to game dynamics. In other words, the research tool *Strike Up* enables players to interact with content, collaborate with peers, and benefit from player support (Northrup, 2001). As such, each cooperation-competition scenarios were scrutinized.

Research participants

This study includes six 5th grade elementary school students from a local elementary school in Taipei. They were divided into two teams. Three girls are in team A, they are labeled as A1, A2, and A3. The other three boys are in team B, they are labeled as B1, B2, and B3. The experiment was conducted after class hours. The participants played Strike Up as part of after class leisure activity.

Data collection and analysis

The contents of this game reflect the emphasis of on-line game. Then, the qualitative data can be carried out as exploratory work to identify themes for further exploration in a fuller study. Data analysis within interpretive methodology is complicated by the central assumptions analyzed by such researchers (Sandiford & Seymour, 2007). Miles and Huberman (1994, p. 9) suggested a variety of 'analytic practices' which could be summarized as: coding data, reflecting on data, sorting data, identifying patterns in data, moving towards generalizations and developing or testing theories/conceptualizing (Sandiford & Seymour, 2007). Then, the process of analysis involves different stages as follows: 1) Preparation of data for analysis, 2) Coding and display, 3) Data reduction: Refining 'raw data' into clear text, 4) Componential analysis: Developing interpretations and verification, 5) Theme analysis: Developing interpretations and verification, and 6) Conclusion drawing.

Reliability has to do with the consistency or repeatability of assessments. Of the numerous types of reliability, estimating the internal consistency among items on an evaluation form and determining the number of responses needed to achieve precise evaluation ratings (Greenwald, 1997). The triangulation method was employed to assess the reliability of the data, three investigators were there to supervise, videotape, and to take field notes. They read the data recorded from game playing by students to analyze and interpret the interactions among children. The reliability of data interpretation reached to .90 of this study.

The Findings

Since children on the same team have varied understanding and expectations for interdependency. Individuals' coop-competition modes also differ. The observation was carried out for three rounds. Play sequence for one round constitute turn taking in the following order: A1-B1-A2-B2-A3-B3. Interactive dialogues in each round were classified into four types of social behaviors based on Frey et al. (2005) proposed theory.

Dominating behavior in the game
At the beginning of the game, the players with better arithmetic ability would figure out the value of the five number cards much sooner than those with lower arithmetic ability. Those players with better arithmetic ability would also spontaneously help those slow counting members and demonstrate some kind of dominating behavior.
Situation 1: To determine who to start first, the game was started by a game of "scissor, paper, and stone". It would be B1's turn to play but B2 stood beside and try to monitor B1's performance. An excerpt of the conversation is as follows.
B2（speaks to B3）："I hope you can draw out 9, 9, 9, and 9."
B2："9, 9, 9, 1, 1… how wonderful！"
B2："9×(9+9)."
B3："Divided by 1, then minus by 1."
B2："No, it should be minus by 1 then divided by 1."
B2："Listen to me, you will find out that the value will be the biggest."
B3："No, I insist on divide before subtracting."
B2："It is the same, either way is OK."
B3："But I prefer subtraction followed by division."(B2 tried to keep privilege)
(13'25"~14'00")
B2's math ability is somehow better than B1's (according to the math tests). So, B2 have more confidence in counting and giving someone a hand. Then, it is observed that B2 is a dominating character who tries to enforce others to take his suggestions. The other type of dominating behavior occurred while approaching toward the end of the game Round 4).

Situation 2: It was B3's turn to play (The card numbers were 2,7,1,5,8. B1 tried 2×（7＋1－5）÷8, yet he was hesitant, then B2 and B1 give some suggestions to him.
B3："6 divides by 8 is equal to?"
B1："6 divides by 8 is equal to 6 out of 8."

B2：”No, the rules require us to round up, so the result is 0.”
B3：”Is 0?”(B3 spoke in a doubtful sound.)
B1：”1 is goody！
B2：”I count out，1 or 0.” (He stood up and insisted his results.)
B3：”Well, the result is…”(Ask B1 to confirm B2’s results)
B3（speaks to B2）：”I don’t want your help. I will count it by myself…”
B1（speaks to B3）：”You can take B2’s idea. You can take B2’s idea.”
B3（speaks to B2）：”No, I don’t want to listen to you.”(B1 used left hand to keep B2 away)
B2（speaks to B3）：”OOXX” (Murmuring dirty words)
B3（speaks to B2）：”Go away or shut up！”
B1（speaks to B2）：”He counts out 1. Perfect！”
B2：”Really?”
B3：”Yes, it is right.”
B3：”So, I can work it out by myself and do better than others.”(Show that he is confident by tapping his chest using right hand)
(13’15”~14’35”)

Denotation: People with a proself inclination are either self-maximizing or competitive and will only cooperate when it is in their self-interest to do so (Van Lange, 2000). People on Machiavellianism display a combination of selfishness and opportunism (e.g., Wilson, Near, & Miller, 1998). From the above discourse, B3 as dominator tends to cooperate less and their cooperative behavior is purely default.

Individualistic behavior in the game

Those players with better arithmetic ability and more ambition in winning the game will show that they only concerned about themselves in counting or using functional cards.

Situation 1: It was B1’s turn in the secondary round. B1 was counting his five cards to figure out the maximum value or best value (go by short) and B2 drew another five cards to count (A3 will be next player).
B1（speaks to B2）：”I have 6, 7,8,3,7, how to arrange for best movement.”(B1 tries to ask for B2’s assistance)
B2：”6,7,8,3,7…..Very good. But, I have 6,2,5,7,6. I have to figure out the best value.”
B1（speaks to B2）：”Please help me figure out this first, it is my turn to move.”
B2：”Let me figure out mine, then I will count for you.”
B1：”The scenario will be changed after this turn, the value you count out will be useless, please count mine first.”
B2：”No, after I figure out mine, I will count for you.”
B1：”You help me, then, I will help you.”
B2：”I count out mine already, now I can help you.”
(18’25”~23’00”)

Situation 2: B2 played his turn by figuring out the best value of five cards. After moving his flag to that place which according to the calculation of the five card numbers, he drew the so called “function card” and got J card by which he can move forward 50 steps as bonus or give to one of his teammates to move forward 50 steps. Since B3 was lagging way behind and he wished that B2 could give him a hand.

B3: “B2 please use that card for me, I am so far behind everybody else.”
B2 (making an excuse): “I want that card for myself. Do not be worried; you will get a lucky card during your turn.”
B3: “You should help me; otherwise we will lose the game.”
B2: “Don’t worry; it is still very far from reaching the end. I would have helped you if I am close to the end.”
B3: “… I might always be kicked back, then, it will be too late to rescue me later.”
B2: “You are too noisy. I will wait for someone to give me a hand, and then I will help you.”
(25’ 25” – 28’40”)

In order to promote the playfulness in the mathematic game, the cooperation and competition are two very important elements. If the players only approach the game competitively, then it will be very difficult for all members to finish the game. In particular, at the very final stage, the exact value needs to be figured out for the rest steps to the goal, if there are the remaining values after subtracting the steps to the goal, the player will move him or her further backward from where he or she started. Thus, players should realize that cooperation is important as the team needs to win the game together.

Situation 3: As the game went on, most players were having their flags close to the end. This meant that the chance of being bumped back would be increased. In addition, the function card could be used to help others and/or hinder others. If team members were too individualistic, it would be difficult to finish the game.
B2: “I got bumped back so many times; I stayed around the last part of the game for at least 10 minutes.”
B3: “You deserved it.”
B1: “B2 you should help B3 at the beginning of the game.”
B2: “OK. I know I was wrong.”
(14’00”-14’10”)

Denotation: Individualisms showed that their social strategies are more calculative and adapted to the situation at hand. It is not unlikely that behavior should predominate among individuals with other-regarding preferences (Bogaert, Boone, & Declerck, 2008; Gintis et al., 2003). In line with this, the above discourse indicated that B2cooperation in a social dilemma was more likely to proself before he can help others. B2’s willingness to cooperate in one-shot social dilemmas has further been related to individualism in stable personality traits.

Egalitarian behavior in the game

At the beginning of the game, opposing teams sought possible assistance by exchanging benefits. However, it was uncertain if the other members could be trusted. Exploratory talks were frequently conducted to test each other and to determine whether the other team could be trusted. Mutual improvements were pursued throughout the process with optimistic attitude.
Situation 1: A1 believed that the game was just a game. She did not take it too serious but still tried to seek reciprocally help. At the beginning of game, she ever gave some benefits to B2. It was interesting that one of her teammates (A2) tried to compete to hurt one of opposite teammates, so when A1 got a number, she can decide t to bump back B2 or recalculate out other number to move forward, A2 asked her to take the first action to bump back B2.
A2: “Try to bump back B2.”
A1： “Never mind, I will give way to B2, he will repay me later!”
B2： “A2 (Calling her by the name) I will revenge, watch out!”
A1： “Just remember to add 90 steps for me!”
B2： “No way, your friend did this to you, blame her.”
B1： “If we get a King, we will set her (A2) up”
……
A1： “Your thoughts are evil!”
B1： “You call me evil! B2 is worse than me!”
A1： “But I just descended him and revenged!”
It is the turn of B2 to draw the function card, and he got the King card.
B2： “K, according to the rules of this game, I will move A2 50 steps backward.”
A2： “Please help me, don’ hurt me. You can use it to help your teammate B1”
B2： “Ok. I will let you know what revenge is” (B2 set A2 to move backward 50 steps)
(39’40~43’30)

By Round 3, there were more descend short-cut close to the target. The possibility of setting up rivals using function cards increased. The desire for the children to win resulted in attitude inconsistencies and conflicts. Different strategies to handle conflicts reflected the individuals’ varied characteristics. It was even possible for the members to alter individual social behaviors in order to solve the conflicts.

Situation 2: In the scenario below, A1 and B1 insisted on keeping promises (Egalitarian) at the beginning of the game. However since B3 wished to win, his attitude was more individualistic at this stage. A1 was displeased and B1 tried to change the mind of his teammate. In the process, B3 altered his social behavior.

B3： “J, according to the rules of this game, I got J, I can assign one opponent to the nearest ladder to go up or descend.” (B3 assigned A1 to descend.）
B1： “Really?” (His teammate was surprised in B3’s decision)
B3：“Why not?”
B1：“Didn’t A1 just descend a while ago?”
B3： “Why can’t she (A1) be moved down again?

A1： “Why did you descend me again?”
B3： “Why should I be nice to you? You’d better go down from here.”
B2： “Oh, let them both go down, so I can get rid of them both!”
A1： “B3, you shouldn’t do that.”
B3： “I’d do anything to win, so I don’t really want you to go up.”

A1： “All right then, you owe me 3 square magnets! It’s unfair! You broke your promise! You will be condemned by God!”
B3： “I honestly want A2 to descend some more, but I can’t.” (A2 is closed to the end)
A1： “Never mind just let her go up. It gets harder the closer she gets.” (The rule of this game require the players to find the right numbers to step forward to the end, otherwise, the players have to move backward based on the rest of numbers deducing from the forward steps)
B3： “Ok! I will let A2 go up.” 。
(Meanwhile, B1 interrupted their conversation and ask B3 to help A1)
B1: “Look! B3 let you go up!”
A1： “Ok, then. We are even B3!
(53’15”~55’50”)

Denotation: Not surprisingly, the term “strong reciprocator,” commonly used by Egalitarian, refers to those individuals that are inclined to both cooperate in one-shot interactions, and support those who do (Fehr & Fischbacher, 2004). From the above discourse, the study indicated that A1is a strong reciprocator even willing to help a defector when they themselves were merely the opposite party of a fair interaction.

Altruistic behavior in the game

In a game, not all people share common interests and help one another strategically. In a group, there are those who do not expect returns. After multiple “gives”, a positive stimulus is produced within the group. Subsequent mutual help and teamwork attitude are then produced. Based on observed records, A2 is the altruist. The dialogue below shows how she repeatedly assisted her teammates in conducting computations:

Situation 1: At the game, basically, no body can use calculator to count his or her number cards. Not every participant is good at arithmetic. Those who did better at math would need to wait longer for his or her turn and might feel impatient. As such, it was observed that effort was made to help those who were poor at arithmetic, even for the opponents.
A3: “B3, what cards have you got?”
B3: “8, 9, 3, 8, 1…”
A3: “let me count, 8, 9, 3, 8, 1…”
B2: You can’t calculate for the opponents.”
A3: “Yes, I can.”
(73’23”- 75’15”)
Toward the last part of the dialogue during the game, A3 actively helped others but was not dominating. She sought the greatest benefits by calculating on behalf of others.

Situation 2: Also, A2 displayed “self-sacrifice” characteristics in the group. She sacrificed herself to achieve greater good for the group. It is A1’s turn, A2 asked others to descend her as shown in the dialogue below:
A1： “Let’s calculate together (referring to A3), and see who’s better.”
B3： “You can’t help her calculate!”
A2： “Let’s compare if the equation she just wrote is better than mine.”
（76’20”~76’53”）
A2： “I descended the least, descend me please.” (She tried to work out the most possible ways to get the end for other teammates)
A1： “Why do we descend all the time in the game”? (She seemed to ask all players to give helps to opponents instead of giving hurt)
（77’00”~77’10”）

Toward the end of the game, A2 and A3 even helped their opponents compute. The mutual help mode not only applied among teammates but also between opposing teams.

Situation 3: At the final stage, if players choose not to use negative strategy, due to it was likely that all members of the team would be descended. Then, it would be difficult to get to the end.

A3：“B3, my calculations turn out to be 16.”
A2：“16 means B3 has to go back a long way, 12 steps will be better.”
A3：“B3 wait a moment, I re-calculate and come up to 10, take a look for you!”
（90’05”~90’30”）

Denotation: After being treated fairly and unfairly in a cooperative/competitive game, altruistic express cooperative emotions more frequently than do dominators or individuals (Schug et al., 2010). From the above discourse, that is, by expressing help emotions in the game playing, A2 and A3 are altruistic cooperators reveal their honest motivational intentions which serve to attract potential interaction partners and deter defection.

Discussion and Conclusion

Social behavior changes refer to the phenomena that people seem to care about certain “social” goals, such as a “fair” allocation among members in society, in addition to their own material benefits (Li, 2008).

To answer the first research question: “*Will the players’ socially competent behavioral change when they are grouped to play a coop-competition game?”* The results of this study showed that at the beginning, individualistic behavior displayed frequently in the boys’ team and dominating behavior was displayed at the final stage in the boys’ team. Evidence of ‘conditional cooperation’ is identified: when students expect others to contribute, they themselves tend to donate more (Frey & Meier, 2004). In the manifestations of children’s game behavior, the interaction frequency increases as they get closer to the target, their altruistic behavior appeared at the final competitive stage in female team. The Strike Up game involved activities in creating coalitions and dominance result in many of the social behaviors of boys that are sometimes viewed unfavorably, this result is agreed to the study of Geary et al. (2003) which indicates that boy are more serious to win then their proself behavior is displayed at the beginning stage of competition, because they do not want to be the suckers (Croson, 2007; Gachter et al., 2003)

To answer the second research question: “*Is there any significant difference of behavior change between girls and boys in the game*?” It is observed that the numbered cards utilized in Strike Up help promote arithmetic competence of children. Function card use also helps enhance interactions between teams. The function cards in the game design can be used to help or to set up opponents. At the beginning of the game, girls mostly interacted in egalitarian mode, or chose to be outsiders. When competition grew fiercer at the end of the game, children changed from egalitarian to individualistic or altruistic. If an altruist is present in a group such as A2, there will be mutual help between groups, and harmony can be maintained. The results are agreed to the studies of Geary et al. (2003) and Trivers (1971) which state that among the proximate mechanisms of cooperation, if they feel guilt for a failure to reciprocate, they will monitor the give-and-take of the relationship and maintain the cooperation. In comparison to girls, the relationships of boys are predicted to be and are more readily maintainable (Whitesell & Harter, 1996).

In conclusion, this study found that that apart from a few unconditional cooperators (“altruists”), most 5th grade male students are *only* willing to cooperate when they expect others to cooperate as well. The most powerful support for the importance of social norms for altruistic behavior directed towards genetically unrelated individuals stems from studies of strong reciprocity. Consequently, people who contribute apparently trust the others after several runs in this game. These results of this study may imply grouping system for allocating different characters of students in the game of *Strike up* to promote the awareness of prosocial behavior and maintain the behavioral intention more stable.

Limitation and Future study

This study has been conducted in qualitative method, the case analysis was employed which might not be enough to predict all other cooperative and competitive contest settings, and the quantitative method should further be applied to analyze the research data to imply the better grouping for students to have behavior change.

Social information processing models can be used to explain the development and maintenance of prosocial behavior (Nelson & Crick, 1999). More precisely, relationships based on reciprocal altruism should result in the evolution of proximate social and emotional mechanisms that function to ensure equality of the benefits received from the relationship. This model would be examined in relation to the development of behavioral intention, future study may place at examining the relation between prosocial behaviors and the evolutionary change of 4 types of game behavior in a coop-competitive game.

Acknowledgments

Thanks to all schools and children who participated in this study and to Ying-Hwa Kee for comments on an earlier draft on this manuscript. In particular, thanks to National Science Council to support this study (NSC 99-2631-S-003-003).

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HCI AND EYE TRACKİNG TECHNOLOGY FOR LEARNİNG EFFECT

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Abstract

The utilizing of interactive teaching and integrated application in technology has revolutionalized ways of teaching and learning. By making use of the interactive input and output devices that users are able to control the learning information from stem to stem. According to the research in Sander & McCormick (1987), it indicated that more than 80% that human beings manage to process cognitive information through visual operation. That is to say, the eye movement is an essential source of information in the cognitive processes. In combination with the human-computer interaction and eye movement processes, only if the eye obtain the correct teaching message which will generate the greatest effect for the content delivery in the digital learning industry. Therefore, the experiences of human-computer interaction and the eye tracking technology have been widely used in usability testing for different digital learning contents. This article will review the representative theory of interactive behaviour, eye tracking technologies and related studies. In addition, we will also discuss teaching operation and other basic data analysis in the use of eye tracking technology.

Keywords: Human-computer interaction; eye-tracking, education, processing mode

Introduction

In the process of using E-learning products or even as information receivers that these people perform a self-control behaviour in the manipulating procedure. In other words, users have the authority to select which products they want to use. Therefore, it is different that learners process information from tradition to modern technological education. However, the education way we use still in the same position but to teach students in accordance with their aptitude. Due to this situation, the effectiveness of education is still in the same place without progress. Thanks for the development of technology, in order to enhance the effectiveness thoroughly that we should take the information processing behaviour into account. Besides, the acceptance of learners is also a key factor to improve education.

The scholars developed eye movement monitoring technique which provides a nature and real-time instrument to explore the cognitive thinking of users. This method is widely applied in the understanding of the learning process and other related issues such as the perceptual span, the integration of information processing and the eye movement characteristics. Furthermore, the eye movement information recorded to examine the cognitive processes under different cognitive tasks.

The eye movement data is so important but people could only observe the eye movement through the eyes in the past which are not objective enough, low accuracy and unable to grasp the subtle changes of the eye movements. Consequently, it was difficult to accumulate and provide convincing research under such condition. Nevertheless, the scholars began to use the characteristics of the eyes to record eye movements. With the progress of science, making the eye tracking technology more advanced and diversified. Nowadays, the eye tracking technology is a technique which using the image processing technology and collocate mini-camera that

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enable to focus the eyes and capture the infrared which reflect from the cornea and pupil; then, to record the changes of eye movements continuously and analyze the result of eye tracking process.

In the past, learners receive the learning message passively; however, since the development of technology that the education way has been changed. It is not merely one-sided to supply the message on the journey of education. Therefore, we must apply the appropriated and accepted learning methods to learners by observed the characteristics of them in order to enhance the quality of education. Combining the design of human-computer interaction with understanding the operation of eyes and the way that human manage the cognitive information which have considerable relevance when improving the education. Through reviewed the studies which included human-computer interaction, information processing model, as well as eye tracking technology that we can thoroughly improve the education and provide practical advices to the development of learning.

Human-Computer Interaction

The design of human-computer interaction has been an important issue for the process of developing information technology. Based on the research of Venkatesh & Davis (1996) in Technology Acceptance Model (TAM), they pointed out that the perceived usefulness and perceived ease of use will affect the users' behavioural intentions. Simultaneously, the perceived usefulness will also affect perceived ease of use which will influence the final decision on the actual users' behaviour. Well-designed human-computer interface will help users be more receptive to new forms of technology services. As for education, due to the appearance of new technology that changes the way of learning. According to the extent of intervention of information technology, Urden & Weggen (2000) proposed the new types of learning that included computer-based Learning (CBL), web-based learning (WBL), digital learning, distance learning.

The research and theory of Human-computer interaction (or human-computer interface, HCI) has gradually been taking seriously nowadays. Hence, the key designing factor of human-machine interaction will change eventually from the computer to human. With the extension of the fields in computer science, and the software, system functions became more complex that the interaction patterns between people and computers has become even more diverse when it compared with the past. Human-computer interaction is an interdisciplinary subject; it is the innovative object from two scholarships which included computer science and cognitive engineering. When it comes to human-computer interaction, it also includes numbers of popular computer technologies, such as artificial intelligence, natural language processing, multimedia systems, as well as the operation of human factors engineering, linguistics, and sociology.

A well-designed human-computer interface requires covering a wide range of designed principles and there are a number of different theories that announced from domestic and foreign researchers. Beside, in the past two decades, the development of computer science has been gradually varied from the focus on the standard function of mechanics to consider the user experience, usability and the Human-oriented perspective. Kristof & Satran (1995) indicated that as for the designing of computer product that it should be mainly based on user experiences. In other words, users have considerable control authority to decide the speed of receiving information, the direction, and make decisions on whether to accept the learning or using message or not. For users, a good human-computer interface design should combine the user experiences with the ideas of designers that will make the systems more useful and play a teaching role for learners. In addition, a well-designed product will attract students' attention and the digital learning products will achieve the desired effect as well. In the correlative analysis of human-computer interaction, Nielsen (1993), announced in a published book of Usability Engineering in order to test the usability that he designed several different testing methods to measure the systems, and that users will be assigned to complete the task through the system. The evaluators will analyze the testing results to understand the usability of the user interface. The detective method is through the people that included experts, software developers, users and other experts to test the systems directly. In the detective situation, the heuristic evaluation can be applied into evaluate the system. Nielsen proposed the method to evaluate the systems in order to provide practical recommendations to improve the design of the user interface and solve the difficulties of the systems.

Information Processing Model

The main theoretical framework for cognitive psychology is information processing model. The model indicates that people have the initiative to manage massages and receive massages, storage massages, extract information, and manipulate massages by sense organ. The information processing illustrates that how people process massages, deal with conceptual information, explain the reasoning skills, and the way people learning by descript the stimulus of the inspiring motive and response within the mechanism of mantel activity and characteristics. Sperling & Melchner (1978) pointed out that the human cognitive system is a limited resource allocation system, not only the working memory, but the concentrated resources are limited. People do not notice the whole massages when facing a large number of information, not to mention to place the massages into the level of consciousness. As for receiving information, the brain can only capture a small part of massages and lay the other part of information into the subliminal of memory part. That is to say, individual will select the most economical or most preferred way to capture the required visual information into the consciousness level when facing a large number of information. It is an active process of construction and which combined two different direction into the cognitive processes when human beings face the real things outside of the world. One of the direction is the physical signals from outside to attract our attention from the process of bottom-up, and the other is an existing knowledge systems in the brain which already know how to capture and interpret external messages in the top-down process.

Recently, scholars concentrate on the development and research on the information processing model, and one of the researchers, Gagné Ellen, announced a model that made the educators and psychologists feel interested. Gagné Ellen integrated the concept of behaviour and psychology into one model and emphasizing the importance of the cooperation between teachers and students in the learning process. He announced a theory about the learning point of view in the information processing mode is the most suitable theory to explain the inherent learning process of human beings. The Gagné Ellen’s theory in information processing mode includes receptors, immediate memory, working memory, long-term memory, reflecting organization, and reactor. Short-term memory refers to the memory that receives by the sense organ and extended the time up to 20 seconds. The capacity of long-term memory is extremely large, due to the existence of the message in the long-term memory have been well managed, once they have been stored in long-term memory which can be retained in perpetuity. In Gagné Ellen’s theory, the process of retrieving memory or massages is called search. Message retrieval and activation of short-term memory depends on the appropriate "probed messages" that individual have and to activate associated message in long-term memory. The control process in long-term memory system is an individual part, by executing the control process that learners can select or decide the information processing in completing the learning process. The procedure will control the entire information processing steps and affect the learning quality of the thinkers.

Eye-Tracking and Measurement

Under the premise of achieving the attainment of educational effectiveness, we must realize the learning process of the learner and which may encounter several unconscious learning problems, or learning defects, and obstacles. Several visual psychologists found that the eye tracking movement is an objective indicator and one can monitor the whole cognitive processes of the learners (Baker & Loeb, 1973; Rayner, 1998; Salvucci & Anderson, 1998). Cognitive psychologists Tang & Sung (2007) found that sometimes the eye using strategy will also reflect the automatic operation of oneself. In addition, Sander & McCormick (1987) pointed out that more than 80% that human beings manage to process cognitive information through visual operation. That is to say, the eye movement is an essential source of information in the cognitive processes. Through recording and analyzing the data of eye movement that can help us to realize the variety of cognitive processing in different courses.

To the eye construct, the photosensitive cells which in the retina are not evenly distributed, and only the fovea on retina have higher density of photosensitive cells which can receive the visual information from the outside world for about two-degree visual angle. The characteristics of eye movements can be divided into six motions that included saccade, pursuit, vengeance movements, vestibule-ocular reflex(VOR), optokinetic nystagmus (OKN), and fixation. According to Kandel et al. (2000) that they illustrated the movement of fixation is much more static when compared to other five types of eye movements. In order to comprehend the relationship between eye movement and external messages, it must be retrieved the information of the time and space from eye movement and external messages. In most of the eye movement studies, researchers look forward to getting quantitative information which means the gaze location and stay time for eyes on gazing at a graph or a paragraph of text. Moreover, based on the study of Henderson & Hollingworth (1999), as for the time dimension that researcher understand the depth of the visual perception system to process the messages by analyzing the gazing times and fixation duration; on the spatial dimension, which puts emphasis on the fixation position and saccade length.

There are three types of methods have been used to measure the eye movements. First, the special lens equipped with a built-in induction coil and be able to be worn on eyes to record the eye rotation, such as scleral search

coil; secondly, using optical non-contact way to measure eye movements, such as video-based eye tracker. The third equipment is electro-oculogram (EOG) which used the change of electromyography to obtain the eye movement data. The eye tracker that used to record the eye movements included the data about time and visual angle. In order to get the correct eye movement information that must be captured the corresponding location of eye rotation angle which relative to the external environment. Therefore, the most important function of eye tracker is that it is able to generate the corresponding equation of eyeball rotation and fixation position by calculate the calibration in the subsequent process. When individual views a visual stimulation included text or image that the eye tracking instrument will record the fixation position in a fixed sampling rate. The measured ways of eye tracking focus on two types of eye movements: fixation and saccade. Each data of fixation contains the message of fixation duration as well as fixation position. Each of the saccade data includes saccade duration, saccade length (saccade amplitude), saccade direction, and saccade velocity. The above information is the original information utilized by eye tracking.
According to Rayner (1984) that he found the average fixation duration for various tasks are: type for 400ms, music reading for 375ms, sees the picture for 330ms, read for 225ms. The saccade sizes for different tasks are: view photos for 4 degrees, read for 2 degrees, read music and typing for 1 degree. From the view of developed direction, Kowler & Martins (1985) found that the saccade length of pre-school children is shorter than adults but the fixation duration is longer than adults. Basically, the average of fixation duration may reflect the degree of difficulty of the job to the participants (or the degree of mental resources it required), the more difficult jobs it is the longer the average fixation duration; however, saccade length reflects the density of the message. That is to say, the increasing of the density of massages, the saccade length will become short depending on the length. Apart from a holistic point of view on the data of eye movements, the researchers usually proceed from theories or assumptions, for instance that researchers will set several particular parts which is called area of interest (AOI) and then analyze the eye movement data base on diverse units. For example, by observing pictures from given information and the picture will divide into several different blocks. Based on the study from Chua, Boland, & Nisbett (2005), the study had found that a divided picture which included two parts: foreground and background, it shows that the Chinese readers have to spend much time than those English readers on viewing the part of background.

There are no more than ten standard eye movement indicators for analyzing the information retrieved from eye tracking and researchers usually conduct the statistical analysis based on several area of interest that participants pay more attention than other area. The gaze duration count up when the sight of participants get into the particular area of interest and stop counting when the sight leaves. Besides, the duration may contain one or several fixation time. Long fixation time reflects several possibilities which included: 1. the viewers want or need to spend more time dealing with the messages in the particular region; 2. the contents of this area have a higher degree of difficulty; 3. the area attracts the viewers' attention. However, when facing the complicated visual stimulation that the participants view the parts more than once that can be categories into the first past gaze duration (first run gaze duration), or second past gaze duration (second run gaze duration) till the last past gaze duration (last the run gaze duration), while the sum of the entire time period referred to the dwell duration (dwell time). The dwell time represents the whole required time to fully understand the area of interest, and may also stands for the time that the area attracts individuals to enjoy or read it. Through analyzing the first fixation time that it can be learned the degree of the region which attracts the viewer. In addition, when particular areas attract the readers more than other than which will reflects the shorter time in the first past gaze duration. Moreover, when reading the article that the reader's eyes will not absolutely perform one-way forward which means the reading path will be from the first word to the last word. Sometimes, the reader will return back to what he already read and this phenomenon called regression.

Conclusion

Simply to say, a poor designed user interface will lead users encounter difficulty everywhere when using the systems and after receiving the bad experiences that users will not going to use the system any more. Conversely, a well designed user interface that will increase the pleasure for users to use the system again. Therefore, in discussing how to increase the acceptance of the system as for users that we can easily find the issue about human-computer interaction provides an essential entry point and when designing the new systems without considering the needs of the human factors that the new system suffer the rejection from users.

When emphasized the importance on the well designed human-computer interface that it should combined the measuring instruments in order to thoroughly achieve the principle of human-centered design. Eye tracking technology has the advantage that it does not influence the learners, record the information immediately which is utilized to solve the problems including the learning process for creativity, learning, reading, teaching and other issues. Furthermore, the technique gradually becomes a popular measured instrument but with less related researches and learning applications. The eye tracking technology is still in the initial step as for the education industry in Taiwan, that is to say, there are quite a number of issues needed to be explored, looking forward to attracting more scholars and researchers to join the research and enhance quality of education as well.

In addition, the eye tracking measurement can be seen as a facilitator in learning area. The eye tracking technique can be expected to link directly together with computer and apply the immediate feedback to the learners, or teachers. In other words, through the eye movement teaching feedback system, the computer can directly guide the learner to watch critical areas in order to promote students' ability to solve problems.

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HOW LEARNING ENVIRONMENTS AFFECT EDUCATIONAL TECHNOLOGY STUDENT IMAGINATION

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Abstract

The purpose of this study was to investigate an array of environmental factors that can stimulate imagination and explore how these factors manifest in different instructional design phases. The participants of this study were students in the field of Educational Technology from four universities across Taiwan. The instructional design process was divided into three major phases: analysis, design/development, and implementation/evaluation. Influences in the learning environment were deconstructed into four factors: physical component, organizational measure, social construction, and human aggregate. The results of this study indicated that environmental factors have varying effects during the three phases of instructional design. The social construction was claimed to have the greatest effect on stimulating imagination, followed by organizational measure, human aggregate factor, and lastly physical component. These effects were seen in the development process, especially in phase two and with a lesser effect in phase three.

Keywords: educational technologist, imagination stimulation, instructional designer, learning environment

Introduction

Instructional designers construct activities and anticipate conversations and actions that will bring learners' inquiry to fulfilment, enabling their growth toward desirable skills and understandings. Fabricating such meaningful experiences not only requires a significant amount of expertise, but also creativity and imagination. It involves imagining how learners learn; how they respond to a task; where, with whom, and how they work; using which resources under which circumstances; and over what timescale (Goodyear & Retalis, 2010). Moreover, designers need to have imagination to forecast emerging technologies and their potential applications. However, until now, few studies have clearly discussed imagination in the field of educational technology, let alone developed an evaluation tool for assessing imagination stimulation.

Educational technologists are always interested in how the digital world changes the educational landscape. They need to care more about how learners use these technologies to gain knowledge and skills, and how physical component and social environments where the technologies are used would influence their learning. With these concerns in mind, this study aims at exploring what environmental factors influence imagination of students majoring in educational technology, how these factors influence students in different design phases, and how demographic backgrounds manifest themselves in these influences. In this study, "imagination" refers generally to "the process of transforming the inner imagery of educational technology students, when they face an instructional design task."

Imagination study

Imagination can be perceived as the basis for cultivating creative thinking, and thus is the driving force of innovation (Finke, 1996). In addition to fantasy, imagination has several noticeable characteristics, some of which are related to psychology aspects, such as: exploration, intuition, sensibility, and crystallization; while some are more practice-oriented, such as: effectiveness, novelty, transformation, elaboration, and productivity.

Valett (1983) indicated that children *explore* the world through playing, and Thomas (1999) followed that the process of controlled perceptual exploration takes individuals from a vague appreciation to a detailed understanding of reality. Colello (2007) also asserted that imagination allows one to explore, dare, challenge institutional order, and thus overcome limits. *Intuition* also has a place in human imagination. Intuition makes imagination concrete as a judgment and equivalent to a conclusion, which leads to a foresight of the future

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(Ribot, 1906). Townsend (2003) believed that if people utilize more intuitive representations, then their imagination would last longer. Reichling (1990) contended that knowledge is gained directly as an insight, or a grasp of the whole through intuition. She further claimed that most of imagination is emotive content, with an intuitively *sensible* meaning. Vygotsky (2004) supported that the ability to control imagination comes with the maturation of emotion. Another psychology-related characteristic of imagination is *crystallization*. DeVries (1988) illuminated Hegel's theory of mental activity and added that imagination connects "abstract properties" and "concrete universals" by law of association. Vygotsky (2004) concluded that all objects of common life appear as crystallization of the imagination.

Accordingly, *effectiveness* is one of the practice-oriented characteristics of imagination. It can be said that every invention has resulted from a particular human need and has its own special purpose (Ribot, 1906). Betts (1916) added that people are in danger of drifting into daydreams, unless their imagination is guided by some purpose. Reiner and Gilbert (2000) further confirmed that imagination is goal-oriented, based on prior experiential imagery and internal coherence. The imaginative effectiveness has its link to *novelty*. Betts (1916) held that imagination is an inventive power which allows the ability to see the old in new relations, and thus build new constructions out of old materials. Beaney (2005) indicated that someone who is imaginative is good at creating new possibilities, and can offer fresh perspectives on what is familiar. *Transformation* thinking will also bring useful outcomes to novel combinations (Lombardo, 2010). Imagination assists people in transferring a function from one object to another that did not previously have such a function (Vygotsky, 1978). This ability helps people in dealing with unpredictable problems by using existing experiences.

Besides providing intuitive insight, an individual's imagination can also take time. When people *elaborate* ideas, imagination becomes a long, laborious, and painful personal moment (Ribot, 1906). Through acts of dissociation and association, an inventor's imaginative constructs are challenged, corrected, and united, until they are adapted to a social consciousness. The process of elaboration is similar to the ideas of 'zooming in and out' described by Reiner et al. (2000), and the focusing-defocusing structure proposed by Folkmann (2010). *Productivity* is another characteristic of imagination, especially in terms of quantity, intensity, and duration of mental images (Ribot, 1906). Concerning the design process, Folkmann (2010) claimed that imagination starts as either an overall conception of the design as a whole, or a more experimental exploration for details. Both positions clearly state the success criteria for the design task in terms of imagination productivity, continuity, and fluency. In the current study, "imagination" refers specifically to the process of transforming the inner imagery of educational technology students when they face an instructional design task. Such transformation is assessed in terms of the characteristics identified above.

Learning environment

Accordingly, the campus environment can be divided into four dimensions: physical component, organizational measure, social construction, and human aggregate (American College Personnel Association, 1994). There are a myriad of variables related to each of these dimensions, which accounts for the complexity of the campus environment.

The physical component dimension of a campus consists of its natural environment (location, weather, temperature, etc.) and its man-made environment (architecture, sound, facilities, messages, etc.). Both components shape attitudes toward the campus and influence its inhabitants' experiences in powerful ways. They also define space for activities and events, thereby encouraging some phenomena while limiting others, thus influencing students' preferences and behaviors (Strange, 2003). The major components of a physical environment include: (1) ambient environment, (2) environmental load, (3) personal space, (4) territories, and (5) crowding (Gifford, 2007; McAndrew, 1993). There are numerous follow-up studies which indicate that the environment has a profound impact on students' imagination (e.g., Büscher, Eriksen, Kristensen & Mogensen, 2004).

The organizational measure dimension arises from the myriad of decisions made about environmental purposes and functions (Strange, 2000). Who is in charge? How will resources be distributed? What must be accomplished and how quickly? How will participants be rewarded for their accomplishments? The complex nature of universities results in the need to maintain a sense of order and generate various arrangements that define the organizational characteristics of an environment. As a result of this need, rules and regulations are formed, rewards systems are developed, and reports become necessary for resource allocation (Strange, 2003). Such organizational measures could raise or lower the morale of participants. Many studies by modern scholars (e.g., Claxton, Edwards, & Scale-Constantinou, 2006) also give evidence to the influence of organizational measures on students' creativity and imagination development.

The social construction dimension focuses on the "subjective views and experiences of participant observers, assuming that environments are understood best through the collective perceptions of the individuals within them" (Strange & Banning, 2001, p. 86). Environments can also be described in terms of social climates, which are composed of relationships, personal growth, and system maintenance (Moos, 1979). The social climate usually has intrinsic influence (such as members' motivations) as well as external impact on the environment (such as control over the members) (Peterson & Spencer, 1990). McMillan (1995) held that the emotional factor is the key to cultivate students' imagination, such that all schools should create an educational context that is full of encouragement and support.

The human aggregate dimension is the collective characteristics of people who inhabit the environment. This dimension creates features in an environment that reflect varying degrees of consistency, especially in terms of organizational culture, tradition, or style (Huebner & Lawson, 1990; Strange et al., 2001). These features stress the uniqueness of the organization and provide a sense of belonging for its members. This dimension affects the students' performance, restricts their behaviors, creates campus culture, and produces a stable impression of the school (Peterson et al., 1990). Modern research (e.g., Claxton et al., 2006) also echoes the impact of human aggregate on an individual's imagination. For the purposes of the current study, the learning environment is categorized into the four dimensions reviewed in this section.

Method

The current study adapted the ADDIE model and divided the instructional design process into three phases: Analysis, Design/Development, and Implementation/Evaluation. Since measures of the influence that environmental factors had on stimulating imagination in different design phases were unavailable, new scales needed to be developed. Based upon the literature reviewed previously, nine items were created to represent imagination characteristics, and 21 items were created to represent various environmental influences. The environmental items were grouped into four dimensions: physical component, organizational measure, social construction, and human aggregate. The items were scored on a five-point Likert scale ranging from 1= *strongly disagree* to 5= *strongly agree*. Face validity of these items were examined by five research associates and a small group of graduate students to clarify its comprehensiveness and meanings. A pilot study was also conducted consisting of 60 students in the educational technology field to examine the constructed scale. Based on the satisfactory analytical results, the formal questionnaire was confirmed.

Participants involved in this study were students from four universities across Taiwan. Students had to satisfy two requirements in order to participate for this study. They had to be currently majoring in educational technology field, and have similar assignments in instructional design based on the agreement between the instructors and this research team. In order to ensure the quality of this study, the research team communicated the survey with instructors in the target universities first, and then arranged similar schedules and assignments. In other words, this study could be implemented across multiple campuses under comparable timetables and similar design tasks.

The investigation process delivered in each university followed the same procedure. Each participant received a cover page and a questionnaire in a package. On the cover page, all participants were informed that their involvement was voluntary and they were guaranteed anonymity. In the questionnaire, students were asked to determine the level of agreement with each imagination characteristic, and the strength of influence that each environmental item had on their imagination in the current design phases. Although the design process is iterative, a systematic approach of instructional activities that allow students to gradually grasp complicated concepts is often times needed. The questionnaire was thus distributed in three different periods which represented the three instructional design phases of analysis, design/development, and implementation/evaluation during the fall semester of 2011.

Due to prior communication between the instructors and the research team, the valid samples collected in three different phases were well-controlled to be the same. Within these 402 subjects, 61 were freshmen, 116 were sophomores, 89 were juniors, 19 were seniors, and 117 were in their master programs. There were 152 men and 250 women. Data was analyzed using SPSS version 17.0 software. The measured items were organized by item analysis on the mean of imagination (3.21-3.92), the mean of learning environment (3.55-4.23), and standard deviation (> .75) of the data acquired during the formal survey. The reliability test of the scale was conducted and found to be satisfactory to warrant confidence in internal consistency reliability.

Results and discussions

Due to the novelty of this research topic, a Principal Component Analysis (PCA) with promax rotation was conducted to determine the most appropriate structure of the developed scales. Based on the data, the integrative single-factor solution (explained variables of 33.27%) with an oblique rotation provided the better factor structure both conceptually and statistically. The concept of imagination included items related to productivity, transformation, sensibility, intuition, novelty, exploration, effectiveness, crystallization, and elaboration. The results also showed that the internal consistency of imagination (.81) was considered stable (refer to Table 1).

Table 1. Factor loading and descriptive statistics of the imagination characteristics

Characteristic (Item)	Factor	*M*	*SD*
Productivity (I constantly have ideas toward my designs)	.73	3.27	.80
Transformation (I am flexible in my thinking and can transfer ideas to multiple fields of tasks)	.67	3.55	.76
Sensibility (I often help myself imagine by arousing personal feelings)	.63	3.70	.73
Intuition (I often come up with new ideas leading by my intuition)	.60	3.78	.76
Novelty (I often have uncommon ideas compared to others)	.57	3.21	.78
Exploration (I like to explore unknown areas of knowledge and experience)	.57	3.92	.69
Effectiveness (I often complete my tasks by focusing on effective ideas)	.52	3.57	.71
Crystallization (I am good at expressing abstract ideas by using concrete examples)	.46	3.50	.81
Elaboration (I improve my thoughts by focusing on formalizing ideas)	.37	3.44	.82

In reality, design activities are compound processes that often include iterations or re-definitions of the problem. In order to gain a holistic view of factor structure, the research team combined all the data regarding environmental influence of the three phases and made an integrative factor analysis. The results indicated that the 21 items could be organized into four learning environment factors. The first factor, *social construction*, a seven-item scale (M = 4.04, SD = .54), measured the extent of which participants reported being influenced by the climate of the class. The second factor, *physical component*, a five-item scale (M = 3.55, SD = .48), measured the degree to which participants considered the facilities and messages in an environment would stimulate imagination. The third factor, *organizational measure*, a six-item scale (M = 3.99, SD = .51), assessed participants' perceptions of the influence from the institutional structure and organizational measures. The fourth factor, *human aggregate*, a three-item scale (M = 3.91, SD = .67), indicated the degree to which participants felt that their imagination was influenced by the environment's organizational culture, tradition, or style. This four-factor solution accounted for 50.05% of the variance. Table 2 reports eigenvalues, factor explained variance, cumulative accounted variance and Cronbach's α. Table 3 presents factor loading values of the integrative factor analysis.

Table 2. Eigenvalues, factor explained variance, cumulative accounted variance, and Cronbach's α of the four factors

Factors	Eigenvalues	Explained variance	Cumulative variance	Cronbach's α
1: Social construction	8.646	38.86	38.86	.87
2: Physical component	1.645	5.44	44.31	.79
3: Organizational measure	1.157	3.45	47.76	.82
4: Human aggregate	1.009	2.29	50.05	.89

Table 3. Factor analysis of the 21 items in learning environment

Factor Item	Phase 1 to Phase 3 F1	F 2	F 3	F 4
Factor 1: Social construction				
Mutual support between teachers and classmates	.85			
Teacher's attention over the design process	.80			
Communication and discussion with classmates	.48			
The willingness to accept challenges in class	.46			
Competitive learning climate	.44			
Climate of respecting diversity and free expression in class	.39			
Pleasant learning climate	.38			
Factor 2: Physical component				
Environmental factors such as materials, furnishings, and other interior design		.81		
Dynamic audiovisual stimuli such as rhythm, sound, and movies		.76		
Static visual stimuli such as content, composition, and proportion of images		.70		
Environmental factors such as lighting, sound, and other infrastructure design		.62		
Public spaces for exhibitions and discussion		.43		
Factor 3: Organizational measure				
Teacher's tolerance for error			.66	
Rich learning resources provided by the department			.58	
Teacher's encouragement and praise for taking risk			.57	
A personal space for creation provided by the department			.52	
Explanation and guidance offered by teachers during the design process			.47	
Opportunities provided by teachers for concentration and solitary thinking			.39	
Factor 4: Human aggregate				
There is a culture on campus of putting imagination into practice				.84
There is a tradition of encouraging imagination in the department				.80
Teacher's respect for individual differences				.33

Overall, the *social construction* was claimed to have the greatest effect on stimulating the student's imagination, followed by *organizational measure* and *human aggregate*. Although the *physical component* had the smallest effect, its mean (3.78) was high enough to be considered influential. This result suggests that a soft mechanism like a welcoming climate is the most powerful stimulus to facilitate imagination. Harder factors like institutional measures, intangible factors such as tradition or culture, and physical environment like space and its facilities, are also effective stimuli.

Moreover, the results of the F test and paired comparison technique indicated that means of both phase 1 (analysis) and phase 2 (design/development) were greater than those of phase 3 (implementation/evaluation) in the *social construction* and *human aggregate* factors. The results of *organizational measure* were similar, but mean of phase 2 here was significantly greater than that of phase 1. In addition, the mean of phase 2 was significantly greater than those of both phases 1 and 3 in the *physical component* (refer to Table 4). The results suggest that environmental variables have significant effects on imagination stimulation, especially in the first two phases. Specially, the effect of the *organizational measure* in the second phase was significantly greater than in the other phases.

Both discussion with classmates and free expression in class are important for stimulating imagination in the phase one in order to clarify the design task and initiate action. Having a pleasant learning climate and rich learning resources are critical for concept development in phase two. Mutual support between teachers and classmates and teacher's tolerance for error are crucial for the third phase. The results also imply that a set of unique instructional strategies applied during both phases one and two could be particularly beneficial to students. These results also echo the study done by Büscher et al. (2004) in which the work environment, the tools to be used, and the nature of the task were sought out to form the best combinations for designers to utilize their imagination.

Table 4. F test and paired comparison for environmental influences on the three different phases

Factors	Mean			F	Paired comparison
	Phase 1	Phase 2	Phase 3		
Social construction	4.06	4.08	4.00	12.56*	1 > 3; 2 > 3
Physical component	3.74	3.90	3.70	24.41*	2 > 1; 2 > 3
Organizational measure	4.01	4.06	3.89	26.93*	2 > 1 > 3
Human aggregate	3.93	3.96	3.85	11.28*	1 > 3; 2 > 3

*p < .05.

We examined the relationship between the imagination and environmental factors, and found it reached a significance level, $p < 0.05$. In the integrative analysis of the different design phases, the averaged correlation coefficient is .3, and the individual coefficients are between .23 and .35 (refer to Table 5). The averaged correlation of the first phase is .25, .28 for phase two, and .27 for phase three. The results also showed that the four environmental factors were significantly correlated, $p < 0.05$. The averaged correlation coefficient of the integrative process is .62, and the individual coefficients are between .45 and .74 (also see Table 7). The averaged correlation of the first phase is .55, .59 for phase two, and .58 for phase three. Specifically, the correlation of *social construction* and *organizational measure* was noticeably high. This result may imply that the items of these two factors may be overlapped and thus may need to be modified further.

Table 5. The correlation analysis of the imagination and environmental factors

	Imagination	Social construction	Physical component	Organizational measure	Human aggregate
Imagination	--				
Social construction	.35*	--			
Physical component	.30*	.57*	--		
Organizational measure	.34*	.74*	.53*	--	
Human aggregate	.23*	.66*	.45*	.62*	--

*p < .05.

The research team further utilized the maximum likelihood estimator of structural equation modeling method with LISREL 8.80 to examine the relationship between environmental factors and imagination. The results showed a good fit to match the hypothesis that four environmental factors influence imagination, with $X^2(395)= 1104.13$; CFI = .96, RMSEA = .07, SRMR = .06, TLI = .95. The squared standardized path coefficient of the *social construction* is .0441, the *physical component* is .0144, the *organizational measure* is .0625, and the *human aggregate* is .0225. The residual of this analysis is .81 which makes the total explained variables 19%. This result is possibly because of the high correlations among environmental factors. The high multicollinearity caused an unstable parameter estimation which, in turn, may result in the insignificant prediction result. The other inference by the research team is that, similar to multiple influential factors on human creativity (Shalley, Zhou, & Oldham, 2004), the learning environment is only but one factor stimulating a learner's imagination. Additional factors such as psychology and personality should be added for further inquiries.

Conclusions

As Marshall (2001) claimed, the more quickly things change, the more imaginative we have to be to keep up. Educational technologists need a more radical and holistic imagination to distinguish between enduring fundamentals of learning and teaching, and the transient froth splashed up by new waves of innovation (Goodyear et al., 2010). In other words, educational technologists not only need technological imagination to make predictions about the future, but also need to engage with the practical problems of educational reform in a rapidly changing society. Even more, educational technologists today need to foster a hybrid imagination, mixing scientific and technical skills with a sense of social responsibility (Jamison & Mejlgaard, 2010). Bearing these expectations in mind, this study inquired imagination under a certain societal environment, and tried to learn how this environment influences the inhabitants' imagination. This particular environment is the higher education system.

Imagination in this study is defined as the process of transforming an instructional design student's inner images. The results of this study indicated that imagination is consisted of several characteristics: productivity, transformation, sensibility, intuition, novelty, exploration, effectiveness, crystallization, and elaboration. However, we ask ourselves, can these nine characteristics represent imagination in full? In other words, are there any other characteristics together with the present ones which can signify imagination thoroughly? According to the recent studies, the research team proposed that the indicator of elaboration could be divided into two independent items for further study namely, dialectics and focusing (e.g., Cartwright & Noone, 2006; Folkmann, 2010).

On the other hand, the learning environment is composed of four factors: social construction, physical component, organizational measure, and human aggregate. The *social construction* was claimed to have the greatest effect on stimulating the student's imagination, followed by the *organizational measure*, *human aggregate* and *physical component*. This study also found that there was a significant relationship between imagination and environmental factors, thought the correlation coefficients were not considered high. In addition, according to the recent studies in learning environments (e.g., Gislason, 2010; Kember, Ho & Hong, 2010), student learning should be separated as an independent variable to be studied. This notion, therefore, casts light on the direction of scale revision.

The graduate participants declared to have a higher imagination than the undergraduates. The female participants weighted the influence of *physical component* on imagination stimulation to be greater than the male; and graduates weighted the influences of both *social construction* and *organizational measure* to be greater than the undergraduates. The possible explanations and suggestions are presented in the previous section. The environmental influences of the first two phases (analysis and design/development) are greater than those in the final phase (implementation/evaluation). Specifically, the physical and organizational influences of phase 2 were significantly greater than those in phase 1. All of these findings have implications for instructional strategies of imaginative education in the educational technology field.

Acknowledgements

The current study is part of the research projects (NSC98-2511-S-155-005-MY2) supported by Taiwan's National Science Council. The authors would like to extend their gratitude to Dr. Hsu, Yu-Lin in Yuan Ze University for her valuable contributions.

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ICON DESIGN PRINCIPLES FOR PRESCHOOLERS: IMPLICATIONS DERIVED FROM CHILD DEVELOPMENT

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Abstract

To better design GUI for preschool users, this study suggests three icon design principles: the principle of obvious visibility, the principle of visual resemblance, and the principle of conceptual resemblance. The conceptual reasoning behind the proposed principles is borrowed from research areas of semiotics, picture-reading and neurodevelopment of children. These principles had also been applied to icon designs for the self-made story-authoring software, *MyStory*. With this application, the readability of the designed icons is investigated. Icon designs violating any proposed principles result in low readability. Five reasons for lower readability are proposed: unrealistic decorative designs, distorted written styles, experience void, overgeneralized association, and infrequently visible.

Keywords: Child development, Icon design, Interface design, Preschoolers, Story-authoring

Introduction

Graphical user interface (GUI) design has not only made computers more accessible to adults but also to children of early ages. One of the reasons why GUI has created wider and more possible access to computers for young users is its use of symbolic icons as indicators of computer commands. This assists the users to be able to operate technological tasks visually and to gain mastery in the realm of symbolic mentality (Kay, 1990). Specifically, the GUI design emphasis is on eliciting metaphors from real objects or concepts that the computer users already know well, so that the users can intuitively induct the symbolic meanings of the icons and master different functions of computers (Blackwell, 2006). However, different users' interpretations may vary, and the variations may be extended beyond what the designers had originally expected. Only if, during the design process, the designers can put themselves in the shoes of the computer users, feel what the users feel, and ponder what the users are pondering, will the potential icons be possibly interpreted correctly by the users (Norman, 1999). Hence, some researchers suggest that during the process of designing computer icons for young children, some prospective users should be invited to participate in the design process to better explore their psychological modifications and interpretations (e.g., Druin, 2002).

There were two flaws found in the suggested children-participating design process despite the benefits given above. First, in such design process, the designers were usually too focused on the design itself to investigate the psychological modifications processed by the children or to even notice why the potential icons were successful (Whittaker, Terveen, & Nardi, 2000). Moreover, if the target users were preschoolers, communication between the designers and the participating users was somewhat restricted because of the limited language expressions of the youngsters. Hence, the developmental psychology of the youngsters needs to be considered (Sluis-Thiescheffer, Bekker, Eggen, Vermeeren, & de Ridder, 2011).

To solve the above problems of the GUI design for preschool users, this study has suggested a set of icon-design principles from the perspective of child development. The conceptual reasoning used to propose the design principles was borrowed from different research areas, such as semiotics, picture-reading, and neurodevelopment of children. This new set of principles has also been applied to icon designs for the self-made story-authoring software, *MyStory*. In addition, the readability of the designed icons has also been investigated in the current study. To explore the interpretations made by preschool users of the icons of *MyStory*, this study contained two phases of testing. The first phase focused on an exploratory-icon recognition test. Modifications of

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icons were made corresponding to the first test results. The second phase included a summative-icon recognition test to investigate the readability of the modified icons used in *MyStory*. Findings from the recognition ratios and from children's responses to our interview were elicited and suggestions were made.

Icon design principles for preschoolers

Peirce's triadic model is useful for comparing design intentions with perceived meanings. According to the Peircean triad, the interpretation of an icon metaphor involves three components: (a) an object, which is the abstract task; (b) the icon, which is the pictorial symbol used to stand for an object; and (c) the interpretant, which is the interpretation made by the users (de Souza, Barbosa & Prates, 2001). Based on this model, an icon is effective only when the interpretant of the user matches the object that the designer had intended with the icon. In line with the Peircean triad, the object and the interpretant shown in Figure 1 should agree. To reach such agreement, a proper icon design may be crucial. A good icon metaphor can bridge the two sides of the Peircean triad (e.g., *a*-*b* and *b*-*c*), so that the users can properly associate icons with meanings given by the designers. For the purpose of reinforcing connections of *a*-*b* and *b*-*c*, this study proposes a set of icon design principles: the principle of obvious visibility, the principle of visual resemblance, and the principle of conceptual resemblance.

Principle of obvious visibility

With insights contributed by developmental cognitive neuroscience, scholars found that the frontal lobes that related to *Executive Functions* (EFs) and short-term memory are relatively immature for children from age 3 to age 8 (Fusaro & Nelson, 2009). EFs allow adults to pay attention to relevant information on the interface while inhibiting irrelevant information. With immature EFs, younger children are not able to have a good command of attaining the information on the interface as adults do. For young children, out of sight usually means out of mind. Hence, it is not surprising for Gilut and Nielsen (2007) to see that school-aged children surfing the internet mainly interact with what was visible above the fold, and to suggest that designers should make icons look clickable with visual rollovers to serve as cues. In accord with the viewpoints of Gilut and Nielson, this study tries to suggest that icon design for child users should be compatible with the principle of obvious visibility in order to attract attention and to assist recall for young children. Thus, *a*-*b* in Figure 1 will agree. This viewpoint can be illustrated by the example of Figure 1. The designer chooses "a blank picture book" as the metaphor of "starting a new drawing", and uses  as its icon. The icon should be able to attract the young users' attention.

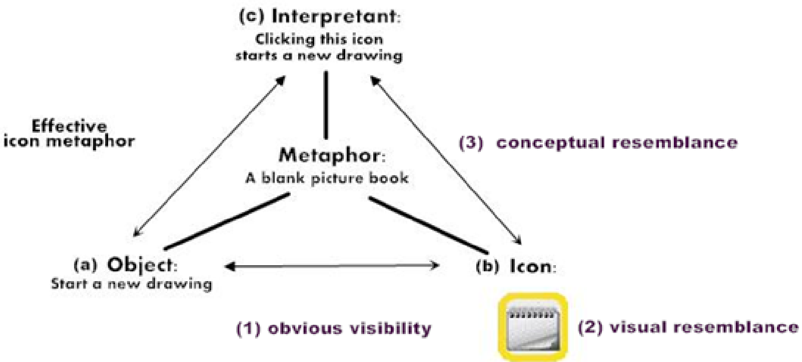

Fig. 1. Three principles proposed to reach an effective icon metaphor

Principle of visual resemblance

Based on the framework derived from Picture Reading (e.g., Gattis, 2001), researchers of this study suggest that the users should receive both visual and conceptual cues via icons. These cues must be helpful in the retrieval of storage memories for recognition and understanding (Bauer, 2009). After the user receives visual cues provided by the icon, the icon's visual representation will preserve perceptual resemblance of what it represents to reactivate the neural network that represents the image. As a result, in Figure 1, the users can associate the icon with "a blank picture book". Noteworthy, using a concrete object as a metaphor does not guarantee the graphical image resemble the object. The graphical image of an icon must meet the principle of visual resemblance to be recognized.

Principle of conceptual resemblance

After the user recognizes the icon metaphor, he/she can then proceed with reading the conceptual cues provided. Similarly, a metaphor should be able to convey concepts and attributes resembling the object to reactivate the neural network that represents the concept. As in Figure 1, the drawing action associated with a blank picture must resemble the action of starting a new drawing, so that the long-term memory of the users can be activated to interpret messages delivered by the icons. Child users will be able to have *b-c* agree easily by being introduced to picture books in advance. That is, the prior experiences of a user can help to store images and build up conceptual neural networks in the brain. The principle of conceptual resemblance is also in accord with the norms for meaningfulness and familiarity proposed in prior studies (McDougall, Curry, & Bruijn, 1999).

In summary, these principles emphasize that icons should be visually conspicuous to attract the attention of preschool users and resemble the visual features of metaphors, so that preschoolers can recognize them immediately. These tips also note that icons should also resemble the conceptual and functional features of the metaphors to simulate the appropriate association within preschoolers. To demonstrate the feasibility of the proposed three principals in explaining children's interpretations of icons, this study applies them to discuss the readability testing results for icons of a story-authoring software, *MyStory*. *MyStory* is briefly described in the following section.

The design of *MyStory*

The program design process

MyStory is a story-authoring program, which allows 3-6 year old preschoolers to imagine and tell stories of their own with digital photos and audio inputs. Storytelling serves as a critical role in children's development. Young learners tell stories about events they have experienced. In storytelling, children not only practice their commands of knowledge, but also need to take the listener's perspective into consideration (Hamilton & Weiss, 2005).

The program design process of *MyStory* involves requirement gathering, iterative program design, and users' feedback analysis. Requirement-gathering was performed through field observations and through a questionnaire survey. First, the social context in which children work was observed. Second, thirty-nine preschool teachers, with 3-18 years of teaching experiences, were asked to respond to a questionnaire about what children may need to operate well on a story-authoring program, and what teachers may request to integrate a story-authoring tool into teaching. The iterative program design process involved serious discussions and brainstorming. Members of the design team come from multiple disciplines, including early childhood education, computer science, and multimedia design. Besides referencing related theories, user requirements are the major concern. Users' feedbacks were gathered from the teachers and the child users through quantitative and qualitative surveys. In this study, only children's feedbacks were discussed. Children's feedbacks were gathered through an exploratory and a summative interface usability evaluation.

The icon and interface of MyStory

In practice, generally there were two teachers and thirty children in a preschool classroom, and only one computer in the story-authoring center. Roughly, two to three users may choose to enter the story-authoring center at one time and work cooperatively to create stories. Therefore, the interface design must fulfill the needs of multiple users at one time as well as children's desire to work with peers. Hence, the interface of *MyStory* incorporates multiple entrances for numerous child users (Figure 2a). A child may click on his/her numbered entrance and then enter a personalized interface with the child's name on the screen (Figure 2b). In *MyStory*, story authoring tasks are broken down into five easy steps as a scaffolding structure, including: selecting photos (Figure 2c), adding book covers, recording narratives for each photo (Figure 2d), selecting background music, and selecting an animation effect.

Fig. 2. (a) multiple entrances; (b) personalized interface; (c) photo selection; (d) audio recording

This study adopts the three principles proposed in this study to design icons. To comply with the obvious visibility principle, icons were animatedly designed and simple visual rollovers were added to serve as cues to young children that an icon is clickable. For example, the “door” icon was used as a metaphor of an entrance into the interface. When the icon is rolled over, the “bear” on the “door” would wave hands to attract the eyes of the preschoolers. To meet the requirement of visual resemblance, the graphical image of the “door” icon was composed of two visual features, a colored rectangle as the door per se and a small round dot as a door knob. These two images are often associated with the object of a “door” in real life. Also, in real life a door is often used as an entrance to another room which is in accordance with the principle of conceptual resemblance. Likewise, conceptually a “book” may be used to resemble a “story”. Thus, books placed on the bookshelves symbolize a child’s story created previously. A new book held and opened by a bear signifies starting a new story.

Icon readability tests

In this study, an interactive simulating interface prototype was designed after the exploratory icons had been completed for *MyStory*. The prototype was used on the preliminary test to first examine the readability of the exploratory icons, and then to gather feedback for modifications. After the icon modification was completed, a summative readability test on the interface icons was conducted. Because ongoing modifications were underway between tests, the number of tested icons was different on the two tests: 19 on the exploratory test and 22 on the summative test.

Participants

Nineteen kindergartners and 16 1st graders participated in the exploratory test. Their average age was 6.7 (*SD* = 5.1), and male children consisted of 64% of the total. The 1st graders were invited to participate in the exploratory test because they could articulate themselves more clearly. Articulated feedback would benefit the upcoming icon modifications. On the other hand, only kindergartners were invited to participate in the summative test since icon modifications had been completed at that moment. The number of the participants in the second phase was 20, and their average age was 5.5 (*SD* = .24), and male children consisted of 56% of the total.

Semi-structured icon readability tests

The methods of investigation on both exploratory and summative tests are identical. In a set-off space individual participant was directed by the testers to complete the process of composing a story step by step. Tasks and listed questions were aimed at assessing the child’s ability to identify icons. Examples of commands given by the testers are listed as follows:
Now, let’s start to create a story. Which button should we click?
What should we do to choose a picture for our story? Where should we click?
What should we do to choose a cover for this book?
What should we do to move forward to the next step after we have selected the book cover?
What should we do to record our story?

On both tests, the tester spent about 20 minutes introducing the software to the tested child. If the child identified an incorrect icon, the researcher would further interview the child to explore his/her possible reasoning.

Measure of readability

For each icon, the number of the participating children identifying it correctly was divided by the total number of the participant children as the recognition ratio. That is, icon readability is measured by whether the users can recognize the icon requested by the tester in this study.

Qualitative analysis

When children identified an incorrect icon, their reasonings were recorded and transcribed. Two researchers read the qualitative data and elicited the common patterns underlying children’s reasonings. A third researcher was responsible for challenging the proposed patterns. The discussion continued until they reached consensus.

Results

Recognition ratio of icons

By comparing the quantitative results of both the exploratory and the summative tests, the researchers found that the recognition ratio of the less recognizable icons on the exploratory test reached a higher recognition ratio on the summative test after modifications. Results of the exploratory test showed that the recognition ratio of all icons ranged from .23 to .95 (M = .83, SD = .10). After modifications, the recognition ratio was raised to the range from .65 to 1.00 (M = .92, SD = .06). The four less recognizable icons, which had the recognition ratio lower than .75 of the exploratory test, included two concrete daily objects (TV and pencil), an abstract triangular symbol, and a set of digital figures. After modifications, the recognition ratios of both concrete and abstract icons were all significantly enhanced. Table 1 illustrates the graphical design of these four less recognizable icons on both the exploratory and the summative tests. Despite the fact that modifications of the icons did raise the average recognition ratios, results of the summative tests still show that there is room for improvement. In the following section, data of interviews with children provide further explanations.

Reasons for lower recognition ratios

According to the patterns elicited from the qualitative interview, there are five reasons why the icons are less recognizable by children: unrealistic decorative designs, distorted written styles, experience void, overgeneralized association, and infrequently visible. Examples will be exemplified below.

Table 1. The recognition ratios and graphical design of the less recognizable icons

Function of Icon		Demo	Bookshelf No.	Play	Edit
Exploratory test (*n*=35)	Icon				
	Ratio	.49	.57	.49	.23
Summative test (*n*=20)	Icon				
	Ratio	.95	.90	.75[a], .90[b]	.65

a: icons appear only when rolled over by a cursor; b: icons appear constantly on the preview window.

Unrealistic decorative designs

On the exploratory test, in the self-made software, *MyStory*, a TV was used as a metaphor for a user support video. Children could click on the TV button to watch a tutorial video. Seventeen percent of the participating children could not recognize the graphic as a TV because it had two extra "horns" (in the children's words) on its top surface. This indicated that a decoration inconsistent with the children's real-life experience might hinder recognition. After removing the unnecessary decorations which had no resemblance to the children's life experiences, it became easier (90%) for the participating children to choose the button when they were asked to seek a tutorial video clip.

Distorted written styles

In *MyStory*, stories made earlier by the participants were placed on the personal bookshelf interface. Children could click on the number underneath to browse through the multiple bookshelves. Fourteen participants were not able to recognize the symbols as numbers. Preschoolers first learning the numerical system may have a much more rigid scheme for its representation, and distorted numbers may hinder the assimilation process. After switching to a classical style, the recognition ratio reached to .90 on the summative evaluation.

Experience void

A previous experience void of conducting certain behaviors might hinder children from associating the metaphors with the real objects. For example, a triangle is used in the prototype to indicate "play" because it is an often-seen icon on audio or video tools, such as a CD player. Fourteen percent of the participating children expressed that they could not associate it with "play". The triangle metaphor could not be recognized by children because of their previous experience void of using audio or video tools. After modification, a concrete image of eyes was used instead to be associated with "look" or "play". This icon appears in multiple places on the interface. In the photo-selecting interface, this icon located on the preview window is consistently well-identified.

Overgeneralized association

The designers' overgeneralizing the experiences of adults regarding association as being the same for children might hinder children from associating the icons with the real objects. The prototype used a pencil as a metaphor to represent the "edit" command. On the exploratory test, children had trouble associating the metaphor with writing or editing. Eleven percent of the participating children could not associate the metaphor with a real pencil because they said the shape of the pencil should be thinner and longer; some (23%) expressed that the pencil should be used for drawing but not for writing or editing. This may imply that the important features of how children perceive objects could be very critical in whether they could associate the metaphor precisely with real objects. Oftentimes, adults, including the designers, overgeneralize that adult experiences and the experiences of the children's world regarding association are compatible. This overgeneralization in design may confuse children.

Infrequently visible

After modifications, in the completed software program, a highlight would appear when children rolled over to the completed book (story) on the bookshelves. Children could simply click on the book to initiate the editing process. However, the recognition ratio was still low (.65). The possible cause may be derived from the children's responses such as "Oh! I forgot!" This response may indicate that some participants failed to roll the cursor over the completed books, so they did not spot the yellow highlight which served as a hint for initiating the editing process. Also, in the personal interface, to make the interface simple, the play icon "eyes" appears only when the cursor is rolled over to a specific book. Its recognition ratio (.75) is lower than that of locating stationary on the photo-selecting interface (.90).

Discussions

Icons on this study were designed and modified based on the three principles of obviously visible, visual resemblance, and conceptual resemblance. Results show that most of the completed icons could be recognized by the preschooler participants. Findings of this study indicate that failing to recognize the icons might be caused by violation of any the above principles. Principle violations will be discussed further in the following.

Violation of the principle of obvious visibility

To make the interface simple and clear, sometimes designers may make icons (e.g., the play command) or visual cues (e.g., the yellow highlight around the book) appear only when the participants roll over the icons with the mouse. However, the icons or the highlight sometimes do not show up because the participants have not attempted to roll the mouse over the screen. This is an example of violating the principle of obvious visibility in design. Gilut and Nielsen (2007) point out one of the importance of usability design strategies for children is that designers should make clickable items look clickable and provide rollover visual feedback. This echoes the principle of obvious visibility.

Violation of the principle of visual resemblance

In the design process, designers might try to shape the icons into a cartoon style, add redundant decorations (e.g., antennas on top of the TV) or twist their original outlook (e.g., distorted numbers) to make the icons more special. However, this design process may run the risk of blurring the visible features and hinder the participants from retrieving their existing image schemes to appropriately interpret the icons. It seems that sometimes the exterior beauty of the icons may hinder readability (Russo & de Moraes, 2003), and simplicity is the best policy in icon design (Rogers, 1989).

Violations of the principle of conceptual resemblance

Most metaphors used in this study were modified images from daily objects. An abstract symbol was adopted only when no concrete object could be found to represent the concept. Although concrete objects are more recognizable than abstract symbols (Blackwell, 2006), interpretations of concrete objects (e.g., pencil as metaphor for editing) are often restricted by the children's prior experiences. In addition, the children's interpretations of certain abstract symbols might differ significantly from those of adults. For example, in this study the preschooler participants were prompted by a triangular symbol to proceed to the next step, but they failed to associate it with the command "play". Children have to learn to understand the meaning of an abstract symbol (McDougall, Curry, & Bruijn, 1999). However, icon designers often overlook the familiarity property of an icon as an important determinant of its usability.

Discussions

By applying the Peircean triad relationship to define effective icons, this study suggests that the users need to connect the object with the interpretant to recognize and interpret correctly the icons. First, the principle of obvious visibility concluded in this study emphasizes presentation of the icons. Second, the principle of visual resemblance focuses on the graphical design of icons. These two principles reinforce the connection between the object and the icon. Finally, the principle of conceptual resemblance is more related to the choices of metaphors. This principle places an emphasis on reinforcing the connection between the icon and the interpretant. Finally, all of the above findings can be supported by development theories. Although there have been several studies proposing guidelines for designing websites or computer software for children (e.g., Gelderblom & Kotze, 2008; Gilut & Nielsen, 2007), very few of them focus on readability of icons. The principles concluded in this study might not answer all of the problems encountered in the process of icon design, but their simplicity might still assist designers to enhance the effectiveness of icons.

Acknowledgements

This article is part of a research project founded by *Taiwan National Science Council* (NSC96-2520-S-142-002-MY3).

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IDENTIFYING AUTISM SYMPTOMS USING AUTISM SPECTRUM QUOTIENT (ASQ) A SURVEY AMONGST UNIVERSITI SAINS MALAYSIA STUDENTS

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Abstract

The advancement of ICT technology especially in detecting rare diseases has becomingly common in today's technology. One of the issues that arise is how this technology could help human to identify Autism characters? Little research has being made to educate society how to recognize this symptom and most of the past research was concentrated only for autistic child and none of the outcomes are dedicated for the society to understand. This study investigates the levels of autism symptoms amongst target respondents in Universiti Sains Malaysia by using Autism Spectrum Quotient (ASQ). This instruments is a questionnaire published in 2001 by Simon Baron-Cohen and it consists of fifty questions and it aims is to investigate whether adults of average intelligence have symptoms of autism or one of the other autism spectrum conditions. A quantitative survey method through the distribution of questionnaire and online survey form has being applied. The finding shows that significance levels of autism symptoms amongst respondents are rising and become silently increased. The findings from this study will help researcher to analyze and propose suitable method in identifying Autistic behavioral symptoms through engaging multimedia learning environment.

Keywords: Autism; Spectrum; Quotient; Symptoms; Survey;

Introduction

This study reports the findings from a survey that was conducted on a number of undergraduates from Universiti Sains Malaysia with the hope to investigate the probability of possessing autism symptoms themselves. This study is really important as according to previous literature reviews and past researches on Autism cases, the number of reported has been increasing tremendously over the years. The execution of this study is also crucial as the level of knowledge on this issue is alarmingly low due to a small number of researches done in the past for this particular area. The lack of knowledge has contributed to the lack of awareness and hence the little support from local authorities. According to a report done by Malaysian Ministry of Health, Autism is a rising issue throughout the world including Malaysia and reported cases has been increasing fast over the years. Along with that, there has been a considerable increment in the amount of effort in instilling awareness among Malaysians. However this issue still goes unnoticed among Malaysians. The fact that there is not exact cure for Autism requires the society to be aware of this matter. Early exposure and education would definitely help in reducing its implication later.

2. Literature Reviews

See, C. M. (2004) defined autism as a development disorder characterized by impairments in three areas namely communication, social and repetitive behaviours. Autistic symptoms normally start showing when a child is aged between 1 to 3 years of age. Unfortunately, many parents do not know the basic symptoms plus the characters would normally vary according to the children themselves. So, it would be harder for the parents to notice the symptoms. During childhood, autistic children may fall behind in comparison to their same aged peers in the areas of communication, social skills, and cognition. As reported in Jasni, Wan Ahmad Jaafar & Toh (2010), the lack of awareness on Autism is the contributing factor of why autism is not well understood and professed by the society. Mansor (2010) supported that autism is often misconstrued as mental illness.

Consequently, these children are mostly kept at home and hidden from the outside world. Azizan, H. (2008) stated that due to this, most of them do not have the same chances like the rest of the children without autistic behaviours. These children might have been refrained from obtaining education, which happens to be the basic human right; as well as the access to health care. This scenario must be put to a stop and society must take decisive step in educating those around us on autism. We need to teach the parents and society about the symptoms to be looked out for if they suspect their children of the probability in suffering from autism.

They also need to be convinced that being diagnosed with Autism does not equal to the end of the line as there is hope with these children as well; just the same as the other normal children and the only difference would be the effort that they throw in to be successful in life. Autism should not be the reason why children stop getting the rights that they are entitled of; the right to live as a normal human being. That is the main reason why people should be educated on this issue. Teaching the children to take care of themselves is one crucial step in realizing a better world for them.

3. Objective

This research aims to outline the feedback from respondents of Universiti Sains Malaysia and propose the best method in identifying and learning Autistic characters. The core research questions that guide this study are as followed;

- **Can the specific instruments help to detect autism symptoms?**
- **Can the feedback helps to implements alternative method in learning autism?**
- **Does these instruments suitable to be use in identifying autism symptoms?**

More specifically, this research has four objectives to achieve;

- **To determine which percentage of age group having low and high levels of autism symptoms.**
- **To determine which percentage of race group having low and high levels of autism symptoms.**
- **To analyse feedback based on Autism Spectrum Quotient (ASQ).**
- **To suggest conceptual framework of alternate method in learning autistic behavioural symptoms.**

4. Problem Statements

In Malaysia, this issue of Autism is silently increasing and this shows that this issue should be stopped from being taken for granted all these years. Based on a research that was held in Perak, it reported that one of every 625 children is autistic. The findings do not represent the actual amount of children diagnosed with autism but the number might also be higher than the recorded one. The lack of research on how the society should be educated about this disability makes things worse. Nobody knows what has caused autism; no proper guidance is distributed and no information of autism can be shared at school level. Autism needs special attention from our society since the cause of this disease is still unknown. More support in terms of research and guidance are needed in order to educate society how this issue could be handled at the earlier stages.

Furthermore, there is no specific method that is accessible by the society in order to learn and identify autism characters. As a result, parents would usually just rely on the information given by the psychiatrist or doctor and this is not really helping as normally their service is quite limited due to the lack of expertise. Thus the shortage of knowledge will also result in parents who cannot estimate the right amount of money to be spent on their autistic child. Speech therapy and physiotherapy cost alone as much as RM100 per session and a child needs at least one session a week and this is often beyond the means of an average Malaysian family. Another figure that may incur more cost to this matter is consulting advice from physiotherapy, speech therapy, behavioural therapy and a few others. This does not include cost of living expenses such as transport, house rent, food and schooling. Parents would have a lot on their minds that somehow will put the child on hold.

Another worrying issue is the lack of support from government and private sector in terms of providing more appropriate centre and facilities that can help autistic parents in getting the right support that they need. To this day, there is no official specialized building or centre that runs by the government agency in providing services to these autistic children. NGO's like National Autism Society (NASOM) is among the non-profits organization that are running the services. From their observation, there is no specialize doctor or dedicated physiotherapist available at government hospital that can give consultancy to an autistic child. This is a sad phenomenon, considering that these children are not getting the attention that they should be given.

5. Methodology

The targeted population for this study are from various centres of study in Universiti Sains Malaysia, Pulau Pinang. The unit of analysis was the group of fulltime undergraduate students from selected schools and the sampling frame lists received from registrar at their respected centre. This survey adapted one instrument called Autism Spectrum Quotient (ASQ) which was developed by Simon Baron Cohen (2001) in order to detect autism symptoms. This instrument contains fifty (50) questions of Likert scales where the respondents will be required to select one option at one time. The determination of sampling size is based on the literature reviews of the growing rate of autism cases amongst society has been increased in recent years and this number chosen hopefully will be generalized amongst students in this university. Before distributing the questionnaires, the targeted respondents are identified and emails are sent to them as a way of acknowledging the purpose of this study as well as the questionnaire. They are be notified through email. Once they have agreed to it, then only the questionnaires are distributed among them. There is also a link given on the questionnaire; this link will lead them to answering the questionnaire online. Descriptive statistic, ANOVA, correlations and regressions analysis have been conducted using SPSS to analyze the outcome.

6. Reliability Test

A reliability test was carried out at Universiti Sains Malaysia, Pulau Pinang with the purpose to measure the average level of respondents towards their knowledge on Autism by adopting the instrument of Autism Spectrum Quotient (ASQ). The purpose of this instrument is to investigate the probability of adults with average intelligence in having symptoms of autism or one of the other autism spectrum conditions. This instrument consists of 50 statements, each of which is in a forced choice format. Each question allows the subject to indicate "Definitely agree", "Slightly agree", "Slightly disagree" or "Definitely disagree". Approximately half of the questions are worded to elicit an "agree" response from normal individuals, and another half is to elicit a "disagree" response. The subject scores one point for each question which is answered "Autistically" either slightly or definitely. The questions cover five different domains associated with the autism spectrum: social skills; communication skills; imagination; attention to detail; and attention switching/tolerance of change.

Two centres of study have been selected and target population for this study consisted of seventy six (76) students from two faculties of study. The unit of analysis was the fulltime undergraduate students from selected schools and the sampling frame lists received from registrar at their respected centre. These entire students have been selected randomly after they have finished their class. Class lecturer were contacted and consented to allow the authors to solicit student participation. The determination of sampling size is based on the literature reviews of the growing rate of autism cases amongst society has been increased in recent years and this number chosen hopefully will be generalized amongst students in this university. Criteria for participation included (1) being current undergraduate students and (2) majority of students were from 1st and 2nd year.

Based on the scoring point set by Autism Spectrum Quotient (ASQ) at below Table 3.12, it is shown that majority of target respondents do have Average score of autism symptoms. This scoring point shows the indicator of which category of respondents having the most characteristic of autism symptoms. Scoring from 0 – 10 is LOW, 11 – 22 is AVERAGE, 23 – 31 is ABOVE AVERAGE and 32 – 50 score VERY HIGH. Of those participating, 34.2% were male and 65.8% were female. The Malay's dominating the population in term of Race with 69.7%, Chinese with 27.6 and others with 2.6%.

Table 3.12 **Autism Spectrum Quotient (ASQ) scoring point**

Point	Indication
0 - 10	**Low**
11 - 22	**Average** (Most women score about 15 and most men score about 17)
23 - 31	**Above Average**
32 - 50	**Very High** (Most people with Asperger Syndrome or high functioning autism score about 35)

Table 3.1 **Final result of achievement**

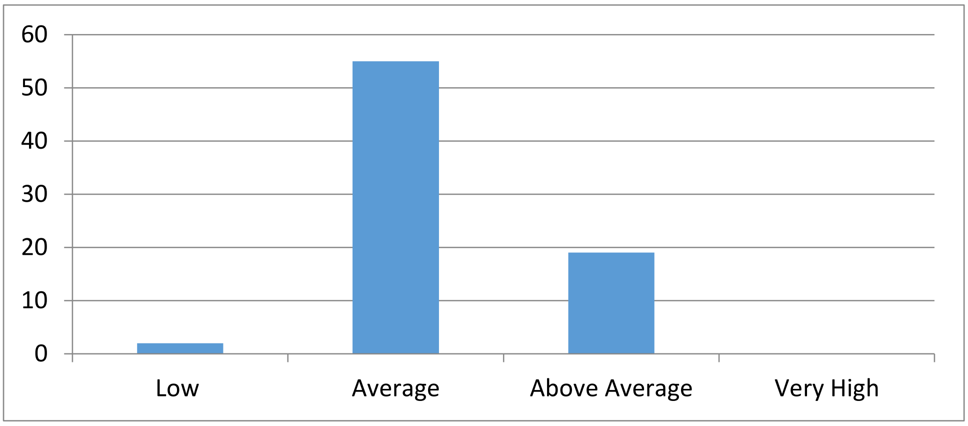


Table 3.1 above shows the result from this baseline test. Based on the guideline from ASQ scoring system, students who scored LOW level of autism symptoms was two (2) people and fifty five (55) students having the most AVERAGE of autism symptoms and nine teen (19) students having ABOVE AVERAGE. None of students scored VERY HIGH level in this test.

Table 3.2 **Score between Genders**

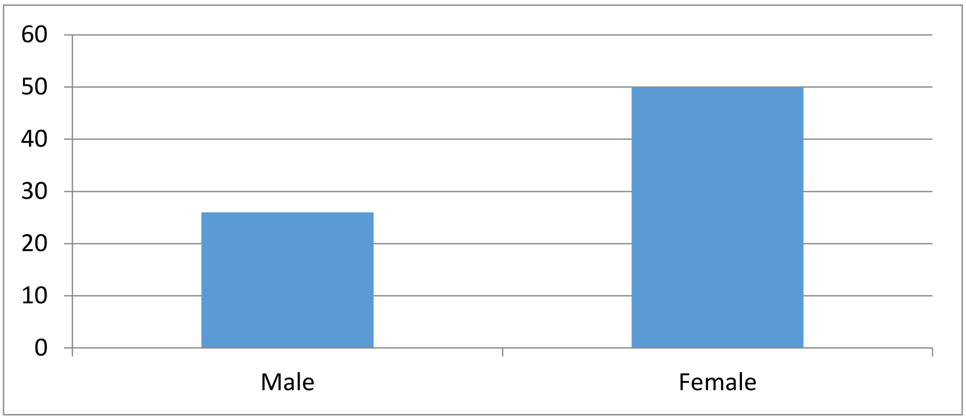
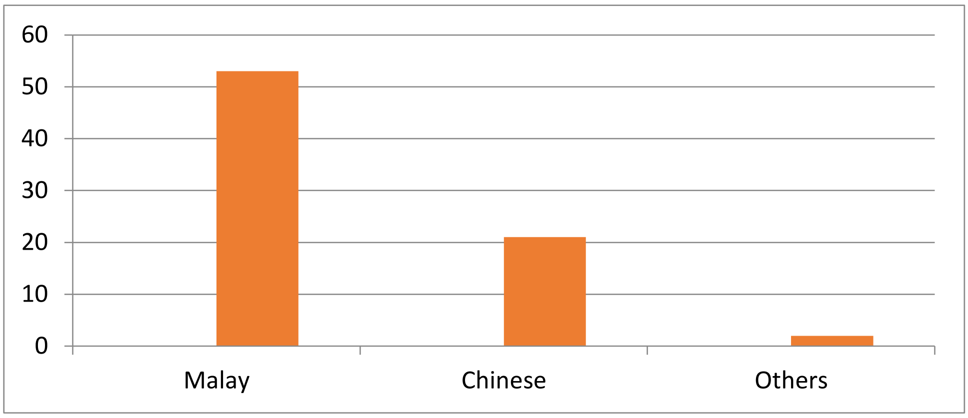


Table 3.2 above shows the achievement in term of demography gender where Female is the group with higher percentage; effected by autism symptoms with a score of 65.8% and that women contributing a highest percentage of having the most affected symptoms in comparison to Men at the score of 34.2%.

Table 3.3 **Score between Races**



In terms of which race are effected most as shows in Table 3.3, Malay students contributing a highest numbers of having the most effected symptoms with fifty three (53) students than Chinese where the score was twenty one (21) compare to Others races which scored only two (2) students.

Case Processing Summary

		N	%
Cases	Valid	76	100.0
	Excluded[a]	0	.0
	Total	76	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.801	50

The reliability coefficient of Cronbach's Alpha for this survey was achieved at 0.801 after being calculated.

7. Future Work

The feedback will be analyzed and the final outcome will be used in developing new learning materials that be utilized by the society. All these characteristics of Autism will also be converted into cartoon characters and these converted images will be presented to the public by using interactive multimedia learning. Prototype will be made available online as well so that it will be easier when it comes to accessing it; once the validation of the prototype has completed.

8. Conclusions

From the findings, it can be concluded that the number of children with Autism in our society have increased tremendously over the years without exposure to the public's attention. Our society must be educated on this matter as this should not be in gray area anymore. Actions should be taken to inform our society in order to instil awareness among them on this matter. Early exposure to these children might save their future and parents should be made aware of this. That is why it is important to develop and implement new suitable learning materials that would suit their needs.

9. Acknowledgement

I wish to thank Dr. Zainudin Mohd Isa from School of Education and Mr. Arman Abdul Razak from School of Housing, Building and Planning, Universiti Sains Malaysia who are giving a fullest support in getting the testing session running smoothly. And not to forget big thanks goes to the participants of the testing sessions. The testing presented in this paper was carried out as part of my PhD research.

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ITUNES UNIVERSITY: POTENTIALS AND APPLICATIONS

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Abstract

This paper aims to introduce iTunes University as a service that can be used to design and distribute courses that supplement traditional print media. Besides, it purports the pros and cons of the iTunes university service such as modernizing the metarials, easy access and organization, free courses and positive marketing, and expense, training, losing control, and investment respectively. The paper also focuses on the educational opportunities attached with the iTunesU application and its connection with other apple technology and discusses how the platform can be used to create interactive learning material for students at various educational levels.

Key words: Podcasting, apple, i-tunes, i-tunes university

Main text

1. Introduction

Previous studies reporting that podcasting is regarded favourably, indicates the potentials of podcasting as a benefit environment for the general learning tasks. “Podcasting” refers to the distribution of digital media files series including audio and video materials, by a podcast creator over the Internet. Heilesen, (2010; p. 1064) states that “podcasting may be an answer to some of the challenges to higher education to modernize, to open up, and to develop a competitive edge.” Vogele and Gard (2006) distinguish three categories of administrative podcasts, special lecture series, and classroom podcasts. This paper will focus on the classroom captured podcasts and their potentials for improving learning in the context of a new medium provided by Apple.

Jowitt (2008) summarizes the pros of podcasting in teaching and learning as portability, flexibility, convenience, listening anywhere at any time, multitasking while moving about, easy Internet access when needed, listening repeatedly, controlling speed of playback, automatic RSS subscription, free and individual choice of what to listen to, special advantages for auditory learners, enhances services to distance and online-students. Among those capabilities mentioned above, Heilesen (2010) perceives ‘replaying repeatedly’ as the most obvious benefit of podcasting since there is a ground of evidence indicating that students use podcast while doing revisions and preparing for exams. Evans, (2008) claims that there is some evidence that students consider podcasts to be more reliable and effective than their own notes.

The teachers can adopt podcasting as a medium to deliver learning assets for revision and review after teaching. Besides, they may develop scheduled podcasts with updated, background information and guidance for curricular activities such as brainstorming and lecture summaries. Moreover, podcasts can serve as tools to improve problem solving skills. To exemplify, teachers may provide their students with recordings of different problems via podcasts prior to a lecture and then discuss the problems with learners. On the other hand, it is not necessary to create your own podcasts. In fact, you can incorporate podcasts made by other people into your course of teaching. Apple iTunes now features a section of their store called iTunes U which features free audio & video downloads from dozens of universities across the United States and around the world including

Stanford, Duke, MIT, Arizona State, and more. Bilkent University is also involved into the project by allocating budget and staff for capturing courses from various faculties.

2. iTunes University

The advancements in lecture capture technology provided educational stakeholders with simple, substitutional recordings of class teaching (Ramaswami, 2009). Besides, open content, allowing for free way of obtaining higher education, has been used to develop alternative channels towards higher education by focusing on collective knowledge and the sharing and reuse of learning content. There has been multiple projects and organizations that promote learning through open content and some universities are making their courses freely available on the internet via iTunes University. To exemplify, Duke University initiated to deliver iPods to its intake and to populate the devices with course material and timetables. iTunes University, a website with downloadable educational podcasts, can provide students the opportunity to obtain professors' lectures when students are unable to attend class (McKinney, Dick, & Luber, 2008). As one of the most widely-accessible platforms available that can be used to supplement traditional learning material with more modern alternatives iTunes University receives digitally recorded course contents and videos from many leading universities throughout the world. It is becoming one of the most popular online educational catalogs, covering over 800 universities with over 350.000 audio and video files from educational institutions around the world. According to Apple, there have been over 700 million downloads to date of iTunes University. Created in 2007, iTunes U is advertised by Apple as a service that can be used to design and distribute courses that go beyond traditional print media. Designed to appeal to educators, the platform can be used to create interactive learning material for students at university, college or K-12 level (Osborne, 2012).

A video lecture involves recorded lectures and demonstrations which can be used to support an asynchronous learning method giving students a better ability to learn independently of time and place (Viksila, 2011). Recorded video lectures gives learners more control for their own time scheduling. The idea of educational podcasts that are easily accessible takes mobile learning, or m-learning, to the next generation (McKinney et al. 2009). Apple points out that the pros of iTunes University include that it is easily accessible 24 h per day, students can listen to the podcasts whenever and wherever they choose, and it helps to keep the students motivated because it engages them in a way that is very familiar to them. Although these potentials seem to make educational podcasts appealing to students. The addition of iTunes University as a resource for students in the classroom is interesting because it gives students a chance to listen to a lecture for the first time or listen to a lecture that they attended in person additional times after the class session is over.

One proposed purpose of having iTunes University available to students is for them to use it as an alternative to getting notes from a friend if they miss a lecture. The student can download the exact lecture that was given by their instructor for the day they missed. In many cases, at larger universities, the podcasts even include video as well as audio. So rather than relying on notes that were taken by others of a lecture they missed, it is possible for the student to take their own notes of the lecture based on the audio (and possibly video) of the in-class lecture. What is unknown is what the students do with the lecture content they are given under these truly mobile and flexible conditions, and how these actions influence their educational outcomes. By replacing the paper with digitally stored resources, iTunes U initiates a new period in accessing to learning materials. Various types of learning materials are provided through iTunes U application in pdf files which is decided as the common format for all lecture notes in the database. The applicaiton also allws the lecturers and students to add their own content or mark the content uploaded. Since the content is provided by accredited people, the copyright is owned by the universities and is shared freely in the current time.

Some educational establishments use iTunes U purely for promotional video and public content, whereas others avoid it all together; citing the needs of training and a lengthy process of transitional which is not viable. iTunes U is one of the most widely-accessible platforms available that can be used to supplement traditional learning material with more modern alternatives. iTunes U can make the learning experience from K-12 to university more relevant, modern and engaging and appeal to a wider range of learning styles, encompassing visual, audio and kinetic aspects. Students can annotate and contribute on digital content together to improve the overall quality of material available for future studies, and teachers can make the transition from recycling PowerPoint projections and paper quizzes to interactive coursebooks. The iTunes U platform can be quickly accessed from a number of mobile devices — including the iPad, iPod Touch and iPhone. As long as the user possesses an Apple device, then the limits of being connected to a school's intranet or the need to rely on campus-based machines to access material is removed. Course providers who are using iTunes U tend to focus on promoting their material, and therefore extend their following to a wider audience and are able to gain additional subscribers. These types of organisations currently appear to be more active in utilizing the service than schools, colleges or universities. As some of the most innovative uses of iTunes University; Duke University Libraries showed AdViews, a collection of 16mm movie film which had been digitized and which included thousands of TV commercials from the 1950′s through to the 1980′s. At Ludwig-Maximilians-Universität in Munich over 10,000 PDFs are available as LMU has chosen to provide all dissertations stored in its library back to 2002 as downloads.

Although the application is free, the courses can only be accessed on an iPad, iPhone or iPod touch, and these Apple products may not be unaffordable for college students with limited financial resources, or parents of children in average high schools. Once an academic institution has spent the time and money required to train its staff in using a platform, the switch to another not only means changing learning methods, material and infrastructure, but retraining staff. This takes both time and money to achieve; something that can be difficult in the current economic climate. It may be the case that universities, colleges and schools choose not to transfer to an external provider in order to retain control over the content available to their students; including what material is available to paying students and what is available publicly. Some schools are concerned that by making material available on Apple’s platform, copyright and student privacy issues may blossom — an element of online learning not generally applicable to others on offer including Blackboard and Moodle. The crux of the matter is time, investment and whether or not to open up educational resources. By opting to create a presence within iTunes U, it can generate long-term income for a school, but often making the decision to begin the move costs time and money in training staff. Many schools find transitioning to new platforms a challenge, due to a lack of technical knowledge, training and budgetary constraints. Although Apple’s mobile devices maintain a large share of the consumer market, once an academic institution makes the decision to move to a platform that requires such a device, there are repercussions for both students and the organisation itself. Perhaps if Apple introduces more extensive large-scale academic pricing agreements with schools for this hardware, then it will increase the rate of institutions adopting the practice, shifting platforms and taking advantage of services such as iTunes U. Course providers can use iTunes U in order to secure an additional, paying subscriber base by offering free courses. Once an individual begins using the service, it is more likely that they would consider going further and paying for their next course if they are pleased with the free options. However, there are bunch of institutions who have developed free learning material in order to promote their courses. An avenue the universities could pursue in order to establish a long-term gain is investing the time and training required to use these platforms. Because the iTunes software is a proprietary browser it does not afford discoverability to search engines. Apple fully accept that this has been an issue and have recently been including iTunes U in their iTunes Preview service. Audio materials can be accessed directly in the page though it is still necessary to link out to iTunes to play video at present (Osborne, 2012).

3. Conclusion

Teaching and learning through widely published video lectures is a novel phenomenon in higher education institutions (Viksila, 2011). Educational institutions are encpuraged to use iTunes U for both supporting the larger learning community and displaying their lecturers’ and learners’ performnaces. Hopefully, as iTunes U expands, primary level teachers will start recording/videotaping their courses/lectures/lessons and publish them through their communities. By this chance, the prestige that universities have tapped into by being able to publish their coursework on iTunes U will be promised to primary level institutions. Another noteworthy step is that Apple announced “iTunes U” and their program for digital textbooks that can be delivered exclusively through iBooks and modified by teachers (Gaskin, 2012). It’s also acknowledged that many of the iTunes U professionals are having backgrounds in education rather than software engineering (Speller, 2010).

However it should be noted that evidence that students perform better at exams after having listened to podcasts is inconclusive, and most likely the positive effects claimed should be attributed to the uses made of the technology rather than the technology per se (Heilesen, 2010). Correspondingly, McKinney, Dick, and Luber(2009) posits that the results of the research in favour of podcasting are in no way an indication that audio copies of lectures could or should replace actual professors, or even regular class attendance. It is unclear how quickly other schools are moving to take advantage of the application, which still has to gain wider acceptance by the academic community. It may be a ‘revolutionary’ platform, however it faces opposition from a number of sources; including traditional lesson advocists, in-use management systems and educational establishments already under pressure through financial constraints and increasing class sizes.

Dissemination of knowledge is viewed as a critical remit of a university and iTunes U provides an incredible platform to accomplish this goal and reach stakeholders that could not be possible previously. The launch of iTunes U site in 2008 made Open University very successful in terms of content downloads, and if universities demands to share the content that demonstrates their expertise in a particular subject area, there is a distribution ecosystem in place (iTunes U) that can reach a global audience over a sustained period (Speller, 2010). However, there will definitely be many questions consider before publishing to iTunes U: what makes material ready for iTunes U?, will there be a review process?, what kind of consent is needed to publish?, how will courses be managed/ updated?, and who owns the copyright of the content? By the help of video lectures the educator can possess a wide range of possible expert introductions and presentations available to use in a lecture. As pointed out by Viksila (2011), video lecturing seems to be a valuable tool to attain efficient distance learning. Thus, the actual benefits of using and publishing video lectures to students should be inquired in further research with versatile purposes.

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IVIA: INTERACTIVE VIDEO INTELLIGENT AGENT FRAMEWORK FOR INSTRUCTIONAL VIDEO INFORMATION RETRIEVAL

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Abstract

Current use of e-learning management systems(ELMS) in educational institutions is on the rise. These systems are rapidly increasing in regards to volume. Instructional video is one type of content that is inherently large in volume and sequential in nature in accessing the videos which makes it difficult to manage and retrieve information. There has been extensive research on video information retrieval in the past decade. Existing systems need pre-processing by human intervention, are cost prohibitive, or do not exhibit the natural interaction. In this paper, we propose a framework for information retrieval of instructional video content in an ELMS that utilizes Natural Language Understanding / PROCESSING and an Intelligent Agent in a seamless integrated environment to address the key issues of the existing solutions.

Keywords; Human Computer Interaction; E-Learning; Information Retrieval; Multimedia; Natural Language Understanding (NLU).

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1. Introduction

With the increase of deployment of e-learning management systems(ELMS) in the educational community, it is currently common for any organization involved in education or training to deploy such a system as a support to the learning process. The content within the ELMS is initially unfilled. As more users utilize the system, the content becomes large until it has been packed with an abundant amount of content. ELMS content items have many forms. In addition to other items, the ELMS may contain an abundant amount of training videos captured from real classrooms, talks, and seminars. These training videos are then archived in the ELMS for later viewings as instructional resources. Since instructional videos are considered more favourable to the learner than other forms of instructional material, they will continue to grow in number and size. Moreover, Lectures can convey core course material in a more easily digestible form than textbooks. Students often favour the retention of live lectures in contrast to extensive self reading of textbooks[5].

Unfortunately, for the experienced person searching for the needed information in one or more long videos is a challenging task. This is due to the sequential nature in accessing the videos. The search for information involves the playback of the video, and possibly a number of videos, from the beginning to the end in the worst case, if it is found at all. This sequential search of information in videos, in which many of them are long, requires time and effort.

The training video contains, in general, a number of items. First, the voice of the presenter. The portrait of the presenter can also be apparent in the video. Second, the presentation slides which contain text(and possibly images). The training videos serve two purposes; either a learning tool for the novice or a reference to an experienced person. For the novice person, the video will be usually played from the beginning to the end and possibly more than once. For an experienced user to sequence through long hours of video to find a particular clip is a boring and tedious task. What is needed is a way to find the relevant video clip with the least effort on the use’s part.

In conventional video retrieval systems a question analysis is performed and then, the system searches the video metadata library for the best match. This places a constraint on the content to hold enough metadata for the query to be satisfied. Moreover, current video indexing and retrieval techniques are based on visual and audio features which are not suitable for lecture videos that have frequent scene changes [6].
We have invented a technique to retrieve information for instructional video content that enables a person browse and retrieve instructional video content in a natural and seamless manner. The proposed approach involves a collection of tools and techniques for instructional video information retrieval in a natural and seamless manner by the integration and extension of several existing techniques into a coherent framework referred as IVIA: Interactive Video Intelligent Agent. IVIA accepts commands in natural language by means of user’s voice or typed commands using the conventional keyboard. The input is analyzed and parsed based on semantics of the input words and sentences. IVIA then creates a sequence of commands (or instructions) to search video content using the indexed search information on the video. Our approach is to facilitate the user to obtain the needed information in a speedy and natural fashion.

This is also made possible without the need to perform pre-processing such as re-indexing or cataloguing. This is especially true if the video content is not indexed with enough information to describe its nature. IVIA achieves this by using a "rendering" function of the indexed content to make the search process more effective. Moreover, the video content may have an incorrect index. IVIA can also be utilized during the processes of restructuring instructional resources within the ELMS.

Related Work

Some traditional systems yield as output the query a set of ordered results. Then the user is left with the burden of reordering the results depending on relevance. This puts an immense burden on the user which is an entirely manual process. The new ordering is fedback into the system and a new result is obtained. The user performs a new reordering and so on. This loops many times until the appropriate result is obtained. This puts a constraint on the user in an unnatural way. Moreover, this loop may continue for a many iterations that may result in terminating the search by the user[8].

Other efforts are not proven to retrieve information due to loss of context. This may happen if the same text is available in two different contexts[9][10][11][12].

Our Approach

In order to satisfy the user's query, we must first acquire as much text as possible from the instructional video. There are many methods described in the literature to locate and extract text in video recordings. In this process, there exist a number of challenges. This is especially true if the text is embedded in images with complex background. The problem exists because the background may involve counters that vary sharply. This background may have comparable intensities to the text and therefore considered as part of the text.

Since the main source of text in instructional videos are presentation slides (e.g. Microsoft Power Point Presentation®), it makes it much easier to extract such text. In the presentation slides, the text is normally published by the author taking into account a design that is readable and clear. [This is repeated below – so, please take out one ...]

The text extraction is a multi-stage process which involves segregation of frames that contain text from others. A single presentation slide may present in many frames, and thus duplicate frames are discarded. Since the main source of text in instructional videos are presentation slides(e.g. Microsoft Power Point Presentation®), it makes it much easier to extract such text. In the presentation slides, the text is normally published by the author taking into account a design that is readable and clear. Text from Closed caption can also be found in the instructional videos. In the literature, there are a number of established methods of extracting text from videos by utilizing OCR software of a selected frame for some time [1] [2] [3][4].

The objective is to have an Intelligent Agent that attempts to obtain the most desired and accurate results. The form of the query is natural language, which is spoken or typed, and obtains the specific answer from such an Intelligent System. Thus, our approach is the use of Natural Language Understanding (NLU) for Intelligent Information Retrieval. The Semantic Engine of NLU helps to derive the meaning of the input words (see below for more details) and sentence which, in turn, get rendered to equivalent content search commands. To reach to a level of certainty, IVIA resolves ambiguities by resorting to the Question and Answer Module.

While traditional approaches to Natural Language Understanding (NLU) have been applied over the past 50 years, results show insignificant advancement, and NLU, in general, remains a complex open problem. NLU complexity is mainly related to semantics: abstraction, representation, real meaning, and computational complexity. We argue that while existing approaches are great in solving some specific problems, they do not seem to address key Natural Language problems in a practical and natural way. [7] proposed a Semantic Engine using Brain-Like approach (SEBLA) that uses Brain-Like algorithms to solve the key NLU problem (i.e. the semantic problem) as well as its sub-problems. In this paper, we plan to utilize SEBLA to apply NLU for Interactive Video Intelligent Agent (IVIA) in the following ways:

- In the query sentence/string to understand the meaning of each words and sentence.
- Generate all related sets of query strings using semantic meaning of each words (thus generating lot more search results related to the input words).
- Extract the most appropriate and related results from the extended search results.

The main theme of our approach in SEBLA is to use each word as object with all important features, most importantly the semantics. In our human natural language based communication, we understand the meaning of every word even when it is standalone without any context. Sometimes a word may have multiple meanings which get resolved with the context in a sentence. The next main theme is to use the semantics of each word to develop the meaning of a sentence as we do in our natural language understanding as human. Since learning is an interactive and iterative process, the proposed system involves the learner in a natural dialogue to obtain the required results.

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KNOWLEDGE SHARING BEHAVIOR IN E-LEARNING MATERIALS DEVELOPING TEAM

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Abstract

A new model of knowledge sharing is proposed based on the theory of social support. The research explores the relationship among teacher's feel of social support, teacher's team interaction, and teacher's knowledge share. After running the structural equation modeling, both substantive social support and respect social support have no apparent influence on knowledge sharing of the teacher. Team interaction is an intervening variable to reinforce the effect of social support and to raise the behavior of knowledge sharing. It's helpful to promote knowledge sharing by establishing a supportive social network for the teacher.

Keywords: social support; knowledge share; team interaction;

INTRODUCTION

In the digital learning environment, whether the curricular content is rich and plentiful is the crucial key. It is indispensable for teachers to face with the adjustment of teaching materials and methods, as well as the way of interaction by the learners through the application of technology (Passmore, 2000). The teaching functions presented from the network is not to make the translation of books to the content of the textbook, but need to make the transformation to comprehensive and relatively in-depth teaching process, providing the web-based instruction complete and closing to reality.

It is the enhancement of the method of independence or competition in the past to the model of coordination and cooperation of the teachers, making the mutual support and circulation of e-learning materials that can make e-learning sustainable. What's more, teachers even break the organizational boundaries between schools so as to make the e-learning materials development team divided the work and share the resources.

Basically, schools can demand the teachers to share their own knowledge by means of various explicit specifications, but there are great obstacles for teachers to share knowledge. The motivation for knowledge sharing of those teachers who have developed the e-learning materials are high; however, if they have doubts whether to plunge into the development of e-learning materials program is due to one reason that the cost of time and effort on the creation of materials is far more than the practical curriculum. It is easy for teachers to accomplish the whole production of textbook independently with adequate support, or the school can set up professional e-learning materials development team to assist the post production of textbooks. As for those teachers who are less familiar with the information technology, it is enough to focus on the design and program of textbook content, leaving other details to be done by the professionals, which is also comparatively in accordance with the economic benefit.

In addition to coping with the daily school teaching and clerical work, teachers have to spare time and energy to the development of e-learning materials. Therefore, adequate social support system, for teachers, has its pivotal position. However, whether the possession of social support can make the teachers improve their mental health and be more willing to share that knowledge with their students and peers?

Social support is mainly the adopted concept, taking the social reason of mental disorder as research object, to illustrate the impact on the sense of psychological frustration and sense of deprivation to the social members of interaction, social networks and social environment. Such impact is likely positive (the reduction of stress), or negative (the formation or expansion of pressure). Griffith, Steptoe, Cropley (1999) discovers that the improvement of adaptability and social support can't only alleviate stress and increase the happiness, but also affect the evaluation of environmental stress by the teachers, which is helpful to the attitude and behavior of knowledge sharing; however, there is a lack of relevant research data at home. Therefore, it is indispensable and essential to probe into the relevance of social support and knowledge sharing.

In order to explore the fetch strategy of social support, this study takes the sources of social support (family, colleagues and friends) and types of social support (substantive, respect) into consideration, takes the teachers who have experience in the development of e-learning materials in Taiwan as the study subjects, and takes the social support theory as basis, thus establishing a pattern affecting knowledge sharing behavior.

LITURATURE REVIEW

2.1. Knowledge Sharing

In the traditional economic theory of the organization, the basic assumption of people is the personal interest in power and personal interests (Kim, W.C. & Mauborgne, 1998). The mentality of sharing with others unwillingly is obvious when people take the knowledge and information as the materialized assets (Senge, 1997). Meanwhile, as to the knowledge workers, the requirement to share their expertise will end up with the proliferation of knowledge, enabling knowledge workers no longer unique and to the detriment of their interests. However, such competition is not just limited to the knowledge workers in different departments, but also within one department due to the promotion, the scarcity of salary and other resources. As a result, sharing knowledge with others voluntarily is usually not compatible with the human nature (Davenport & Prusak, 1998), and the social exchange theory provides a theoretical basis to solve this problem.

People make the combination due to various reasons and they will provide each other with the intrinsic rewards and the extrinsic rewards to maintain and strengthen the tie once success (Blau, 1964). In fact, knowledge sharing behavior also belongs to a kind of process of the interpersonal interaction. It can be seen from the process of knowledge sharing that both sides of knowledge sharing and knowledge exchange make the transaction of resources in fact, but the reward from the transaction is determined on the demand of both sides and the form of reward is not surely the same. The providers don't take the probably obtained immediate interests into the main consideration, but make the expectation that the other party will repay in other form as the compensation in the future.

2.2. Team Interaction

In the process of software development, in order to make the mutual connection and cooperation of system development work in various stages, the members need to accomplish the system development work with communication or cooperation between each other by way of the team interaction (George & Jones, 1999; Kraut & Streeter, 1995). The interaction means a series of acts and activities, which include the interactive effect of communication, decision-making, leadership, conflict and so on (Robbins, 1992). The team members interdependently carry out the activities of cognition, language and behavior, etc. (Marks, Mathieu and Zaccaro, 2001). Kraut and Streeter (1995) believe that the activities of coordination are the biggest problem to develop a large-scale software system; meanwhile, as the software projects become increasingly tremendous and complicated, the coordination task also becomes more and more difficult. In the course of the operation of the team, the work of the team can be accomplished with the mutual cooperation and convergence in various stages and by way of the team interaction, including the interactive communication, coordination and cooperation among them (George & Jones, 1999). Curtis, Krasner and Isooe (1988) mention that the communication barriers and breakdown in the process of project development are very common and inevitable; the practice of team learning is to deal with this predicament.

The team conflict and members' degree of satisfaction are conspicuously related to the team commitment, but the job satisfaction has little relation with the team commitment (Bishop & Scott, 2000). Hollingshead (1996) discovers that the interaction between team leaders and members will have a positive impact on knowledge sharing. When the interactive relations between leaders and members are favorable, the members can obtain more resources, opportunity and support than those who have poor interaction relations..

The interactive strategies such as communication, cooperation, chatting and so on are conspicuously associated with knowledge sharing (Petrash, 1996; Allee, 1997). Hipple (1998), Trott, Cordey-Hayes and Seaton (1995) all points out that the knowledge sharing mechanism is mainly established on the interactive model of knowledge exchange and communication and has a positive impact effect (Nelson and Cooprider, 1996).

Knowledge sharing is a kind of gradually generated group synergy through the mutual understanding and respect among people (Bostrom, 1989). The team interaction is an important key factor of knowledge sharing (Nonaka & Takeuchi, 1995). Many studies have also confirmed that the team interaction and communication have a positive impact on the exchange of knowledge and resources as well as the team performance (Tsai & Ghoshal, 1998; Hansen, 1999; Tsai, 2000). Therefore, this study suggests that the team interaction will have a positive impact on knowledge sharing behavior of team members.

Assumption H1: the team interaction of teachers within the organization will affect their knowledge sharing behavior.

2.3. Social support

Sarason (1983) concludes the social support as a kind of relation, which is an objective reality or can be perceived by the individual; meanwhile, in this relation, the individual can communicate with others, receiving the concern, acceptance, love, the experience of being valued and the help. Wang, Wu and Liu (2003) point out that social support, a kind of supply of relationship and interpersonal communication, is the subjective perception of adequacy and benefit felt by the individual to different forms of support. House (1981) puts forward that the sources of social support consist of the work partners, other related parties on work, friends, neighbors, supervisors, colleagues and so on.

As regards the functions of social support, it has been mainly the research perspective of functional approach since past and it can be broadly grouped into several aspects, and the most accepted are substantive social support and respect social support.

Substantive social support means to provide the assistance of service or material to help others solve the practical problems (Jacobson, 1986). Substantive social support consists of the labor, money and a variety of other material or strategic assistance, problem-solving oriented. The individual will seek social support in accordance with two kinds of reasons; if the individual is looking forward to obtaining some useful comments, information or substantial assistance (Carver, Scheier, & Weintraub, 1989).

Respect social support is the multi-level structural system composed by the psychological support, mutual relation support and achievement support. It mainly refers to the emotional encouragement and acceptance obtained by the individual from his interpersonal networks (Colvin, Cullen, & Thomas, 2002).

When the working environment is favorable to the nature of the team, social support will probably have a greater impact on the work product (Dawn and Rosemary, 1997; Lantz and Laflamme, 1996). Under the framework of social exchange, Eisenberger, Huntington, Hutchison, Sowa (1996) think that the feelings among members to support the organization are mainly established on the leader's cognition of commitment. It is extremely essential for the members whether the leader will provide appropriate assistance and support when they are confronted with the difficulties at work or not (Durham, Knight, & Locke, 1997). The so-called assistance and support of members refers to the assistance provided by the organization members of the individual (Caplan, 1974). The reason is that timely and appropriate support can not only improve the affective relationships between the leader and the members, but also improve the work performance indirectly. Therefore, this study suggests that respect social support will have a direct impact on the team interaction.

Assumption H2: When the feelings of faculty members in the organization to the respect social support are high, their team interaction to the organization is also high.

Edvina (1990) believes that social support is not merely a kind of one-way care or assistance; meanwhile, in most cases, it is a kind of social exchange and a kind of social interaction relations among people. Gerloff and Hoyt (1999) deem that the organization with supportive cultures can not only provide the employees with favorable salary and benefits, but also provide a lot of necessary resources and support the employees to the utmost. Eisenberger, Huntington, Hutchison and Sowa (1986) believe that the so-called supporting organization is the organization that shows solicitude for the welfare and request of the employees; what's more, such kind of organization will provide compliments and commendation and attach importance to those who make the contribution. Therefore, this study suggests that substantive social support will have a direct impact on the team interaction.

Assumption H3: When the feelings of faculty members in the organization to the substantive social support are high, their team interaction to the organization is also high.

Vygotsky (1978) describes the development of cognition and the construction of knowledge from the orientation of social culture, he also believes that the change of cognition occurs during the social interaction; at the same time, people express their understandings of knowledge and the interaction with the outside world by means of the mind tools (such as language) and continuously construct the personal cognition by way of the internalization and transformation of social interaction. Hanley (1999) believes that the informal association, inducement, reward and technology are all essential promoting factors for the knowledge sharing. Within the organization, knowledge sharing should be more inclined to be the performance objectives of everyone. However, Hidding and Catterall (1998) think that knowledge sharing should be supported and should make the combination with the reward system, culture and information technology and provide time to the staff; in addition, the organization should add new posts or new roles responsible for promoting the knowledge sharing. Therefore, this study suggests that substantive social support will have a direct impact on the knowledge sharing.

Assumption H4: the higher feelings of teachers to the substantive social support will affect their behaviors of knowledge sharing with other teachers.

Davenport & Prusak (1998) deem that altruism is one of the factors to promote the willingness of people to share; some people are born with the nature of philanthropy, and such personality trait gives them impetus to be willing to share the knowledge. In accordance with the perspective of social support theory, if the employees can get the support from the social process to which they belong, their trust of the organization can be improved and

the quality of relations between the employees and the relative teams related to the system can also be improved. Therefore, when the employees think that the system where they stay takes care of them, supports them and is on reliability, they will perform well and prefer to or even take the initiative to share knowledge with others. This study suggests that respect social support will have a direct and positive effect on knowledge sharing behavior.
Assumption H5: the higher feelings of teachers to the respect social support will affect their behaviors of knowledge sharing with other teachers.

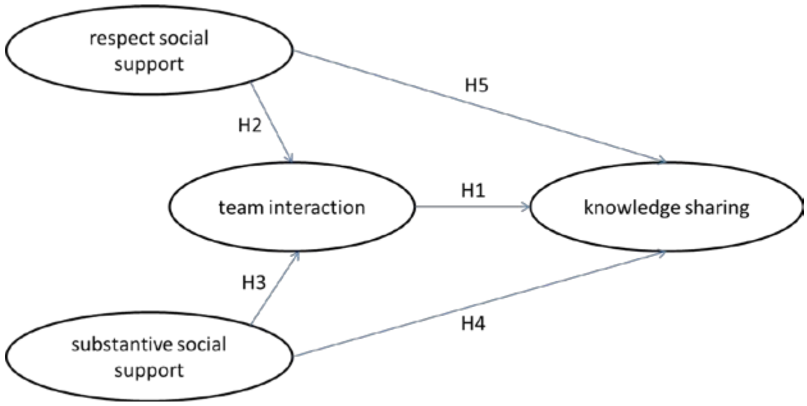

Fig. 1 Research model

3. Methodology

3.1. Research on the operational definition of variables

In accordance with the discussion of the antecedent literature, this study makes the model (See Fig 1) of an operational definition of variables as follows:
1. Social support: it is mainly to measure the situation when teachers obtain support and assistance from the organization, supervisors, other teachers and the outside of the organization. Therefore, through the main reference of opinions of Colvin et al. (2002) and Carver, Scheier and Weintraub (1989), the questionnaire of this study on the social support of substance includes the help such as matter, money and so on; however, the respect social support consists of being able to share and communicate with others about personal emotions and feelings, and obtaining the friendly emotional support. The social support with information and trust adopt the measuring scale of organizational support from Armeli, Eisenberger and Linda (2001); the social support with companion adopts the measuring scale of coworker support from George and Zhou (2001).
2. Team interaction: it is mainly to measure the situation when team members are willing to being together and the dynamic process and power of endeavor for the same team objective. The questionnaire of this study about the cooperation of members makes the main reference of the measuring scale from Bishop & Scott (2000); the relationship between the members and the leaders make the reference of the measuring scale of transformational leadership from Podsakotf et al. (1990).
3. Knowledge sharing: the questionnaire of this study makes the main reference of the items developed by Hsu, Ju, Yen and Chang (2007), Fishbein & Ajzen (1975), Bock, Zmud, Young-Gul and Jae-Nam (2005), Ajzen (2002).
The measurements of studying the variables mentioned above all adopt Likert five-point scale to measure.

3.2. Method

This study takes the objects are mainly those teachers who have participated in the development of e-learning materials. There are completely 282 copies of a questionnaire sent out and 259 copies recovered, so the rate of recovery is 91.84%. The experiment is carried out by the known teachers to discover those teachers, who have participated in the design of e-learning materials in their school, as the samples; therefore, the quality of samples has been taken into the strict consideration. Those teachers, who are willing to fill out the questionnaire, are glad to be in coordination with the experiment, so the rate of recovery is exceedingly high. Finally, there are 27 copies filled incomplete, and without being taken into account, so 232 copies of the questionnaire are valid.

4. Results and Analysis

It can be made the assumption that the three hypotheses of H1, H2 and H3 are all of significance. H1 proves that team interaction will positively affect knowledge sharing (estimate = 1.116, $p<0.001$). H2 proves that the respect social support will positively affect team interaction (estimate = 0.470, $p<0.001$). H3 proves that substantive social support will positively affect team interaction (estimate = 0.371, $p<0.001$). There is no enough evidence to prove that substantive social support can positively affect the realization of knowledge sharing (estimate = -0.686, $p>0.05$); on the other side, there also lacks enough evidence to prove that respect social support can positively affect knowledge sharing (estimate =-0.296, $p>0.05$). The overall adaptive statistics have presented the suitable goodness of fit ($\chi 2$/df=1.2535, GFI=0.945, AGFI=0.924, RMSEA=0.033, NFI=0.942, CFI=0.987, IFI=0.988, TLI=0.985, PNFI=0.771, PGFI=0.677).

1. The chi-square value is 107.8 and the degree of freedom is 86, then chi-square value/ degree of freedom (χ^2/ df) is 1.2535, which is in line with the standard of being less than three, the ideal value, and showing that the goodness of fit is excellent.

2. Absolute goodness of fit index: In this model, GFI, 0.945, is greater than the ideal value, 0.9; and AGFI, 0.924, is also greater than the standard, 0.9, of ideal value. RMSEA value is 0.033, $\leqq 0.1$, showing that the theoretical model is acceptable. ECVI value is 0.761; it is better when smaller and it should be lower than the value of stand-alone mode, 8.109.

3. Value-added goodness of fit index: such as NFI (Normed Fit Index), CFI (Comparative Normed Fit Index), IFI (Incremental Normed Fit Index) and TLI (Tucker-Lewis Normed Fit Index), these four kinds of value-added goodness of fit index refer to that one model can explain the covariance percentage of observed data, and the goodness of fit is better when the value is closer to 1; in general, the goodness of fit is excellent when the value is greater than 0.90.

4. Parsimonious goodness of fit index: PNFI (Parsimony Normed Fit Index) and PGFI (Parsimony Goodness of Fit Index) are 0.771 and 0.677 respectively; when the both values are greater, the theoretical model is most likely of parsimony, and greater than 0.50 is taken as the standard to determine whether the model is appropriate or not. AIC (Akaike information criterion) = 175.796, its value, similar as ECVI, is better when smaller; meanwhile, AIC value is lower than the value of stand-alone mode, 1873.207, indicating that the revised structural model is acceptable.

By synthesizing the evaluation results of overall goodness of fit from the aspects of the absolute goodness of fit, parsimonious goodness of fit and value-added goodness of fit, it can be generally shown that this research framework has the ideal external quality of the theoretical model for the attitude of knowledge sharing, and it is able to explain the observed data of related factors affecting the attitude of knowledge sharing.

5. Discussion

1. The team interaction of teachers within the organization will affect knowledge sharing behavior among teacher members within the organization. The result of this assumption H1 is verified to be tenable. The conclusion supports the opinions of Gruenfeld et al. (1996) that the settlement of information will be affected by the composition of the team, and knowledge sharing of members will also be affected by personal cognition and value, making further influence on the team performance. The opinion of E.Schein (1985) is supported by the verified results that when the definition of culture has relation to the value of sharing and conviction, continuous learning must be a part of organizational culture. In case this supportive learning culture can develop in the organization, team interaction will also grow with it.

2. This study makes the assumption H2 that there is a positive relation between the respect social support and the team interaction among organization members, and the tested result of this assumption comes into existence. The empirical conclusion of this study supports the opinion of Liebowitz (2000). The performance of high achievement of organization members builds up the best image in their fields and the social support of psychological development and confidence encouragement, inspiring the organization to pursue innovation and progress with continuous efforts and achieving the culture of continuous study. The research of House (1981) also proves that the supportive superior and colleagues can decrease the interpersonal tensions to a minimum. This support experience can meet with the motivation of relevant work such as the participation, recognition and accurate assessment of themselves and environment, making them satisfy with themselves and their work.

3. When the feelings of teacher members within the organization to the substantive social support are higher, the team interaction to the organization is also higher. It has been proved in this study that this assumption H3 is tenable. The empirical conclusion of this study supports the opinions of Shore and Wayne (1993). When the organization members think that the compensation provided by an organization is higher than formal provision, they will promote the support to the organization, and the trust relation will also be enhanced. Kankanhalli et al. (2005) deem that if the compensation provided by an organization is higher, then the users are more likely to share knowledge.

4. The assumption H4 considering that the high feelings of teachers to substantive social support will affect their knowledge sharing behaviors. This study cannot prove the tenability of this assumption for the indirect deduction. Social exchange is certainly important to social integration, but the influence of social structure of people can't be neglected with the mere emphasis on interpersonal interaction. When there is cognitive

dissonance in the team, it will be made to rationalization and converted to common value or common rules of the individual. This is called team-influence. Such argument has crossed the category of exchange theory and entered into the scope of facts model, so the individual will not be identified as the behavior-oriented.

5. The high feelings of teachers to respect social support will affect knowledge sharing behavior of other teachers. This assumption H5 cannot be proved to be tenable by this study for the indirect deduction. The relations between the conflict of roles and negative learning attitude can be relaxed by peer support. When the teacher developed the e-learning materials have vigorous energy to pursue knowledge, he is yearning for increasing self-esteem and obtaining favorable recognition from others. When obtaining peer support, the conflict between roles felt by him is lower than those who have less peer support; however, when the conflict between the roles of teaching affected by development is higher than a certain degree, the more negative learning attitude can be led to in contrast. Obviously, such result is in accord with original anticipated results incompletely, it is likely that high peer support will also bring about high expectation and stress.

6. Does team interaction play as the mediating role between social support and knowledge sharing? The reason of those teachers who develop the e-learning materials can obtain satisfactory substance, successful achievements and good interpersonal relationship is that they can effectively use social support to accommodate work and life, share knowledge with others in delight and promote happiness. Such result also conforms to the viewpoints of activity theory, believing that the individual can satisfy the needs such as work, leisure, interpersonal interaction and social support by participating in the process with meaningful and healthy activities to promote the sense of achievement and happiness (Argyle, 1987). This study makes the conclusion that knowledge sharers will provide knowledge for a certain colleague with the expectation to obtain assistance and support from most organization members in the future, but not from the same person next time. This coincides with the research results of Wasko and Faraj (2000); organization members participate in the online community practice to share knowledge in the identification of community interest rather than personal interest. What's more, most of knowledge sharers hold the opinion of generalized reciprocity and pro-social behavior rather than provincially self-interested behavior; or sharing knowledge with community members is purely recognized as the right thing to do (Wasko & Faraj, 2000: 169). The direct effects on knowledge sharing by substantive social support and respect social support are not clear, but the positive effect can be seen through the indirect effect of team interaction. This study believes that the primary thing for knowledge workers is the identification by team members. Under the uncertain situations of facing with the growth and decline of power and whether other members giving feedback or not, they will seek specific guidance of other members in an organization's network. When members of the network have common behavioral response on knowledge sharing, the will to share personally valuable knowledge will be intensified to induce knowledge sharing behavior; on the contrary, the will of personal knowledge sharing will be reduced and personal knowledge sharing behavior will be hindered.

6. Conclusion

1. The main factors affecting knowledge sharing when teachers develop the e-learning materials

The factors that pushing teachers to develop the e-learning materials and share knowledge willingly are: firstly, popularizing for the need of teaching; secondly, there is data conforming to the need of them on the digital teaching platform; thirdly, the design concept of the website of digital teaching platform is quite suitable for the expectation to the professional community of teachers by themselves. The incentive and reward system is the motivation to allure the development of e-learning materials by teachers. However, the external incentive system is not the main cause to maintain sharing behavior of developing digital teaching material constantly; a kind of forming lifelong learning and expanding the horizon of future teaching are the essential factors of knowledge sharing. The attitude of positive encouragement given to knowledge sharing behavior as well as the relevantly supporting measures and information equipment provided by school-level will increase the willingness to share knowledge.

2. The tactics of adequate social support obtained by teachers when develop the e-learning materials

The reason that knowledge sharing-type teachers can obtain more happiness, material success, autonomy and interpersonal relation than low knowledge sharing-type teachers is that they can effectively apply social support to get adaptation at work and live, willing to share knowledge with others and promoting self-happiness. Therefore, the establishment of social support network for teachers is helpful to promote their knowledge sharing behaviors. The power sources of constantly developing e-learning materials are: firstly, to share expertise and life experience with other latterly developed teachers, having the significance of inheritance; secondly, to get comfort on affection and easement on depression through the organization of developing team; thirdly, to exert for the common objective and ideal by looking for a group of teachers in the same camp. Applying the perspective of social network, as to the team interaction among people built on the basis of interpersonal relation, it is more likely to generate knowledge sharing with depth, extensiveness and efficiency if the interaction between each other is intimate; meanwhile, the teachers have more initiatives to share knowledge, thus displaying the value of knowledge.

3. The theoretical model affecting knowledge sharing behavior

Social support can positively affect the interaction, trust and common vision among the organizations' members, which in turn will increase knowledge sharers' intention of sharing, thus promoting knowledge sharing behavior. With regard to those teachers who like knowledge sharing, substantive social support and respect social support has no conspicuous influence to knowledge sharing. Knowledge sharing behavior can be promoted only by intensifying the effect of support through intervening variable - team interaction.

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LANGUAGE CORPORA FOR EFL TEACHERS: AN EXPLORATİON OF ENGLİSH GRAMMAR THROUGH CONCORDANCE LİNES

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Abstract

As it is clearly seen that English is used as an international language across the world, learning the language has great significance and value (Crystal, 2003). English learning and teaching can be enhanced to a greater extent by the incorporation of data representing authentic English derived from language corpora. Learners of English as a foreign language (EFL) are often found to be far more successful when grammar is introduced through corpus-informed data, which evidently promotes inductive learning in such a way that learners not only acquire grammar by language data observation and self-discovery of rules, but also find it entertaining and exciting to make grammar rule generalizations on their own (Cheng, 2012; Hunston, 2002). Furthermore, exposure to corpus data of real English also provides EFL learners with some evidence of how grammar is used in actuality, which may be different from textbook-based rules. The researcher found that graduate Thai EFL learners were very satisfied with learning grammar through corpus-informed data.

Keywords: language corpora; English grammar; EFL teachers; concordance lines; corpus linguistics

Introduction

Students of English as a foreign language (EFL) can easily become bored with learning grammar in a traditional style, i.e., in a classroom setting where teachers primarily focus their instruction on presenting grammatical rules through a series of lecturers. Likewise, to some modern EFL teachers, such a teacher-centered approach to grammar instruction often turns out to be disprefered. These teachers seem to support learner-based instruction where students are encouraged to try their best to analyze real language data and make exciting discoveries of grammar rules from their own observation, possibly under teachers' proper guidance (O'Keeffe, McCarthy & Carter, 2007).

Not only will EFL students enjoy learning grammar via self-discovery, they may also find that computer-based evidence, referred to in this paper as corpus-based data, can reveal certain grammatical patterns or occurrences that are unavailable in most traditional grammar textbooks (Cheng, 2012). Certain findings may contradict what has usually been accepted as a rule (Hunston, 2002). Furthermore, native speakers' intuition on grammar is not always reliable, as there appear to be some actual uses of grammar that even native speakers are unaware of unless a large amount of language evidence is consulted.

In the next section, relevant literature regarding how corpus data can be used effectively in grammar lessons will be reviewed.

Review of Related Literature

Language corpora and concordance lines

Language corpora have been regarded as one of the most effective, accurate, and modern tools in language research and applied linguistics (Cheng, 2012; O'Keeffe & McCarthy, 2010). "It is no exaggeration to say that corpora, and the study of corpora, have revolutionised the study of language, and of the application of language…" (Hunston, 2002, p. 1). According to Linquist (2009), corpus linguistics is viewed as a methodology,

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comprising several relevant methods used in the investigation of language in different aspects, e.g. sociolinguistics, syntax, semantics, pragmatics, discourse analysis, etc.

Defining corpora

A corpus (plural corpora) refers to "a collection of texts, written or spoken, which is stored on a computer" (O'Keeffe, McCarthy & Carter, 2007, p. 1). Likewise, Reppen (2009) defines a corpus as "a large principled collection of naturally occurring texts (written or spoken) stored electronically" (p. 2). A corpus basically tells us what language is like. It serves as a more reliable guide to language use than native speakers' intuition. In language teaching, a corpus can supply information about how language works, e.g. the relative frequency of grammatical patterns. For instance, Mindt (2000) revealed that although the future time in English can be represented by different verb forms, e.g. *be going to + V*$_{\cdot infinitive}$, *will + V* $_{infinitive}$, present continuous (*is/am/are + V*$_{ing}$), present simple (V_1), the most frequent form in conversational English is *will* (or other modals) + V $_{\text{infinitive}}$. Such frequency evidence is rarely available from native speakers' intuition (O'Keeffe et al., 2007).

Apart from frequency, corpora also provide a lexico-grammatical profile, i.e., the relationship between vocabulary and grammar. Language researchers can look at word partners, i.e., collocates, which occur most frequently and with statistical significance. For example, those who are interested in past-participle psyche-verbs, e.g. *pleased, excited, surprised, interested, satisfied, scared*, etc., can gain more information on these verbs as to the preposition often occurring right after them. That is, they will find that a verb like *interested* usually co-occurs with the preposition *in*, whereas *shocked* has *by* or *at* as its common collocates.

Corpora also indicate syntactic restrictions, i.e., grammatical patterns in which a word normally appears. For example, according to a corpus-based dictionary like the Oxford Advanced Learner's Dictionary (2010), the verb *indict* is commonly used in a passive structure in the pattern be indicted for + noun, as in *The senator was indicted for murder* (p. 790).

Thanks to the advantages of corpora as grammatical evidence suppliers, major grammar references are nowadays corpus-informed (e.g. Biber et al., 1999; Carter & McCarthy, 2006; Carter, McCarthy, Mark & O'Keeffe, 2011), containing information that is helpful to both teachers and learners of English for clear explanations and real examples. For instance, most of the examples in *English Grammar Today* (Carter, McCarthy, Mark & O'Keeffe, 2011) are drawn from the Cambridge International Corpus (CIC), developed to describe English and provide examples for learners.

Concordancing and concordance line

Concordancing, as an essential tool in a corpus study, refers to using software, known as a concordancer or a concordance program, to find all the occurrences of a particular word or phrase (O'Keeffe, McCarthy & Carter, 2007). Although there have been attempts to manually find and record every example of certain words, this endeavor has often run into problems, e.g. inaccuracy caused by human errors. At present, utilizing a concordance program enables researchers, teachers, and learners to search for a word or phrase in context with perfect accuracy in seconds (Lindquist, 2009). The search word or phrase, referred to as the node, is presented in concordance lines and appears in the center of the line with seven or eight words. There are many grammar textbooks using concordance information to present grammar to learners, encouraging them to observe the data and then find the rules accounting for the occurrences (Thornbury, 2004).

Data-driven learning (DDL)

According to Johns (2002), data-driven learning concerns the way learners develop an ability to see patterning in the target language and to make generalizations about language form and use. Put another way, acting as language detectives, learners are confronted with language data, i.e., authentic examples in the form of concordance lines, from which they are expected to formulate rules governing usage. As Hunston (2002, p. 170) remarked, this learning style is beneficial and supportive since students "are motivated to remember what they have worked to find out".

DDL normally involves two main kinds of data presentation. The first pertains to using a raw corpus where both students and teachers will explore together. In this way, neither student nor teacher knows what discovery they will make. It is possible that a student may notice some grammatical pattern overlooked by teachers or not included in textbooks. However, Hunston (2002) pinpointed some drawbacks to this form of DDL in that teachers have very little control over what occurs in the classroom. Due to the possibly sizable amount of data, students can find certain grammatical occurrences the usage of which even teachers are not sure of, which could result in teachers' loss of confidence as well as face.

The second type of DDL lies in a more controlled data presentation. Teachers prepare teaching materials based on selected concordance lines, so they know exactly what should be discovered in the lesson, i.e., what grammar rules learners will acquire through the corpus-based data. It is clearly seen that this particular DDL form is suitable and often effective for classrooms with time limits since the grammar lesson is taught in a controlled manner.

While arguments against DDL use in classrooms of low-level students exist, many studies have so far shown positive results of the application of DDL to high-level students (e.g. Cobb, 1997; Kennedy & Miceli, 2001; Lenko-Szymanska, 2002). As suggested by Bernadini (2000), students, especially those with high proficiency levels, reap the benefits of designing their own corpus investigations as they have the freedom to learn any language aspect that interests them. This notion is consistent with Sripicharn (2004), who remarked that "it is important to point out to learners, especially those who have high language proficiency or native-like language competence, that they many use concordance data as a basis for their generalizations or at least to test their intuition against the authentic data" (p. 243).

Hunston (2002), in a similar vein, maintained that DDL is more beneficial to advanced learners who want to fill in gaps in their knowledge than to basic learners who need to lay down a target-language foundation. Cobb & Horst (2002) provided support for the application of DDL to English pedagogy. Through an experiment presenting a great amount of English vocabulary to EAP (English for Academic Purposes) students using concordance lines based on texts from the students' language course, they discovered that the students were more successful in vocabulary acquisition in comparison with other teaching methods.

Cheng (2012) evidently also supports the incorporation of DDL into language studies because doing so helps link up language theories and the facts revealed by natural language. What is more, conducting language projects through corpus-based data can also enable learners as researchers to learn how to develop important learning skills, e.g. analytical reasoning, critical thinking, and problem solving, all of which are highly valued in any university program. To put it simply, students with corpus-based information are expected to think in a logical way and support ideas with well-reasoned arguments and evidence. Moreover, learning how to evaluate information and evidence critically also plays a crucial role as this is related to the development of critical thinking. As for problem-solving, Cheng (2012) claims that language projects allow learners to understand the problem, explore answers, and choose the best solution to the problem.

Grammar observations through concordance lines

English grammar seems to involve some rules that prescriptive grammarians have strictly formulated and forced others to follow. Put differently, there are rules to which even native speakers do not always conform, particularly in spoken or informal language. What is put in traditional grammar references is occasionally not what native speakers actually use in everyday life. One of the outstanding benefits of corpus-based data is that it provides real examples and evidence of English as it is really used. This paper will discuss some grammar topics that are often in apparent conflict between what is contained in traditional grammar references and what is found in language corpora.

The first English grammar topic to be discussed here is the conditional or if-clause. It has been discovered that conditionals occurring in native speaker corpora are not limited to only three classic types, commonly known as first, second, and third conditionals (Carter & McCarthy, 2006). In actuality, a wide range of patterns, i.e., over 30 possible patterns, of conditionals have been noticed. The different structures of if-clauses are adaptable to conditions of use. In particular, the most frequent pattern is the zero conditional (if + present simple + present simple/progressive) (Carter & McCarthy, 2006, p. 749). Corpus-based data also demonstrate that the occurrence of the three traditional types account for less than 50% of the entire if-clause tokens. In addition, of all the if-clause types found, the third conditional is used with the lowest frequency. The examples below in (1)-(4) represent non-traditional if-clause patterns evidenced in the corpus data:

If you**'re** good at organising things **make** sure your discussions are organised and that will suit you better.
(O'Keeffe, McCarthy & Carter, 2007, p. 129)

If I **criticised** her unfairly, then I always **apologised**.
(Carter & McCarthy, 2006, p. 749)

If you**'re suffering** from hay-fever, you **need** one of these sprays.
(Carter & McCarthy, 2006, p. 749)

If you**'re going to** buy a house, then you**'re going to** need a lot of money.

(Carter & McCarthy, 2006, p. 749)

In (1), the pattern of *if + present simple + imperative* is employed, while the use of *if + past simple + past simple* is represented in (2). As for (3), the present progressive occurs in the if-clause and the main clause is constituted by the present simple. As can be seen in (4), *be going to* is used in both the main clause and the if-clause. Carter & McCarthy (2006) claim that these occurrences of conditionals in English refer to real situations, meaning "tenses are normally used in the same way as in other kinds of sentence. Present tenses are used to talk about present and future events as well as about general truths and facts, and past tenses are used to talk about past events" (p. 749).

The corpus-informed data above clearly show that English speakers actually produce many different kinds of if-clause constructions, depending on the situation being referred to. Hence, teaching EFL students only three traditional patterns may not be adequate due to the fact that other conditional structures occur in authentic English.

The next grammatical structure to be covered here is the English relative clause with an emphasis on the relative pronouns *who* and *whom*. It is generally stated in several traditional prescriptive-grammar textbooks that the relative pronoun *who* occupies a subject position within a relative clause, as in (5), whereas *whom* has to be used as a relative clause object, as in (6).

(5) We like the lady **who** is very sociable.

(6) The teacher **whom** my friend fears is irritable.

Nevertheless, even native English speakers are often not sure about when to use the subject form *who* and when to use the object form *whom* (Linquist, 2009). Despite the rule that requires the use of whom as a relative clause object, native speaker corpora demonstrate that the object relative pronoun *whom*, as in (7), is often replaced by *who*, as in (8).

(7) …the man **whom** we have called the last Muddletonian,…

(Linquist, 2009, p. 132)

(8) …the woman **who** I meet up at you know who works in the coffee shop…

(Linquist, 2009, p. 132)

Linquist (2009) noticed that the frequency of *whom* decreases around the 1940s and then stays fairly stable. In contrast, "there is a slow but steady increase in *who* over the decades" (p. 133). It seems that *who* is increasingly replacing *whom* in the object position of the relative clause. Still, Linquist is careful in noting that in order to confirm the substitution of *who* for *whom*, it is necessary to conduct a further corpus-based study on the context in which *who* is used in the relative-clause object position (pp. 133-134).

Research Methodology

Research question

What are Thai EFL students' attitudes towards corpus-based grammar teaching?

Participants

The participants of the present study were 17 Thai graduate students in an English for Careers program at a university in Thailand. The students were enrolled in an M.A. course entitled *Corpus Linguistics and English Language Analysis* taught by the researcher himself from 9.00-12.00 a.m. on every Sunday during June-September 2011. The participants of mixed gender were from different educational and vocational backgrounds and only one of them was working as a high school English teacher. All of them speak Thai as L1 and had more or less similar English proficiency.

Research instruments

The data were collected with two research tools: a questionnaire and an interview. Before both tasks were launched, the students were presented with grammar topics, i.e., conditionals and *who* vs. *whom* in relative clauses, through concordance lines. After corpus-based grammar instruction, the researcher administered the questionnaire, asking them to complete it in 15 minutes and then interviewing each of the participants for approximately 10 minutes. The questionnaire sought their opinions and attitudes towards the corpus-based teaching of English grammar. Additionally, the interview aimed to obtain more information about what the participants thought about this particular teaching method

Results

The students taking part in this study mainly perceived the benefits of using corpus data to learn grammar. Most of them apparently had a very positive attitude towards this concordance-based information as it is considered to be a major contributing factor to success in grammar learning through an inductive method. The survey results, according to Table 1, show that they were very pleased with corpus-based grammar instruction. In particular, the majority of the EFL students in this class were of the opinion that language corpora are a very useful tool to teach grammar. Moreover, most of them thought that learning English grammar through concordance lines is better than other learning methods. They also seemed to enjoy making grammar rule discoveries based on the corpus data provided, as this enabled them to be proud of their own learning outcomes. In addition, many took the view that they could enhance their knowledge with corpus-based teaching of grammar.

Table 1 Participants' satisfaction with corpus-based grammar teaching and learning

1. Content	**N**	**Mean**	**SD.**
1.1 Corpus-based grammar teaching is useful.	17	4.94	0.24
Corpus-based grammar learning has enhanced your knowledge.	17	4.24	0.83
You enjoyed discovering grammar rules through concordance lines.	17	4.71	0.47
1.4 You are proud of your grammar rule discoveries.	17	4.59	0.51
Learning grammar through concordance lines is better than other methods.	17	4.76	0.44
AVERAGE		**4.65**	**0.50**

In addition to the quantitative results, the present study also reveals positive opinions of the participants regarding the utilization of corpus-based data in teaching English grammar. By interviewing these students, the researcher also found that they were pleased with learning and teaching grammar through concordance lines, which is consistent with the questionnaire results. Some of their opinions are presented below:

Participant 1
I never knew there is such a useful modern tool like corpora. I learned a lot from the presented data. It was also fun to form a grammar rule using the information in concordance lines. The data suggest some aspects or uses I was unable to find in any grammar reference.

Participant 2
Learning how to use concordance lines in search of grammatical patterns and usage is so interesting and entertaining. I really like to look at the context of use in which each word occurs. I believe other English teachers should apply corpora to their grammar teaching rather than the old boring techniques.

Participants 3
Corpora allow me to dig deeper into some areas that I haven't investigated before. Certain new grammar points are not available in textbooks used in my undergraduate level. At least I became aware that there are more than three if-clause patterns.

Participants 4
I never liked English grammar until corpora were introduced to me. In the past, my teachers sort of forced me to memorize tons of rules. I hated this indeed! But with concordance lines, I think I began to learn something I ignored before. I have been able to gain some new interesting grammar points through corpora.

Conclusion

As indicated by the findings of this study, the EFL learners evidently enjoyed learning grammar using concordance lines, considered a trendy approach in grammar pedagogy. Not only were the students satisfied with the exploration into language data offered by corpora, they also seemed to begin to understand some grammar points they had been unsuccessful in learning through traditional means, e.g. memorization. In fact, grammar is not always something to be taught in a deductive way, i.e., rule-based teaching; on the contrary, it appears to be more challenging and worthwhile for students to come up with the rules by themselves. Teachers can serve as facilitators in the preparation of appropriate corpus-based lessons as well as by providing further explanations to students regarding English grammar.

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LEARNERS' USE OF COMMUNICATION STRATEGIES IN AN ONLINE DISCUSSION VIA FACEBOOK

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Abstract

This study investigates how learners compensate for their insufficient linguistic repertoire and enhance their online discussion (OLD) via the use of communication strategies (CS) in Facebook groups. Using a purposive sampling procedure, a group comprising 28 learners taking a communication course at a public university participated in the study. Ten voluntary learners were sample within the case for a more in-depth investigation of the phenomenon. Data were derived from threaded OLD, interviews, retrospective sessions and reflective journals. Thematic analysis revealed learners' employment of an array of CS when completing the task which includes direct, digital media, paralinguistic and interactional strategies.

Keywords: communication strategies (CS); online discussion (OLD); Facebook (FB) groups; language learners

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Introduction

Less competent language learners often face great difficulties in expressing their thoughts and ideas when interacting in L2. Despite having a lack of lexis at their disposal, these learners have to compensate for their insufficient linguistic repertoire of L2 to ensure messages can be conveyed. Some learners might circumvent their insufficient linguistic resources by modifying or reducing the content of their messages, avoiding the topic or concept to overcome the lack of TL terms or expressions. Whilst others may be able to achieve their communicative goals and get their messages across by developing an alternative means of expression. This strategic behavior is commonly referred to as communication strategies (CS). Numerous interactions can now be conducted virtually using ubiquitous technology such as computers, mobile phones and other telecommunication devices.

The application of Web 2.0 technologies, particularly on the use of social networking tools such as YouTube, Facebook and Twitter has exponentially risen among youth in recent years. Tertiary level learners' heavy reliance on these tools is now common as they provide social and academic platforms to connect with friends, classmates, course mates, lecturers, and administrators Despite resistance to and skepticism over the incorporation of these social networking tools for classroom activities, some language educators have made attempts to explore and utilise these tools to enrich their teaching and assist learners in improving their language learning (Lockyer & Patterson 2008; Nakatsukasa 2009). In fact, a growing number of recent studies have been conducted on the educational use of FB (Buzzetto-More 2012, Melor & Hadi 2012; Sewlyn 2009), however, little is known about how ESL learners use communication strategies (CS) in an OLD via FB groups.

Learner's use of CS in a virtual environment is an area which is still under explored, particularly in Malaysian educational context. The study on the use of CS is indeed crucial as it is the means through which learners compensate and overcome their language deficiency to reach their communicative goal. Understanding the strategies that learners' employed could help them overcome their language deficiencies and utilize their existing knowledge to reach their communicative goal more effectively. As virtual discourse could have unique features in lieu of its resemblance to or mixture of writing and speaking, exploring learners' CS in FB would pave the way for a better understanding of their problems in the interactions. This paper, therefore, aims to shed some light on how tertiary level learners compensate for their gaps in L2 and enhance their OLD via the use of CS in an information-sharing task using FB groups.

Literature Review

CS have generally been observed as attempts made by learners to overcome communication problems due to insufficient linguistic repertoire, namely lexical deficiencies. They are subsumed under communicative competence, labelled as 'Strategic competence' in Canale & Swain's (1980) communicative competence framework and in Bachman's (1990) communicative ability model. It refers to the ability to use different ways and means of solving communicative problems or enhancing the effectiveness of communication via the use of strategies. Selinker (1972), who first introduced the notion of CS, viewed strategies in L2 communication as one of the central processes in second language acquisition (SLA).

Several definitions of CS have been proposed in view of a marked divergence in approaches to the conceptualizations of CS. Tarone's (1980: 420) interactional perspective proposes that CS involve "a mutual attempt of two interlocutors to agree on a meaning in situations where requisite meaning structures do not seem to be shared". CS are thus regarded as interpersonal phenomena, emphasizing mutuality of efforts by both parties to convey an agreeable and shared meaning. The psycholinguistic approach, however, regards CS as being intrapersonal, focusing on individual's internal and cognitive processes. Its proponent, Faerch and Kasper (1983:36) define CS as "potentially conscious plans for solving what to an individual presents itself as a problem in reaching a particular communicative goal". Language users can therefore employ CS when encountering communicative problems without getting help from the interlocutors.

The scope of CS has been extended by Dornyei and Scott (1995, 1995a cited in 1997: 179) to include "every potentially intentional attempt to cope with any language-related problem of which the speaker is aware during the cause of communication". However, Canale's (1983) concept of CS is considered the broadest as it goes beyond all the approaches previously mentioned. Without restricting CS to problem-solving devices, it includes any strategy or plan of action that "enhances the effectiveness of communication" (Canale 1983:11).

Dornyei & Scott's (1997) taxonomy intergrates majority of the predominant earlier taxonomies of CS in the literature (Bialystok 1983, 1990; Faerch & Kasper 1983a; Paribakht 1985; Poulisse 1990; Tarone 1977). Their taxonomy is categorized CS based on the manner of problem management in their extended taxonomy of problem-solving strategies. Three basic categories have been proposed which are direct, indirect and interactional strategies. Direct strategies refer to the “alternative, manageable and self-contained means of getting the (sometimes modified) meaning across” such as circumlocution or approximation to compensate for the lexical gap (Dornyei & Scott 1997). Indirect strategies, on the other hand, facilitate the conveyance of meaning indirectly by creating the conditions for achieving mutual understanding (eg.the use of fillers and repetitions for preventing breakdowns and keeping the communication channel open). Interactional strategies involve cooperative trouble-shooting exchanges which among others include appeal for help and request for clarification.

CS have been extensively investigated in research on second language learning and teaching for nearly three decades. Nevertheless, a vast majority of the theoretical and empirical studies SLA have centered mainly on CS deployed offline i.e in face-to-face (FTF) oral production (Bialystok 1983; Chen 1990; Khanji 1996; Tarone 1980; Wannaruk 2003) and written task (Aliakbari & Allvar 2009). Even though there are some CS research on virtual context (Chun 1994; Smith 2003), these studies were conducted in SCMC environment where research subjects communicated using the technology at real-time (e.g instant messaging or chats). This study, nevertheless, selected FB as a platform for learners’ interaction. As aptly suggested by Mohamed Amin and Ranjit (2009:4),“to truly understand the importance and complexities of asynchronous online interaction, one must study the discourse or interactions that occur within them differently from the ways one would study traditional classroom interactions”.

Facebook (FB), regarded as the most popular social networking tool of this decade, has the highest number of visitors among all the social networking tools available in Web 2.0 with more than 840 million active users worldwide (Facebook Statistics 2012). Ranked 17th in the world in terms of FB usage, Malaysia has 12.23 million FB users, which is 72 per cent of the country’s online population (Malaysia Facebook Statistics 2012). Kamaluddeen et al. (2010) and Safurah et al. (2010) found a higher FB usage compared to other social networking tools among tertiary level learners in Malaysia, with nearly half the number using it daily (Safurah et al. 2010). Their daily usage could possibly have been due to its distinctive features and various social applications (Kamaluddeen et al. 2010). These among others include ‘groups’, ‘friends’, ‘wall’, ‘like’, ‘comment’, ‘links’, ‘video’ and ‘share photos’ which facilitate users in staying connected for social and professional purposes. In view of its frequent usage among learners, FB can therefore be an interesting and a promising tool for educational endeavours. According to Kabilan et al. (2010), Malaysian learners perceived FB as an educational environment that could facilitate English language learning by enhancing language skills and motivation, confidence, and attitudes towards learning the language. The FB platform generates authentic interaction which could boost learners’ confidence and collaborative efforts. In view of the increasing number of learners who are also avid FB users, it seems pertinent that this platform be explored and utilised to support language learning.

Methodology

This study adopts a multiple-case single site descriptive case study approach. Using a purposive sampling procedure, an intact group of 28 undergraduates taking a communication course at the National University of Malaysia was selected for this study. These learners participated in an information-sharing task via FB groups in which learners had to share and exchange views in groups of four or five members on general or academic topics and themes selected by the learners and the course instructor. The information-sharing task required each group to select one of three shortlisted topics for the OLD: Beauty and Health (BH), Technology in Education (TE) and Unusual Vacation (UV). Six groups were formed with each group comprising four or five members and two groups covered each topic respectively (BH1, BH2, TE1, TE2, UV1, UV2).

The participants’ levels of English proficiency ranged between extremely limited and modest users of English, based on their Malaysian University English Test (MUET) results. A majority (82.1 per cent) were learners of MUET Bands 1 and 2, categorized as extremely limited and limited users of English , whilst only 17.9 per cent were of Band 3, modest users of English. These learners belonged to different course disciplines from the Faculty of Education, Faculty of Business & Economics, Faculty of Science & Technology or Faculty of Technology & Information.

Each group was represented by learners of mixed proficiency levels to facilitate the discussion. Within three weeks of initiating discussion on the topic, participants were required to post a minimum of 10 substantial entries, including a summary of the selected article, questions, and responses to questions asked by their group members. The assistant instructor-cum-researcher moderated the OLD. This included giving a briefing on how the task was to be conducted, inviting learners to FB discussion groups, responding to any enquiries regarding the task, and, at times, encouraging lurkers to participate in a more in-depth discussion.

There were 10 learners from the group (2 males and 8 females) who volunteered as sample within the case for a more in-depth investigation of the phenomenon. Data from these learners were collected from semi-structured interviews, retrospective sessions and reflective journals. Immediately after attempting the OLD task, the participants were requested to reflect on and write in their journals the problems faced and solutions taken while interacting online. Three to five journal entries were collected from each participant for analysis. Semi-structured interview and retrospective sessions were conducted as soon as the OLD task was completed. Dornyei & Scott's (1997) and Smith's (2003) taxonomies of CS were adopted as the basis for analysing CS in this study, whilst accommodating the new CS that emerged from the data. Descriptive statistical analysis was also undertaken to obtain the frequency count for CS which appeared in the OLD.

Results and discussion

The findings revealed an array of CS employed by the learners in completing the OLD task. This paper, however, only discusses the most frequently used sub-categories of the 4 types of CS namely direct, digital media, paralinguistic and interactional strategies. The sub-categories of each strategy and its frequency of use in the OLD are listed in table 1. The frequency of CS as surfaced in the OLD scripts is brought to light for a general overview of the pattern of CS usage among learners. Nevertheless, some other types of CS was further detected via an in-depth inquiry of 10 participants (P1 – P10) using retrospective comments, semi-structured interviews and reflective journals.

Table 1. CS used by the learners in the OLD via FB Groups

Types of CS	Sub-categories	Frequency
Direct Strategies	Resource deficit-related strategies:	
	Literal translation	536
	Approximation	73
	Code switching	9
	Own performance problem-related strategies:	
	Self repair	4
	Other performance problem-related strategies:	
	Other repair	2
Digital Media	Facebook Features:	
	Like button	281
	Tagging	227
	Hyperlinks	54
	Videos	10
	Pictures	8
Paralinguistic Strategies	Onomatopoeia	234
	Substitution	195
	Using Emoticons	159
	Capitalizing words for stress	85
	Punctuation	69
Interactional Strategies	Asking for clarification	7
	Appeals for help	4

Direct Strategies

Results show astoundingly high occurrences of literal translation (table 1). As the participants mostly comprised less competent ESL learners, they had to rely on their L1 to help them formulate hypotheses and rules of the TL in compensating for their lack of vocabulary or problems in constructing sentences. A sample of literal translation evidenced in group BH1 script is '*Thing that make us health and beauty is what we discuss about*'. She literally translated word per word from L1to L2 sentence structure. Data from an in depth inquiry revealed that all the 10 participants reported their frequent usage of literal translation in words, phrases or sentences as they think in L1 while interacting in L2. A retrospective comment made by participant P4 clearly indicates her use of this strategy: *"I actually constructed the sentence in Bahasa Melayu and I translated word per word to English"*.

Approximation is the second most frequently employed CS. The participants had to stretch their linguistic resources to compensate for the lexical gap, thus providing an alternative or related term that shares the target word structure, but less specific than the intended. For instance, the participants used the word '*consumers*' to refer to '*hotel guests*'. Results from retrospection and interviews also showed participants' option for simple words or sentences that they were more familiar with in coping with their lexical gap. P2 response pertaining to the use of this strategy is evidenced in her reflective journal stating *"I tried to simplify the sentence using easy words that I know and commonly use"*. As the OLD task could be time consuming, learners therefore had to rely on their available linguistic system, which requires the least amount of time and effort to retrieve.

Code switching occurred only 9 times throughout the discussion. This is most probably due to the evaluated task which warrants some level of formality among the discussants. Participants opted for this strategy to refer to special terms such as names of diseases or traditional medications. A participant wrote *'kaki gajah'* to refer to *'elephantiasis'* , while another participant used L1 term *'minyak gamat'* for *'sea cucumber oil'*. As these terms require a high level of knowledge and vocabulary in L2, participants resorted to code-switching since it is a faster and an easier way to get their message across. Even though there are some occurrences of code-switching in the OLD scripts, only one participant explicitly mentioned about this strategy in the interview.

Despite few occurrences of self- repair and other-repair in the OLD, it is also pertinent to take note of the participants' use of these CS while doing the task. Amendments in writing particularly in terms of spelling mistakes, inappropriate or incorrect words could be done as the asynchronous mode allows such repair before or after the messages are posted. In addition to self-correction, there were also instances of a group member correcting another group member's language mistakes. A participant in group TE1 corrected his own error *'I think **is** article is...'* to *'I think **this** article is...'* Another participant in TE2 corrected her group member's mistake by stating *'I **can't be** a new experience but i **will get** a new experience...'* A retrospective comment made by P3 confirms her usage of other-repair strategy: *"I understand what he wanted to say...so I corrected him. Perhaps this is the message he wanted to get across, but it could not be achieved."*

The qualitative inquiry, nevertheless, revealed that 6 of the 10 participants opted for restructuring, even though it was not surfaced in the OLD scripts. For instance, P7 wrote in his reflective journal that *"I began restructuring the sentence for the word to be used suitably"*. Facing difficulties in completing the sentence, he had to maneuver his initial goal via an alternative plan in order to get the message across. In addition, 7 participants reported the use of message reduction in the interview or retrospection when encountering language difficulties. Instead of writing *'Another way to heal dry skin is by soaking our feet in warm water'*, P1 posted *'Other than a foot soak in hot water'*. Her intended message could not be fully expressed due to problems with sentence construction and vocabulary, and therefore had to reduce the message using her limited linguistic resources.

Digital media

Digital media were also highly employed by the participants as apparent in the OLD. There are 5 types of digital media used by the learners, with a substantial usage of FB features. As shown in Table 1, the 'like' button, a distinctive feature of FB, was utilized the most frequently. It indicates their agreement with their group members' comments and symbolizes appreciation to their effort and contribution in the discussion. Tagging group members' names were the second most frequently used. It helps participants get their group members' attention by the notification received in their e-mail. Additionally, there were substantial occurrences of the use of hyperlinks in the learners' entries to help enhance their group communication. Videos and pictures were also uploaded and posted in the OLD to help illustrate and explain the issues or topics discussed.

Apart from the above mentioned CS which appeared in the OLD, all 10 participants reported their heavy usage of online translators, either in the form of software that needs to be downloaded or readily available in the websites. Apparently, they used at least one of the translators, with Google translate (translate.Google.com) being the most commonly used, followed by Citcat (citcat.com) and Language translator software (http://free-language-translator.en.softonic.com/). A remark made by P3 in the interview showed her employment of this type of CS: *"To overcome the problem I usually refer to Google translate"*.

The participants also used Microsoft word and online or digital dictionaries to cope with their language problems. As Microsoft word provides grammar and spell check, some participants preferred drafting sentences prior to copying and posting their messages to FB groups. For example, in an interview with participant P8, he made this comment pertaining to his use of Microsoft word: '*there were instances before posting my comments and giving opinions…and once I've done the translation…I copied them to Microsoft word and checked for spelling"*. The asynchronous mode also facilitates referencing of other tools such as the online dictionaries. Participant P5 mentioned in her retrospective session that she referred to online dictionary and aptly claimed that '*I have Cambridge dictionary in my laptop'*.

As traced in the OLD scripts, some participants used pictures and videos to enhance their group interaction. The participants needed a rather high level of vocabulary to be able to describe places and procedures clearly. Uploading and posting the pictures and videos helped to facilitate and improve their group members' understanding, thus encouraging a more active and meaningful discussion. One of the participants demonstrates the use of this strategy in her statement: *"I used pictures to let them know that the place is very beautiful, but they might not be able to visualize it. As such I used pictures so that they can see them themselves."*

Paralinguistic strategies

As shown in table 1, the learners displayed a considerably high use of paralinguistic strategies, namely onomatopoeia, substitution and emoticons in the OLD. The absence of cues such as intonation, pitch and facial expression in virtual context was compensated by the use of symbols and textual substitutes (table 2). The use of onomatopoeia seems to resemble expressions of FTF oral interaction. The written nature of OLD, which in some ways is similar to chats, encourages the use of abbreviated words and phrases for simpler and faster typing. Emoticons were employed to enhance interaction by creating a friendly environment, replacing their actual smiling face and positive mood, hoping to boost their group members' confidence and motivation.

Table 2. The description and examples of paralinguistic strategies

Paralinguistic Strategies	Description	Examples (data from the present study)
Onomatopoeia	Devices which take place of oral cues in FTF interaction	Woowww!; oohh...;hehehee…; ZZZzzz; hmm…
Substitution	The use of abbreviated forms of a word	before= b4; can u = cn u; as soon as possible= asap;laugh out loud= lol
Emoticons	The use of symbols to represent emotions	^_^ :) ♥♥ :P =D
Capitalized words for stress	Learners capitalize some words to show emphasis	TRULY innocent...; THANKS a lot…PEACE; WHY?
Punctuation	The use of excessive punctuation marks	!!!; ???

All participants, except P7, used emoticons such as smiley symbols (eg. ^_^) at the end of their comments as evidenced in the OLD. Nevertheless, data from the retrospective session and interview revealed this strategy was not employed to deal with language deficiencies, but rather to express their liking, agreement and appreciation to their group members' writing. Such a friendly symbol and atmosphere could influence their group members' affective domain by encouraging their group members to write more responses or questions. P4 mentioned about her usage of emoticons *"to show my happy mood at that time…to know more about the topic discussed…and for Suria to provide more explanation"*.

Interactional Strategies

The OLD scripts revealed only few instances of interactional strategies when learners asked for clarification and appealed for help from their group members. This strategy is evidenced when a participant in group UV2 asked *'Can you explain to me more about solo vacation?'* and a group member of BH2 posting a question *'What is meant by lanolin?'* Since the OLD could be accessed anytime and anywhere, the participants could read the posted messages repeatedly to enhance understanding. Perhaps as the scripts would likely remain on the OLD platform, it is rather embarrassing to explicitly and repeatedly ask for help and get clarification in written form from their group members. However, it is interesting to discover that even though the use of this strategy was minimal and remained unnoticed in the OLD, they actually often turned to their friends who were more proficient in L2. It is pertinent to highlight that all participants, except P10, asked from their friends or roommates for lack of vocabulary. P4 in her reflective journal wrote *"Among the actions I took was to ask those around me, for example my roommate who was proficient in English"*.

Out of the several sub-categories of CS mentioned, each participant was found to employ a minimum of 6 CS covering all the 4 main categories. There was a clear indication of preference to certain types of CS, particularly literal translation, using online translators, emoticons, simple and familiar words or sentences as well as appeals for help. Participant P4 and P6 employed 10 subcategories of CS, exploring most of the identified strategies to enhance the group interaction. Most participants employed a wide variety of CS, illustrating individual styles and preference, regardless of their language proficiency. Participant P10, being a modest user of L2, nevertheless, relied more on her own existing linguistic system without asking for assistance from her friends or roommates in solving her communication problems.

To sum up, despite facing great difficulties in L2 interaction, learners seemed to employ more of the achievement-oriented CS in that they struggled to get their message across via several ways and means. In fact, their use of translators should be seen in a positive light as this strategic behaviour involves evaluation and analysis of the word options in determining its contextual appropriacy. Therefore, apart from having access to the translation of words, phrases or sentences, the translators also provide some options of words for learners to choose from, thus helping learners to expand their vocabulary.

Conclusion and suggestions

It is evident from the study that learners opted for various CS to help them compensate for their inadequate command of the language. However, in addition to several types of CS available in literature, this study has elicited some new CS. Using FB groups for the OLD, learners had FB features and other online tools which could be utilised. It would be of great benefit, therefore, for language instructors to create such awareness of the possible variations of CS that they can employ while interacting online, particularly those features and tools from the latest emerging technologies. Due to frequent use of translation tools, learners need to be guided on the right way to help them translate more accurately.

Similar to Chen (1990) and Paribakht (1985), we believe that learners' communicative competence can be developed by building up their strategic competence. Sharpening their ability to use CS to compensate for language deficiencies can promote a creative use of their L2 knowledge. As OLD allows learners to focus on form and meaning which could help to promote and accelerate L2 development, greater attention could be given to tasks and activities that can develop their strategic competence.

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LEARNING AND EXPERIENCE: TEACHING TANGIBLE INTERACTION & EDUTAINMENT

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Abstract

This paper shares our learning and teaching experiences carried out during a course of Interactive Communication Project delivered at the Department of Design, IIT Guwahati (India). The course focused on tangible user interaction and edutainment and enrolled diverse mix of undergraduate and graduate students. The course was conducted as a part of academic collaboration between IIT Guwahati, India and University of Calabria, Italy. Although the course was conducted in India, one of the two course instructors conducted lecture and critique sessions from Italy. Parallel sessions of lectures and studio components were conducted during the course. This approach fostered theoretical knowledge and its application through hands-on learning. With a time period of hardly 20 days, students have created novel designs on tangible user interaction and edutainment. We discuss and explain the course details, followed methodology, three student projects, problems and challenges faced delivering the course.

Keywords:Edutainment; tangible user interface (TUI); teaching experiences; documentation; input devices and strategies; interaction styles

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Introduction

The spread of educational and communication innovation has generated new didactical methodologies and approaches, software and hardware tools. Despite these conceptual and technological advances, however, most of the current electronic educational systems still consist of video-lessons and few interactive functions that stimulate an effective student's learning. We propose to design and develop innovative learning tools aimed at motivating teachers to use new educational approaches and tools in their didactical activities. Many psychological studies suggest that constructivism promotes the development of a wide spectrum of cognitive functions and skills: communication, creative thinking, social cooperation, language, etc. In this view, we can affirm that edutainment is an empirical application of constructivism theory (Ozkal, K., et. al., 2009). There has been a growing demand to enhance the edutainment environment for children that supports education and entertainment in a seamless manner, given the context of children learning initiatives (M. Rehm, et. al., 2006, H.S .Horace & K. Belton, 2006, Colace, F., et. al., 2008, Z. Muda & I.S. Basiron, 2005). This type of computer-based instruction tools has been designed and developed to efficiently improve scientific teaching. However they are devoted to variety of students (Alessi, S. M., & Trollip, S. R., 2001, Guillén-Nieto, V., & Aleson-Carbonell, M., 2012). Edutainment systems give the opportunity to the subjects to learn scientific concepts by reducing their conceptual abstraction level. In addition, edutainment system provides a good didactical basis to formulate new and more stimulating teaching approaches. The main idea of these interactive tools is to stimulate subjects to learn from direct experience by exploiting the cognitive potentialities of direct manipulation. Learning is more productive when subjects use tools. The productive dimension result from the fact that subjects pursue goals and these tools represents the cognitive indicator of how subjects learn. New paradigms in computer interaction have made promising advances in this regard, redefining how physical objects can be used for both play and learning. In last decade, tangible user interaction research has gained visibility within the Human–Computer Interaction (HCI) community, showing promise to support activities such as learning, problem solving, and design (O. Shaer, et. al., 2009).

In this paper, we share our experiences and learning of conducting 20 days course on tangible user interaction and edutainment. The course involved lectures, studio sessions that included cooperative and collaborative work and student projects. This paper is further divided into four sections: introduction to the course, methodology followed to conduct the course, student projects and discussion.

Course introduction

The proposed course taken at Department of Design, Indian Institute of Technology – Guwahati (IITG) was named Interactive Communication Project (ICP). ICP was an elective course, offered among 4 undergraduate and 3 post graduate students. 3 graduate students were from varied background of fine arts, fashion technology and electronics engineering. The course was mentored by two faculty members, Keyur Sorathia, Assistant Professor in Design, IITG, India and Rocco Servidio, Assistant Professor in Psychology, University of Calabria, Italy as a part of scientific agreement signed between IITG and University of Calabria for academic and research collaboration. A dedicated lab space, Apple computers and prototyping tools were provided to students to conduct their experiments. Similar to other HCI courses in institutions such as University of Washinton, (Camarata, K., et. al., 2003) and Welleley College (Turbak, F., et. al., 2002) the course was divided among lecture & studio sessions and hands-on learning. They were conducted in parallel introducing appropriate theory based on the stage of the project.

Edutainment and tangible interaction

Edutainment, similar to infotainment, technotainment, educational electronic games, is a new term coinage (Rapeepisarn, K., et. al., 2006). The idea underlying edutainment is to promote learning by merging educational contents and entertainment activities that increase engagement, emotion, and motivation. According to Buckingham and Scanlon (2005), edutainment is "a hybrid genre that relies heavily on visual material, on narrative or game-like formats computer games-education-implications for game developers, and on more informal, less didactic styles of address. Edutainment is the act of learning heavily through any of various media such as television programs, video games, films, music, multimedia, websites and computer software. On the other side, technological innovations and emergence of research areas such as tangible interaction have opened new exploration possibilities. Edutainment does not remain restricted to computer based games, but provides opportunity to include multimodal interfaces to interact with educational information. New paradigms in computer interaction have made promising advances in this regard, redefining how physical objects can be used for both play and learning. Tangible user interfaces provide ways of interacting with a computer through real objects that are relevant to the task instead of through the keyboard or mouse (Ishii, H., & Ullmer, B., 1997, Ullmer, B., & Ishii, H., 2000). It introduces physical, tangible objects that augment the real physical world by coupling digital information to everyday objects. The system interprets these devices as part of the interaction language.

There is a need to explore the possibilities of merging edutainment and tangible interaction. There has been good evidence to support the facts through touch, exploring and testing students learn more about the world around them (Strommen, E.F., 2004). Piaget and other developmental psychologists have also emphasized the importance of using physical objects for children cognitive development (Piaget, J., 1962, Ginsburg, H., & Opper, S., 1979). The importance of instrument-mediated activity through the use of edutainment environments it is consistent with the learning theories derived from Piaget and Vygotskij (1962) works focused on cognitive development. Afterwards, these conceptual frameworks have been revised by Papert, which conceived learning as a student's active construction. In fact, the constructivism approaches a kind of learning in which the educator does not transfer information, but is rather a facilitator of learning so the learner enhances his/her knowledge through the manipulation and construction of physical objects. We argue that it is important an integration among edutainment, as learning strategies, and tangible user interaction as an interactive way to communicate educational contents.

Course objective

The objective of ICP course was to train students to design, develop and validate innovative Tangible User Interfaces (TUIs) based on edutainment systems. In particular, students were forced to demonstrate the acquisition of practical and conceptual ways of utilizing advanced technological tools for educational purposes. The project focused on designing and developing an educational system on followings topics: mathematics, chemistry, physics, learning of fruits, colours, history, astronomy, energy conservation, and tourism etc. Students were given freedom to choose any topic. However, the condition was that it had to be in the area of tangible user interaction and edutainment.

Timeline and deliverable

The courses at Department of Design, IIT Guwahati are divided over a complete semester. During the semester, each course is given a particular time slot to conduct lectures, tutorials and studio. Typically each course is provided one day in a week. In a 4 month semester, most of the courses get around 16-18 days for the course to complete. ICP was also conducted in a 4 months semester period. Total numbers of days allotted to ICP course were 20 days (including official 16 days and 4 days during weekend) during the 4 months' time period. However students enjoy freedom of working in studio for unlimited period of time, availing the lab facilities. Students were divided in three groups, two students each in two groups and three students in one group. For deliverable, students designed and developed a system for their selected topics. During the course activities, students learnt new interaction techniques, design methods and prototyped them. Students chose educational contents from National Council of Educational Research and Training (NCERT) course structure. Final users must be able to use the developed educational tool for acquiring new concepts aimed at improving their learning process. Day wise course plan is showcased in Table 1.

Table 1. Course structure organization and timeline.

Day	Activity	Day	Activity
01-03	Project kick-off, literature study and research problem identification	09	Lecture on Creativity Techniques, Brainstorming session continues
04	Presentation on finalized topic & suggestions	10-14	Concept generation, critique sessions and refinement
05	Lecture of Cognitive Psychology on: cognitive factors and system design	15	Introduction session on prototyping tools and techniques
06	Lecture on Tangible User Interfaces- techniques, methods and guidelines	16-18	Prototype development and refinement
07-08	Brainstorming session	19-20	Presentation and deliverable

Methodology

Methodology followed during the course is sub divided into 4 main sections: Self-study assignment, lecture sessions, studio sessions and critique sessions.

Self-study assignment

As a part of literature study, each group was given research papers to read and review. Two research papers; “Attentive objects: enriching people's natural interaction with everyday objects” (Meas, P., 2005) and “A ubiquitous mobile edutainment application for learning science through play” (Astic, I., et. al., 2011) were given to each student. Additionally, different set of papers were given to each student to read and review. The papers focused mainly on tangible interactions, edutainment and related projects.

Each group of students presented these research papers. The literature study exercise was conducted among students to learn more about edutainment, tangible interaction, existing design methods, prototyping and paper writing. The project template included several sections, aimed at describing the system and the mentor evaluated students’ acquired skills derived from the self-study assignment. At the end of self-study session students were asked to define a broader area of work. They were given freedom to choose their area of interest to pursue. For example, one group decided to work in the area of chemistry lab experiments. Once the broader area of work is decided, they were asked to refer NCERT books for understanding the exact educational contents and existing methods of teaching those contents. First group of students decided to work in the area of teaching *acute angle, obtuse angle and right angle*. Second group decided to work on *teaching basics of algorithms* and third group of students decided to teach *Salt Analysis Table* of chemistry lab experiments. As a part of self-study, students were also introduced to children behavior of specific age groups. They were explained children’s characteristics and behavior of different age group. The knowledge based was provided through books articles (e.g. Kail, R., 2006, Smith, PK., Cowie, H. & Blades M., 2003). This exercise helped them get an understanding of characteristics, liking-disliking and behavior of their target users.

Lecture sessions

Lecture sessions were majorly divided into two sessions. The first session explored the relationship between cognitive processing and Human-Computer Interaction applied to the interaction design. More specifically, cognitive psychology is the scientific study of mental processes, which include attention, perception, memory, learning, thinking and reasoning. Finally, we provided an overview of the main ideas and research methods used to design and evaluate user interfaces. The second lecture was related *Tangible User Interfaces (TUI)-techniques, methods and guidelines*. Students were introduced to history & evolution of user interfaces, model of TUI, existing projects, properties of TUI products, tools and methods, framework on tangible interaction- Tangible manipulation, Spatial interaction, Embodied interaction, Expressive representation (Hornecker, E., & Burr, J., 2006), internal abilities, and hands only scenario (Buur, J., et. al., 2004). Tangible interaction guidelines were formulated in a set of questions and given to students to help them design tangible interaction products. For example, is user able to grasp and manipulate the given object? An introductory lecture on *creativity techniques* was also taken introducing techniques such as storytelling, force fitting tools, random input, brainstorming, brain writing, imagery tool and attribute listing. Students were asked to utilize taught theories and applied them in studio session.

Studio sessions

Studio session allowed students to practically apply techniques and methods taught to them. Brainstorming activities, concept generation and prototyping were parts of studio session. Brainstorming activities were moderated by mentor to see appropriate use of techniques taught to them. A common task was given to students to share their personal experiences of school learning. Later on it was narrowed down to a specific topic chosen by their group. This exercise helped them to identify their personal emotions, environment, objects and people associated with it. Mock up tools such as clay, wooden blocks, Lego blocks, specific product packages and other workshop facilities were provided. These materials (especially Lego blocks) and workshop facilities helped students to quickly build up their mock up and facilitate them to communicate and share own ideas. Hands-on session also included learning prototyping. Prototyping tools such as Arduino, processing programming language, RFID phidgets, Fiducial markers, sensors-actuators etc. were introduced to students.

Critique sessions

Learning activities and project progress of students were evaluated and critiqued every week. The aim was to create an environment where ideas can be refined, evaluated and given appropriate future directions. The presentation needs not to be a formal format (e.g. PowerPoint or Adobe Flash), but they were asked to bring their research analysis documents, brainstorming charts, sketches and low fidelity prototypes. Students were asked to digitally report every step of the design process. This report was included in the final presentation, which was formally presented (e.g. PowerPoint or Adobe Flash) by students.

Student projects

In this section we carefully describe and explain three student projects designed during the course. In an ideal scenario, all the proposed designs are to be used with teacher's aide.

Project I: Drop-on-Top (DOT)

Classroom program teaches the relationship between degree of angle and their relationship with acute, obtuse and right angle through a predefined theory, but do not give experience about angles formed through real life objects. To help students to understand angle formation and their relationship in a more playful way, Drop on Top (DOT) was designed. The project aimed at teaching main properties of angles to children aged 8-10 years. DOT allows student to learn and understand basic mathematical concepts by manipulating and interacting with real objects. The reproduced educational contents are borrowed from standard curriculum guidelines of NCERT for primary schools.

Table 2. Table showcasing the range and type of angles.

Range of angle	Type of angle
0-89	Acute angle
90	Right angle
91-180	Obtuse angle

Basics of geometry are taught from angles. DOT simulates the relation between degree of angles and the relationship with acute, obtuse and right angles through tabletop interaction. The angle details are shown in table 2. The design consists of a smart surface on a table and pencil shaped smart objects. Smart objects are shaped of colourful and shiny markers, so that their use is familiar for children.

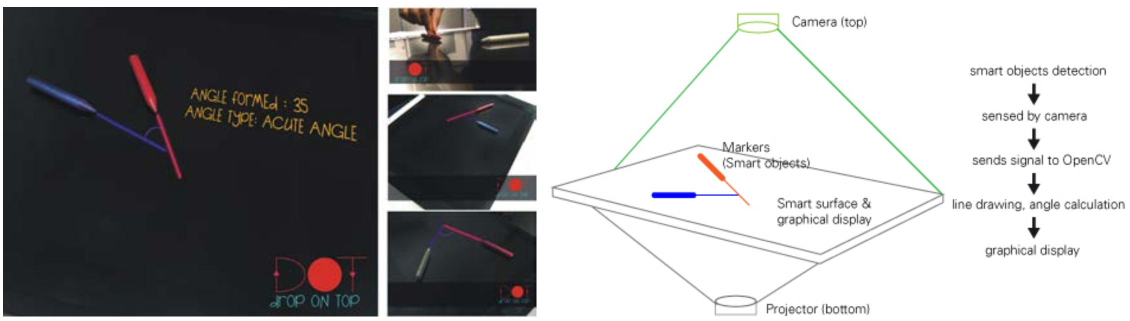

Fig. 1. (a) Formation of acute angle on Drop on Top (DOT); (b) Technology and hardware structure of DOT

As shown in Fig. 1. (a), two different markers are placed on the top of table and extended rays are formed from the markers. The combination of the two rays generates different type of angles, which is displayed through graphical user interface. The rays are of the same colour of the smart objects. The metaphor of rays is: a) related with direction and the figure formed: b) correlated with the shapes formed by markers of the real life objects such as pencils, pens and colour brushes. A working prototype is created using a webcam (mounted on top), projector (underneath the table) and open source software environment Open Computer Vision (CV). Real time image processing is done using Open CV that captures the image frames of placed markers. Each captured image frame is cloned on colour basis generating two main parts: clone-1 and clone-2. Colour line is calculated and drawn from centre location. Slope of line is calculated in their respected frame. The same process is applied for clone-2. When clone-1 and clone-2 are morphed, an angle is calculated and distributed among obtuse, acute and right angle. The type of angle and its degree is shown with customized line colour and font size.

Project II: Salt Analysis Table

Salt analysis test is a test performed by 8^{th} standard students as a part of their first chemistry lab experiment. In current school scenario, an unknown salt is distributed among students to determine the cation and anion present in given salt. The unknown salts are: Coppers Sulphite[Cu_2SO_3], Ammonium Carbonate[$(NH4)_2CO_3$] and Lead Nitrite[$Pb(NO_2)_2$]. Several tests are performed to identify cation and anion, which helps students to identify the correct salt. Prior of the lab test, students are given experiment manual to learn step-by-step process to perform the test. Most often students do not understand the procedure and just memorize them. Students misplace or waste the salt that leads to incompletion of lab experiment. Considering these conditions, Salt Analysis Table (SAT) is designed. It is a tangible edutainment board game that helps students to learn about salt identification tests. It provides a learning platform where students set up the experiments and their role in determining cation and anion in a given salt. As shown in Fig. 2. (a) SAT board is divided into 3 main sections. 14 reaction boxes are placed at the centre of SAT board, control panel placed on the top (e.g. reset button and chances remaining to identify correct salt) and result section (where identified salt is placed in correct slot). 14 reactions boxes represent a set of reactions to be performed to identify the correct salt. As shown in Fig. 2. (b), reaction details are seen when flap of reaction boxes are opened.

SAT is used along with a teacher or teaching assistant. Student is given an unknown salt (represented by rectangular block). The task is to identify the correct salt by performing a series of reaction experiments placed on SAT board. Based on the placement of unknown salt block in reaction box, LED besides the reaction box lightens up green or red. Sequence of reactions is very important to identify the correct salt. Appropriate sequence of reactions results in positive feedback, leading to increased score. Students are given five chances to identify the right salt, represented through LEDs on control panel. Light sensors, connected to Arduino are placed underneath the reaction boxes. They are used to identify the salt box and correct sequences of reaction.

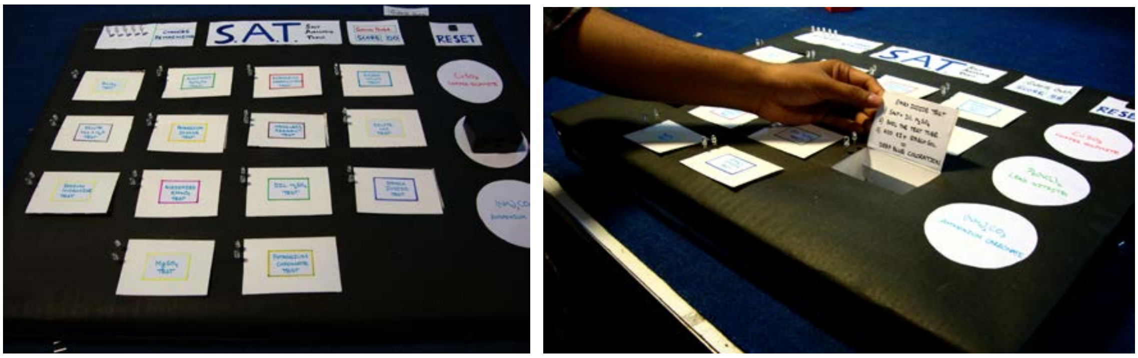

Fig. 2. (a) Low fidelity prototype of SAT; (b) Reaction details showcased on the flap of reaction box.

Project III: Fun-In-Flow

A flowchart is a type of diagram that represents an algorithm or process, showing the steps as boxes of various kinds and their appropriate order by connecting these with arrows. Fun-In-Flow project is a tool for learning flow-charts and algorithms for 8^{th} standard children. It is a play-and-learn edutainment kit that allows children to manipulate predefined symbols to write a program. Flowchart learning is divided into four stages: Children are introduced to flowchart symbols and their functioning:

Children are introduced to flowchart symbols and their functioning
Examples of *washing your hand* and *boiling water* are given to children. These examples are divided into 8 and 10 steps respectively. The predefined symbols are given into Fun-In-Flow kit.
Children are given three simple problems to translate in a software program. It includes use of each symbol. Three following problems are given: *Printing of a particular number, Addition of 2 numbers and Find the greater number.* By manipulation of flow-chart symbols, children learn input/output, start/stop, mathematical operations and decision box functions.
A complex problem is given to children to test their learning. The problem is *to check whether the number is divisible by two or not*.
As shown in Fig. 3. (a), the kit is divided into three main areas: *learn, practice* and *result*. By pressing the symbol buttons in the learn area, students are introduced to common flow chart functions such as Start/Stop, Input/Output, Processing and Decision. Pressing each symbol, the system provides an audio based learning tutorial. Second, third and fourth stages of learning happen in *practice* area. Children chooses appropriate

symbol and place it on *practice* area. Green or red light indicates whether chosen symbol is correct or incorrect. Fig. 3. (b) shows the working of Fun-In-Flow. RFID readers and tags are used to prototype Fun-In-Flow. A tag is attached to every symbol. RFID reader is placed below practice section.

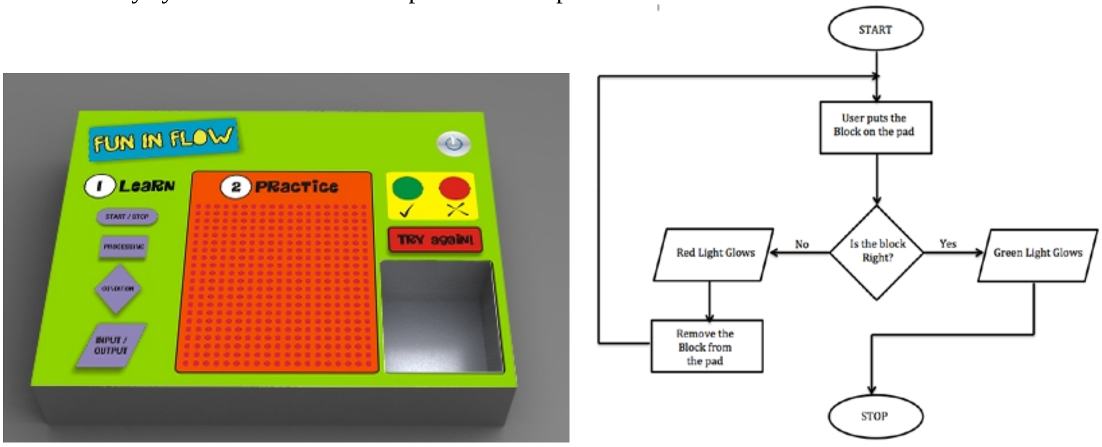

Fig. 3. (a) Overall structure of Fun-In-Flow; (b) Working scheme of Fun-In-Flow.

When the symbol is placed, RFID reader identifies the tag and provides appropriate results. Reader is programmed to identify the sequence of blocks.

Discussion

The course was conducted in different sets of constraints, problems and challenges. Due to a week gap between two sessions of the course, maintaining continuity became a big challenge. Theory taught in one session needed a quick recap in next session for better understanding of new contents. Similarly, students needed time to consolidate the learning activities done in the previous session. We found 20 days to be a shorter period of time to conduct a course that demanded lecture, studio sessions such as research, concept generation, prototyping and final deliverable. Although students were always allowed to avail lab facilities but availability of mentors was not fully possible. Students could not get immediate feedback on design process. Mentors had to conduct the didactical sessions on weekend. During the course we had conducted four sessions on Saturdays to fulfil the requirement of the course. It became difficult to find common time availability for mentors and students to conduct weekend sessions.

Availability of equipment and lab facilities provided a platform to build a working prototype. Although shorter time period and simultaneous peer course work pressure restricted students to build high quality high fidelity prototype. Students found the theme very open ended, which resulted in a longer time period to finalize the problem statement. For example, once students chose a broader area of Chemistry lab experiments, considerable amount of time was spent to choose experiments of *salt analysis test.* Both mentors used Skype useful to interact, critique and conduct lecture sessions. However, minor technical problems such as invisibility of contents on screen-sharing feature and reduced voice quality of the speaker were found. In these cases, speaker was asked to repeat the contents or notes. English language accent was found to be a challenge at the initial stages of the course. Italian accent of English language was found difficult to understand, but students got accustomed after a period of time. Students' background influenced the design process. Students of relatively better schools had different perspective on education. For example, one student learnt angle through real life examples of door opening and closing, while others were taught through a predefined theory course. Diverse mix of students and different background (e.g. engineering, design, fashion etc.) opened different perspective on design. For example, engineer students focused on functionality whereas student with fine art background focused on aesthetics.

Conclusion

In this paper, we shared our experiences teaching a tightly scheduled course, remote faculty collaboration, parallel lecture-studio approach and highlighted challenges faced to conduct the course. The area of tangible user interaction and edutainment was new to students; however they showed enthusiasm for the course. Each student attended all the lecture and studio sessions. Lecture and studio sessions were conducted in parallel, which provided an opportunity to practically apply theoretical lessons. Course duration was found less, however better lab facilities, availability of equipment and continuous support from mentors provided a platform to make it a successful course. Interdisciplinary backgrounds of students help bringing in different perspective on design approach and ideas. Greater involvement of mentors, continuous feedback and critique sessions were very critical to drive the project in time. We believe that success of the course will attract students from variety of disciplines, thus bringing different perspective, creative approaches and new ideas to edutainment and tangible user interaction. In future, we plan to longer the course duration, tighten the course brief and plan superior lab and workshop facilities.

Acknowledgements

We would like to thank all students who participated in this course.

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LEARNING AND TEACHING WITH TECHNOLOGY E-LEARNING AS A MOTIVATION IN TEACHING PHYSICS

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Abstract

The paper focuses on the E-learning Physics course, which we introduced in a test form in the teaching of physics at the University of Defence in Brno. Previously, traditional form of teaching has ceased to be unattractive for students, so we have introduced this modern didactic tool and thereby we increase student's interest in studying physics. We introduce E-learning course students through an interactive whiteboard. This kind of approach of the teaching is desirable. The paper presents a multimedia presentation on the topic of optics, used in teaching physics. Particularly important in optics is a graphical interpretation, allowing students to better understand the subject matter. The inclusion of interactivity and multimedia elements in the teaching of physics serves as a convenient means of awakening interest in students and enhances students' self-logical thinking. Further studies using e-learning is very effective due to the fact that each individual person can choose their rate of progress. Learning is not restricted by the lecturer or another student.

Key word: E-learning; Physics; Motivation

Main text

This paper presents the output of Specific research at the University of Defence in Brno. The project is the E-learning course at "Physics", applicable to teaching physics at the baccalaureate level. E-learning course is in testing phase. The introduction of the modern teaching technology into vocational training at our university is important because through them can motivate students and enhance their interest in the study. The course is created in the Moodle software, which is by the University of Defence technically supported.

Character of physics teaching environment is so specific that the creation of e-learning tools was quite complicated. The authors try to incorporate not only distance education, but also through e-learning on campus with the help of a tutor. This is developed to engage in students' individual aspects separately, but still there is the opportunity to consult directly with the teacher. Which is the increased efficiency of work, where students can devote substantially more problems that just makes them wrong and not limited by standard teaching.

Our goal is not only prepare students for an exam in physics, but also the intention is to prepare students flexible, able to work in an interactive environment. As stated in [1]: University knowledge transfer must be understood as a dynamic, complex process, open to changes or new conditions, not only able to provide graduate knowledge content, but also generate funds for the acquisition of certain characteristics, habits and skills to meaningfully manipulate them.

Methods

For creating e-learning course was used the software package Moodle. Methodology is based on partial steps that can be characterized by the following algorithm:

- Analysis of current situation and its subsequent evaluation.
- Theoretical treatment of tackle.
- Subsequent to the implementation of the Moodle software.
- Applications in teaching.
- Giving motivational presentation.

E-learning course is being pilot version that is still being developed and modified. The course is constantly improved through knowledge gained from the introduction to teaching. After reaching the set targets for increasing the current interest of the students was created motivational presentations on the interactive whiteboard.

E-learning course

E-learning course is composed of 16 topics, which are discussed in both semesters of the first year of bachelor study (8 of 8 in the winter and summer semester). Each topic is the content of one seminar, which follows on from theoretical lecture. The theoretical lectures are arranged important physical knowledge and the students are familiar with the physical phenomena and regularities in the field. It can be assumed that they are able to handle e-learning course without help of teacher and they are able to solve most numerical tasks independently. This course is used in addition traditional teaching and thanks to him the students are able to successfully manage object physics.

The course is divided into five sections in each topic:

The basic difficulty - Elementary numerical task. To solve these problems is sufficient knowledge of high school.

Medium difficulty - Counting problems that are addressed in the seminar. For these tasks, it is assumed that the students solved without much effort.

Higher difficulty - Counting problems that are addressed in the seminar, but you need an example of a complete interpretation of the teacher.

Theoretical test - in which the student verify that the acquired knowledge is sufficient. The test serves only as homework.

Theory - Interpretation of the curriculum in this topic, which is referenced in the individual steps in solving examples. Solving problems is extended to include comments explaining the steps that refer to the theoretical part of the course.

We try to apply a course in different ways. In this paper we will introduce one of the possible forms of applications, is a multimedia presentation.

We would like to mention that E-learning course might be used by students individually on separate classroom computer, but can also be used in a group setting around an interactive whiteboard. [7]

Multimedia presentation -

Motivation in e-learning students is one of the basic problems. We must realize that more effective educational journey is seen as a "blended learning", which is conceived in the narrower sense as a mix of e-learning activities and classroom teaching If e-learning will add other elements of distance education, then we reduce some of the disadvantages minimum and vice versa for good management and general study support will greatly outweigh its benefits [2]

Motivation

One of the motivations we are proposing through multimedia presentations. It is possible to show in the classroom via an interactive whiteboard. Connection these two learning tools is an effective motivation for students.

For illustration the authors present example solution problem with whiteboard.

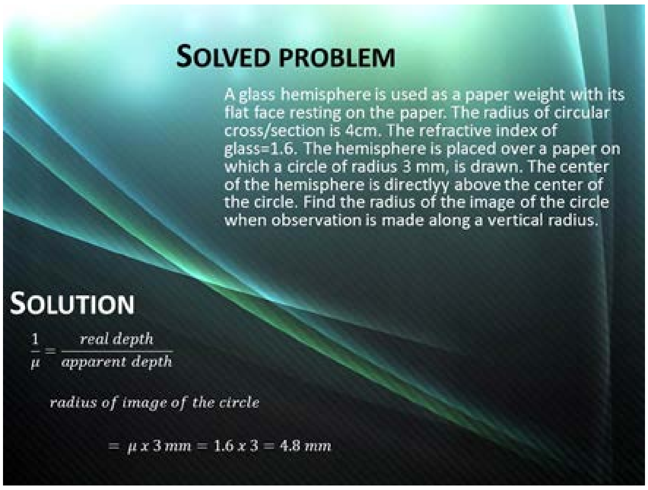


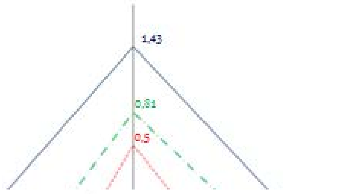
Fig. 1.: *Whiteboard presentation* [6]

The basic idea of our e-course is trying to maintain the 7 basic principles of online education:
Encouraging contact between learners and tutors.
Developing cooperation among students.
Using active learning methods.
Providing rapid feedback.
Emphasizing the time required to perform the task.
Expectations of success.
Respect diverse talents and different ways of learning. [3]

In the contrast to full-time teaching in our course is not the role of teacher in the explain curriculum, but in help and guidance of students during their studies. The main task of the tutor is to communicate with students. This communication is conducted to ensure that students do not lose motivation and desire to study. [4]

Aplication

The Physics course can be taken two ways. The first one is directly in the course of teaching, where teachers present the lessons. The second way is homework, which is available at all times. From the course registered 40 users have used e-learning homework for 34 people. Their success rate is shown in the following chart.



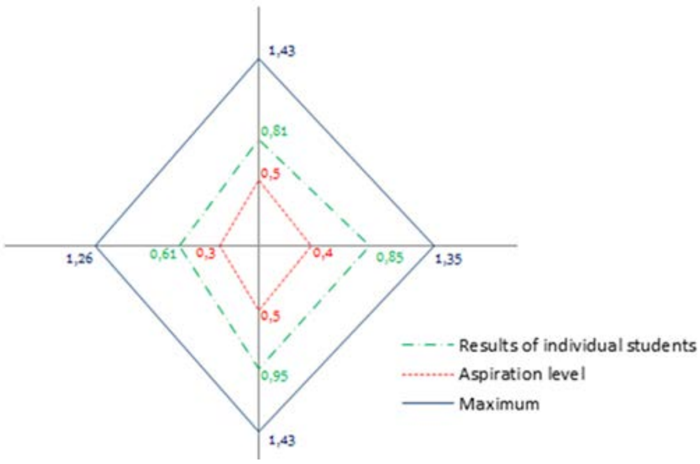


Fig. 2. *Graph of individual results*

The graph shows the multi-criteria evaluation of alternatives. The theory of multi-criteria decision making is based on mathematical modeling, where they are considered different criteria for selecting the best variant of the potentially viable options. Each criterion enters into the final evaluation with different weight, the more weight is higher, it is also its importance. [5]

In our particular case, the individual criteria are examples. Each of solved examples was being weighted depending on the type of difficulty. The graph also shows the level of aspiration, or the value that we set as a minimum to comply.

Discussion

These results can be interpreted as meaning that the E-learning course is interested. The analysis shows that it is used not only on campus but also at home. Its implementation into education has brought a new dimension in physics education. The solved problems might be extended to other examples, theoretical questions or comments to the given problems.

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LEARNING CULTURE IN A SMART SCHOOL: A CASE STUDY

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Abstract

This research was aimed at studying the ICT integration in everyday life of one Iranian smart school. The model, which is used, considers the school as a whole and as a system. The research approach is qualitative. The research data was gathered by 3 months observation and interviews with teachers and students. The model of the examination has several elements including: ICT included in strategic planning, teaching and learning methods – participation for empowerment, flexibility of curriculum, investments in communication, leadership and management and teaching staff's capacity and commitment. According to research findings, ICT is not in the everyday life the school.

Keywords: Smart school; Everyday life; ICT integration; Culture

Introduction

The smart school project in Iran has been inspired by a similar project undertaken by the Malaysian Ministry of Education (Attaran & Siraj, 2010). In Malaysia, the idea of smart schools was proposed in 1997 and became operational in 1999. Seventy-eight million dollars were allocated to the project, the largest portion of which --thirty-eight percent--was spent on purchasing educational material (Puteh & Vicziany, 2004). Patterned on the Malaysian model, the smart school project in Iran was launched in 2004. At the pilot stage, the Iranian Ministry of Education implemented the project in four high schools in the capital city of Tehran. Following the publication of "The Road Map of Iranian Smart Schools" in 2011, the project was extended to other educational districts. The main focus at the present stage has been equipping the smart schools with computers, smart boards, network facilities and so forth. Like many other countries, an implicit assumption seems to be dominant in the project: that by equipping schools with computer hardware, ICT integration will turn into a mainstream trend (Thang, Hall, Azman, & Joyes, 2010). Nonetheless, several transnational researches have proven that such an assumption is not based on reality. The 2006 Second Information Technology in Education Study (SITES) reported "financial investments for the educational use of ICT had not been in line with high expectations" (Niemi, Kynäslahti, & Vahtivuori-Hänninen, 2012). Studies of Eng Tek Ong and Kenneth Ruthven (2010) show that even though smart school projects intended to prepare the younger generation for scientific and technological careers, they have failed to accord with expectations. Thang *et al.* (2011) attribute this to ineffective teacher training. According to their study, teachers in smart schools have not been fully instructed to manage the process of ICT integration into education.

Research findings of Wan Ali, Mohd Nor, and Alwi (2009) show that time, course content and technical malfunction were the main problems teachers faced during the process of ICT integration in Malaysian smart schools. In their research, Mahmoudi, Nalchigar, and Ebrahimi (2008) found that the basic challenges of Iranian

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smart schools were the lack of necessary rules and regulations in the Ministry of Education and the traditional structure of Iranian schools.

Attaran and Siraj (2010) showed that teachers and students do not hold a positive attitude towards teaching and studying in Iranian smart schools. Furthermore, the results of their study revealed that in order to increase the efficiency of smart schools, educational institutions should be provided with further equipment, and teachers should attend ICT training courses, undergo extra training and receive benefits for their participation in such courses. Moreover, educational courses for the students should be presented through diverse models that correspond to their talents. Traditional routines in class should be abandoned and each class should be equipped with computers and peripheral devices.

As research findings by Niemi *et al.* (2012) have shown, “mere investments in technical resources or in infrastructure do not create new school cultures and learning experiences that promote twenty-first century skills and learning”. The present research which aims to probe the impact of ICT integration in smart schools (as an organization or community) has chosen the Absal high school as its case for study. Absal high school is Iran’s oldest smart school, which was established and equipped in 2004. The school is located in northeast of Tehran and has been directed under a single administration so far.

The Theoretical Framework of the Study

As Niemi *et al.* (2012) maintain, to understand ICT integration into the school curriculum, it is better to see schools as communities or organizations so we can more easily gain an understanding of schools’ implementations of ICT. Some of the factors Niemi *et al.* (2012) recount as influential in creating the school culture and in line with the ICT integration into the curriculum are:

- local school culture (openness and enthusiasm for change and reform)
- joint visions and values and the impact of school principals in their creation
- teachers and their pedagogical implementations

A shortcoming of previous research in this area according to Niemi *et al.* (2012) is that they have viewed the ICT integration factors independently and detached from the organization’s culture. The present study, nonetheless, circumvents this problem by viewing the school as a system, i.e. in a holistic form. In other words, ICT integration is linked to cultural elements; Niemi *et al.* suggest the following model for assessment of the degree of ICT integration into the school culture:

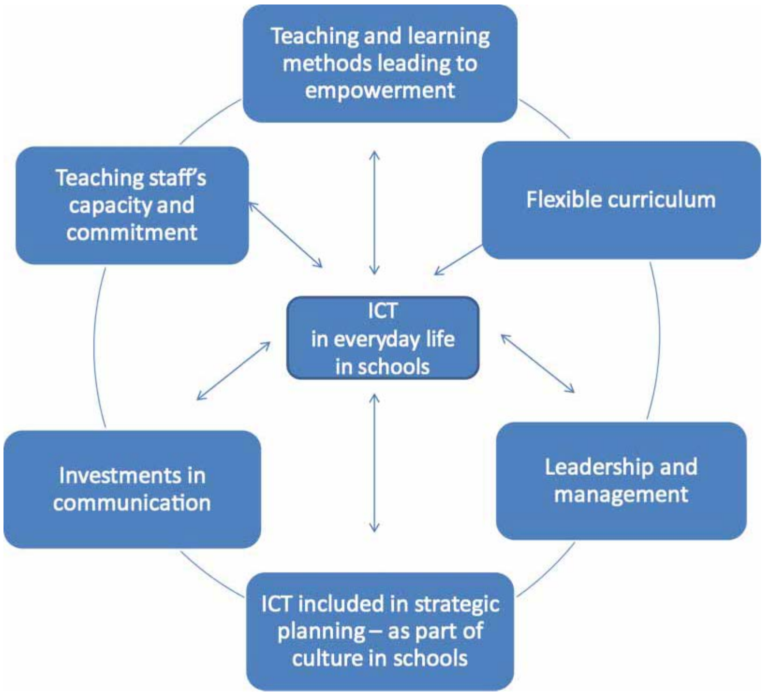

Figure 1. Key factors for educational use of technology in the everyday lives of schools (Niemi *et al. ,2012).*

We have drawn upon this model to study the ICT integration into the school culture and curriculum of the Iranian smart school.

Research Method

This study follows a qualitative approach. One of the researchers attended the classes during a three-month span in order to observe the natural settings of the teaching-learning procedure, with a focus on ICT usage in the teaching-learning process. In addition, interviews were made with the school principal, three teachers who used ICT in teaching, and a focus group of students. Each interview was then recorded, with the main concepts extracted and categorized by the researchers.

Research findings

Observations and interviews revealed that despite the stress in the Ministry's road map of smart schools on integration into curriculum, ICT has not been incorporated in the everyday life of the school. We discuss this issue according to the components of the Niemi *et al.* (2012) model.

ICT included in strategic planning – As part of culture in schools

As the observations and interviews reveal, ICT has not been integrated in the strategic planning of Absal, Iran's oldest smart school. In fact, teachers employed ICT in the classroom not according to a specific plan, but with regard to temporal circumstances and the like. All third grade and pre-college classes were administered in the traditional manner, while in other grades, ICT usage in the classroom depended on the teacher's decision. As the principal of Absal stated, the pressure emanating from national standard examinations such as the university entrance exam (called Konkour) and third grade final exams, beside the pressure from the students' parents, forced the school to shelve ICT usage and choose the traditional methods. However, in lower grades the teachers utilized ICT for teaching.

Even in courses where ICT was used as a learning tool, due to problems such as inadequate computer equipment, the classes were held in laboratories or halls, where issues such as the computers' technical problems and waste of classroom time as much as twenty minutes emerged. Such problems, beside the considerable volume of material to be taught in relatively short time, discourage teachers from using ICT tools for learning inside the classroom. In their research, Wan Ali *et al.* (2009) have come to the same conclusion. According to observations in their research, students' entering the class takes 5-10 minutes, with another five minutes elapsed for them to settle in their seats. They need another five minutes to start their computers and if any technical problem comes up, the teacher has to spend five to ten minutes to fix it before beginning the class. All of these possibilities cut from the regular class time to the teachers' dismay.

Teachers of Absal High School possess the courses' content material in electronic format, and have designed their own lesson plan electronically (in CDs etc.) Their CDs include images captured from the course book or animated movies, exercises and drills from the book, the full text of the course book with extra tips and examples, general information related to the course subject, related multiple choice questions from past years' national university entrance exams and so forth. An approximate 70 percent of the high school's teachers have passed content development training courses. They use the internet to find relevant material and mostly use Adobe Flash® software to create electronic material. Nonetheless, ICT has not yet become an inherent learning tool in Absal's strategic plans and is regarded as an optional tool.

Teaching and learning methods leading to empowerment

In Absal as a regular procedure, in courses where ICT is employed as a learning tool, the teacher divides students into groups and asks each group to create instructional material for a certain chapter. Each group is responsible for teaching the assigned chapter on a specific date. The students are compelled to search for additional information about the subject, browse scientific websites and read relevant papers in order to manage content delivery which satisfies the teacher's and students' expectations. One student even told the researcher that their group had spent two months on their presentation for a lesson on chemistry. Students welcome this method of teaching and believe it has added depth to their understanding of the subject matter since they have to master the topic in order to teach it to the other students. ICT-based research is optional in Absal High School and students obtain extra reward for conducting such research. In the meantime, students' ICT qualifications are not evaluated and even their score on the computer course is not inserted in their performance sheet in the first grade of high school. It would be safe to say no criteria exist for evaluating students' ICT qualifications. That explains why one student claims that at home, he does not turn his computer on even for three months although he studies in a smart school, since he is not interested in computers and cannot 'understand' them. In fact, the school provides ICT opportunities only for those interested in computers and internet, who are reciprocally encouraged by the administration. Those students showing talent in learning ICT are enrolled in computer training centers outside school to receive training in branches such as robotics. In the meantime, if a student team is working on a related project, the school's technicians are ready to guide and assist them, even beyond the working hours. It can be said that in Absal, the school and the teachers have actually placed focus not on ICT-based teaching and learning but on augmenting and evaluating the curriculum.

Investments in communication

The World Wide Web is a rich media, more powerful than its technological counterparts, because of its potential to foster interaction and participation in terms of real-life events. With computers and internet, students and teachers will be able to interact even after school hours. Research conducted during recent years (Norouzi, Zandi, & Madani, 2008) has stressed the communicative role of ICT. Nonetheless, Absal High School has failed to make the due investment in those areas, although interaction with parents has seen improvements. The school has launched a portal enabling students and parents to contact the administration. The portal holds data such as students' scores, examinations timetable, class student list and so forth. There are however self-motivated teachers who used internet features to increase interaction with the students. The banner of a math teacher's weblog reads: "Little is the classroom time and many are the things I want to say. This is a place for me to have more contact with my students."

Leadership and management

At Absal High School, the principal has displayed all-out support for the teachers for integration of ICT and access to adequate resources, proving his ability to facilitate change. Through time management calibrated for optimum use of ICT equipment and emphasis on computer training, an overall 280 hours of training courses have been held in a three-year span. To encourage ICT use among the teachers and to raise awareness, the principal has personally sponsored domestic and foreign scientific tours for the teachers, including a 2010 Malaysia tour during which the teachers visited the Southeast Asian country's smart schools. The spring festival held every year in this high school selects and awards the best electronic content developed by the students and teachers.

Flexible curriculum

The Iranian educational system is centralized by definition and the Ministry of Education is responsible for development of the curriculum for educational institutions across the country. The standard, national exams of sixth, ninth, eleventh and twelfth grades are developed based on these materials. Thus, the teachers' scope of freedom in selecting extracurricular material is a function of the material's impact on students' success in standard tests. ICT-assisted courses for students are also held as extracurricular activities and the teachers are not allowed to change the preordained curriculum. All newcomers in Absal High School pass a Microsoft Office® training course in the summer and are adequately familiar with computer and internet at the beginning of the academic year. Obligatory extracurricular computer training courses are also held for freshmen. Students are taught how to use applications such as Adobe Premier® and Multimedia Builder® and become able to produce content by the end of the course. As mentioned above, they use this ability to create content material for the course they are assigned to teach.

Teaching staff's capacity and commitment

From the interviews held with Absal smart school's principal and teachers it becomes clear that the teachers have obtained adequate ICT skills. However, a major problem, which discourages teachers from integrating ICT and the course, is the problem of coordination in the Ministry of Education's policies that are developed with regard to traditional schools. Hence, the teachers in Absal are forced to adjust their curriculum to that of traditional rules. For instance, even after developing an electronic lesson plan, teachers have to present a printed lesson plan to their supervisor. Moreover, while using the electronic attendance system, they are also asked to sign in the presence notebook. In fact, in order to follow the Ministry of Education's regulations, many daily routines are conducted in both electronic and traditional forms in Absal High School. Moreover, despite their enthusiasm for using ICT as a learning tool, the teachers are hardly encouraged by the Ministry. They complain about not receiving a certificate after passing a three-year training course and non-acknowledgment of this course as part of their in-service training. They believe that no distinction is made between those who spend personal time learning new methods and developing electronic material, and those who do not; this is seen as a discouraging factor in ICT integration. Nonetheless, there are other motives such as visits made by teachers from other parts of the country to Absal High School, which sustain the motivation among the smart school's teachers to continue using ICT as a learning tool.

Conclusion

As the study revealed, despite having a strategic plan for ICT integration in the teaching-learning procedure, the Absal High School has failed to fully realize this document and implement the routine classroom mechanism. In a comparative study, Puteh and Vicziany (2004) have shown that Australia in integrating ICT in the curriculum has been more successful than Malaysia. One reason for Australia's success is that an ICT learning strategy has been a key element in the past two decades in Australian schools.

School principals are known to have a key role in driving forward smart school plans in their institutes. Studies show that without a supportive leadership, such plans are doomed to fail. Fullan (2001) suggested that principals are gatekeepers of every innovation and change in the schools. In our case study school, the administration showed strong support by providing training courses, encouraging the teachers and holding domestic and foreign tours. Nonetheless, support at the ministerial level is limited to hardware support and as Mahmoudi *et al.* have mentioned, the Ministry of Education's policies are a major obstacle to the development of smart schools.

In the meantime, adequate equipment in Absal High School helps teachers to employ ICT in teaching. Moreover, group projects which call for cooperation outside school hours have created stronger connections between the students. Teachers and students have fostered relationship outside the academic environment and reinforced both academic and personal relations through weblogs. Nonetheless, such relations have not been observed among the teachers. The level of mastery over ICT is acceptable among teachers; yet a decline in commitment to ICT use is observable which stems from discouraging policies. Standard, national examinations are a key challenge, or actually *the* most important challenge in developing ICT use in schools.

The standard test in the final grade of high school have put pressure on teachers and restrict time for cultivating their creativity and novelty. Actually, one of the main challenges which inhibit the teachers from ICT application as an education tool, is the standard tests. Parents expect schools to provide the chance for their children to go to the university and sometimes they feel using ICT is fun. Even though the high school principal has provided ICT educational courses for the children and most of them have learned to use computers, the parents consider ICT as a symbol of modernity and advancement in the whole of life and think it is not in line with the success of their children in the university entrance exam.

Last but not least, the centralized educational system is a major obstacle which has minimized the scope of teachers' creativity. Innovation and risk-taking fails to receive encouraging feedback. The one-size-fits-all policies of the Ministry of Education prescribe the same rules and models for every school. Puteh and Vicziany (2004) hold that ICT integration in Australia has fared better than in Malaysian smart schools. They relate the

Australian supremacy to the Australian decentralised educational system, in which teachers play an important role in the curriculum development process. As Cuban's study in California schools has revealed, despite their long-term exposure to ICT, these schools do not display a high level of use (Cuban, 2001, in Hennessy, Ruthven, & Brindley, 2005). Cuban attributes this to centralized policies, which fail to notice the role of teachers in integration of ICT and Education. Hennessy et al. (2005) point to a similar problem in Britain and other countries with centralized educational systems.

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MALAYSIAN EXPERIENCE IN THE ROLE OF MODERN TECHNOLOGIES IN THE IMPROVEMENT OF STUDENTS' ACHIEVEMENT

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Abstract

Transforming the educational system entails changing the culture and practices of Malaysia's primary and secondary schools, moving away from memory-based learning designed for the average to an education that stimulates thinking, creativity, and caring for all students, catering to individual differences and learning styles, and are based on more equitable access. More recent initiatives such as the Smart School and the Intel Classmate PC capitalises on the Internet and streaming technology. A paramount outcome would be the enhancement of the students' competencies in their learning endeavour and the study of the technology itself as a subject.

Keywords: Smart school; Intel classmate PC; Internet; streaming; learning styles; creative perception;critical thinking; integrated science process.

Information and Communication Technologies (ICT) in Education in Malaysia

The Ministry has formulated three main policies for ICT in education. The first policy is that of ICT for all students, meaning that ICT is used as an enabler to reduce the digital gap between the schools. The second policy emphasises the role and function of ICT in education as a teaching and learning tool, as part of a subject, and as a subject by itself. Apart from radio and television as a teaching and learning tool, this policy stresses the use of the computer for accessing information, communication, and as a productivity tool. ICT as part of a subject refers to the use of software (e.g. AutoCAD and SCAD) in subjects such as "Invention" and "Engineering Drawing." ICT as a subject refers the introduction of subjects such as "Information Technology" and "Computerisation". The third policy emphasises using ICT to increase productivity, efficiency and effectiveness of the management system. ICT will be extensively used to automate and mechanise work processes such as the processing of official forms, timetable generation, management of information systems, lesson planning, financial management and the maintenance of inventories (Foong-Mae, 2002).

Students' achievement revisited

As information and educational technologies enter the socio-cultural setting of a school, it changes the ecology of the educational transaction and environment and "weaves itself into the learning process in many more ways than its original promoters could possibly have anticipated" (Papert 1993, p.53). How has our school environment changed in light of the introduction of educational tools? Has the school been redesigned, reconfigured or has new media been 'added' on with little change in the school's set up? There is a context for ICT experiences that encompasses activities peripheral to the particular time and format of ICT interactions. Salomon (1993; p.189) proposes: "No tool is good or bad in itself; its effectiveness results from and contributes to the whole configuration of events, activities, contents, and interpersonal processes taking place in the context in which it is being used."

Each major transition in communication media, from speech to print to video to electronic forms has resulted in changes in our means to create, record, store, distribute, access and retrieve information. What it really means is that – there exist a change in the way information is handled, and in education, it means that there exist a transformation in teacher/student as well as student/student interaction. There has always been educational technology in the classroom, only that it is either 'old' technology or 'new' technology or 'little' media or 'big' media.

Before technology is introduced in the teaching and learning process or teachers participate in their first professional development session, the educational goals for students should be determined. What do students need to learn, and how can technology promote those learning goals? How can technology improve what has been done thus far? To answer these questions, the school needs to know the cause of the problem in teaching that may have rendered it 'ineffective'. Exactly which educational goals a technology plan should address and attempt to accomplish must be determined before the technology plan is implemented (Holmes & Rawitsch, 1993).

Technology should not drive pedagogy or the teaching and learning process. Rather, decision making should be based on the learning and teaching needs of the student. Unless teachers start out with specific technology goals that support their vision of learning, technology will most likely be used to reinforce the status quo (Cohen, 1988; Cuban, 1986).

So, what do we want our students' to achieve? That would be inherent in one's own objectives, teachers, students, teaching and learning culture, socio-economic state, prior learning and development of one's country. Then from the standpoint of learning, how will technology be used to provide and support a challenging curriculum through engaging instructional practices such as collaborative learning, problem-based learning, problem solving, critical thinking, constructivist classrooms, project-based learning, and so on?

Malaysian initiatives – The Smart Schools

The Malaysian Smart School was launched in July 1997 by the Prime Minister as one of the Multimedia Super Corridor's Flagship Applications. The aim was to capitalise on leading edge technologies and the rapid deployment of the MSC's infrastructure to jumpstart deployment of enabling technology to schools. This project was implemented by the government in collaboration with a consortium led by the country's major telecommunication company. The implementation was scheduled to go through 4 waves;

i) the pilot in 88 schools from 1999 – 2002,

ii) the post –pilot (2002- 2005),

iii) making all school smart (2005-2010), and

iv) consolidation and stabilization.

The Pilot Project incorporated the Smart School Integrated Solution, which involved the following main components:

- Browser-based Teaching-Learning Materials (and related print materials) for Bahasa Melayu, English Language, Science and Mathematics
- A computerised Smart School Management System
- A Smart School Technology Infrastructure involving the use of IT and non-IT equipment, Local Area Networks for the pilot schools, and a virtual private network that connects the pilot schools, the Ministry's Data Centre and the Ministry's Help Desk
- Support services in the form of a centralised Help Desk, and service centres throughout the country to provide maintenance and support
- Specialised services such as systems integration, project management, business process reengineering, and change management.

In the Smart School endeavour, the academic performance of Malaysian students improved across all national examinations in core subjects – Language, Mathematics and Science (Figure 1). Compared to assessment scores in 1997 before the launch of the Smart School programme, Primary School scores increased by 11.4 per cent last year, Lower Secondary scores by 6.4 per cent and Malaysian Certificate of Education scores by 3.4 per cent.

A recent independent study confirmed that students from Smart Schools do better. The study compared outcomes and characteristics of 2743 students from Smart Schools and Non Smart Schools in five non-academic performance areas: creative perception, critical thinking, integrated science process, multiple intelligence perception and ICT knowledge. Students from Smart Schools have significantly higher scores than students from Non Smart Schools in four of the five categories (Ng, 2010). Further, the impact of the Smart School programme is most noticeable in rural areas. Schools with computers and internet access quickly become focal points of remote communities. Residents in the area use the school's IT facilities to get information and send emails.

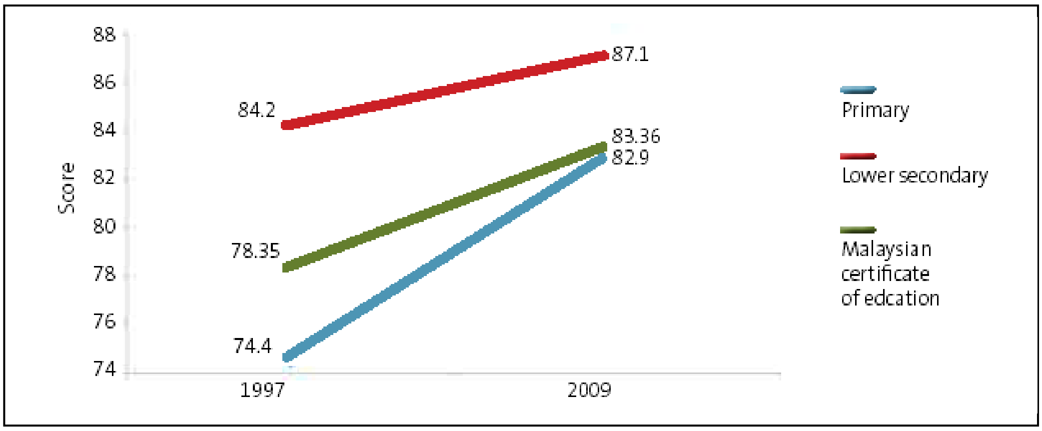

Figure 1. Average academic performance of Malaysian students since the launch of Smart School programme

Malaysian initiatives – MOE-INTEL School Adoption Project

Since 2007, under the World Ahead Program, Intel has donated more than 2500 computers (CMPC) to Malaysian schools aligned to the government's vision of bridging the digital divide and making schools smart. The Intel 1-1 e-Learning Program was successfully piloted in 10 Malaysian schools across the country. The ten schools included seven secondary schools and three primary schools. In each school, a class was selected for the implementation of the new learning environment, i.e. a Year Four class in the primary schools, and a Form Two class in the secondary schools.

The heads of the ten selected schools and all three of their Senior Assistant Teachers (Administration, Student Affairs, and Co-curriculum) were briefed on the project and its implications during a Principal Leadership Forum and they were also given assistance in the development of implementation action plans for their schools.

All teachers who taught the selected classes were given training in Intel@Teach courses. In addition to the integration of ICT in teaching and learning, they were also briefed on other important aspects of the project, i.e.

inquiry based learning, 21st century skills and higher order thinking skills, project based learning, copyright laws, fair use guidelines, using search engines and directories, and evaluation. The participants were taught how to operate the CMPC for classroom teaching and learning.

The Task Force started monitoring the use of the CMPCs and teacher's laptops in a 1:1 e-learning environment beginning July 2007, after all the CMPCs had been delivered to the schools. Task Force members together with their counterparts from the states visited all the project schools at least once during Phase One of the project. The schools were also monitored closely by the State Educational Resource Centres and the nearest Teacher Activity Centre. Weekly reports were sent to the Task Force for analysis, and for action to be taken immediately should problems be detected.

The feedback from the Secondary Schools student focus group was gleaned entirely from the Project Report of the MOE-Intel School Adoption Project where the author (RMI) was the Head of the independent evaluation panel (MOE-Intel, undated)

How has the CMPC helped you in your classroom activities?

These students showed a diverse application of this technology that encompasses the classroom activities and beyond. In general, the activities were focused on real class work orientation such as;

- Able to surf and explore the Internet and learn new things
- Can get information faster
- Finding information and pictures on the Internet
- I now know many things such as MS note taker and power point (presentation)
- No need to bring heavy books
- Easy to make notes
- More in-depth information
- Answer online quiz
- Created community with friends for support and assistance
- Send email and assignment to teachers

What sort of work have you done with the CMPC?

A summary of the work done by the students using the CMPC were;

Table 1 Student activities on the CMPC

Student activities on the CMPC	
Surf the net	Prepared scrap book
Find information	Create time table
Find past year questions	Class projects
Create power point	Do homework
Chat with friends	Myspace
Send homework to teacher	Visit websites
Email friends	Play games
Download songs	Send Raya cards/post cards
Read newspaper	Create website

There seem to be an equal balance between class related work and a more social and personal application of the CMPC. This is hardly surprising as the students have access to the Internet all the time.

What were the changes in teacher/student and student/student interaction?

Teacher-student: The students felt that there was no barrier anymore for them to ask questions to the teacher via the CMPC. In fact, they felt that they have the 'privacy' to communicate with the teacher and ask any question. They can send assignments to their teacher via email as well as a message to the teacher.

Student-student: I can now chat with my friends that are seated far away as opposed to before. We can now e-mail to, and chat (online) with our friends. In fact they felt closer to their classmates.

How well did the CMPC work towards your class assignments?

Based on the assignments given to them, the technology worked well for the task they needed to do, which included;

- Getting information faster than the book
- Can download while doing other work
- Finding more material in English
- Easy to find references
- Easy to copy and paste
- Get many pictures
- More colourful presentations with power point
- Many new information from the Internet
- Prefer teacher to give the information

How would you like to use the CMPC in the future?

The students were able incorporate an element of extension to the classwork with the CMPC by making requests that would further enhance the use of the computer. They would also like to extend the application of the computer in an immersive fashion to facilitate for their work, hence the following comments;

- Would like to add speaker so that we can add sound and music into our presentations
- Use discussion group on the Internet and connect with all the schools involved
- Need more time to use the computer, especially after school hours
- To use the computer outside the classroom and in the school compound
- Would like to take the CMPC home
- Want to use Friendster and Yahoo Mail
- For the Malay language project, we would like to actual field visit and take photos to be inserted in the power point presentations

It was also interesting to note the students' improvisation by requesting for a field trip in an authentic knowledge construction activity rather than to rely entirely on pictures from the Internet; at least they have the right idea. Too, connecting to other schools will enrich their project work to extended findings not confined to one's own school and environment alone. This can be a great start to exploring the real power of networking.

What type of activities would you like the teacher to do?

The students were definitely enthusiastic with the presence of the CMPC and have come up with an interesting proposition for the teachers. Among the activities put forth by the students are;

- Use of educational (Internet) games in class
- Use of games to improve vocabulary
- Field visits and role play

The students suggested the use of videoconferencing so that they can see teachers from other schools teaching them using the web.

In summary, the CMPC 1:1 computing facility led us to consider the role of technology to improve students' achievement in different functioning framework such as;

- Infrastructure – issues such as classroom configuration, class size, hardwares and linkages become contributory to the scenario
- Learning environment - recommended that students and teachers are exposed to various social networking software enabling them to work in virtual space collaboratively. Such tools include, free online groups and forums. Also recommended that teachers be taught to create collaborative platforms to manage and share teaching and learning resources and to learn from each other.
- Curriculum - recommended that the schools involved should prepare a blueprint incorporating the 1:1 computing facilitation in the teaching and learning practices.
- Pedagogy - recommended that teachers be exposed and trained in the appropriate use of multimedia computing and Internet based pedagogies in accordance to the designed curriculum.
- Teacher development - recommended that teachers involved in the 1:1 Computing project be accorded appropriate workload in order for them to plan, and implement the teaching and learning practices involved. This is especially true for teachers who are also responsible for teaching exam classes. Also recommended

that the teachers be certified competent in ICT and Internet based pedagogies, which are strongly taken into considerations in their increment and promotion.

Concluding remarks

Although the technology has changed, the job of the teacher hasn't. The role of technology is merely to act as a tool that can be used by the teacher to enhance the learning experience by designing the learning landscape in multiple perspectives and according to the needs, preference and modalities of the learners. This can now be done with the marvel of multimedia computing, the Internet, mobile devices and thousands of softwares. In order to achieve the desired competence for the students, the lessons, experience and exposure must be constructed as such. Technology cannot single-handedly change anything, it can only lend itself as a tool in the artful hands of the teacher.

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MODELING SNA RESULT TO IMPROVE LEARNING COMMUNITY

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Abstract

The use of Social Network Analysis (SNA) for online learning communities' analysis is common and usually performed after the ending of semester. Yet, even if such analysis is very useful, it is costly, and cannot be performed many times during the semester. In this paper, we present a model of automated SNA based inference, for a large-scale community, taking into account specific environment of developing higher education system. The model is designed so to send automated reminders to all users, according their activity in the period of two weeks. One additional analysis after the mid-term exams checks if activity matches performance. It has crucial role in directing both students and educators towards the common goal: success at the final exams. The presented model enables inference on user attributes, which are stored in student model ontology. As such, the model is a step in the development of semantic and adaptive learning environment.

Keywords: SNA; inference; online learning community.

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Introduction

In the past years, we were involved in analysis of a large-scale online learning community at the Faculty of Information Technologies - FIT in Mostar, Bosnia and Herzegovina (BiH). We investigated the topology of the communication, and it turned out to be a scale-free, small world network (Bijedic and Burak, 2006). Investigating the network properties, we proved that parts of FITCS (FIT Community Server) provide knowledge sharing (Hamulic and Bijedic, 2009, Bijedic and Hamulic, 2009). In addition to this, we recently presented a semi-adaptive e-learning model suited for the limiting environment of Bosnia and Herzegovina (Radosav et al., 2010). All of these efforts are aiming to increase quality of higher education in post-war Bosnia and Herzegovina, especially concerning the new trend of online learning.

In this paper, we use the previous results to offer a model for automation of SNA results as inputs to adaptive learning management system. We base our model on FITCS, but it can be used for other large-scale learning communities.

The model deploys two types of analysis: periodical activity analysis, and mid-term success analysis.

The first aims to motivate all users to share knowledge in a proper way.

The second is supposed to help all users to improve performance, and is mostly based on mid-term exams results. Both are expressed in algorithmic form, for the sake of better understanding.

We are also addressing some specific problems for BiH environment, such as high drop-out rate, underdeveloped labor market, etc.

Concerning the students, there exists significant lack of motivation and high dropout rate, which are the results of underdeveloped labor market in the country. Such situation results in significant number of spammers in the online learning community, and we treat such students in an adequate way.

The situation with educators is quite similar, due to brain-drain. There is significant lack of teachers, so it is very difficult to work in small groups. In practice, one educator is responsible for at least fifty students, which makes it very difficult to monitor student’s progress. Since it is impossible to perform SNA many times during a semester, we here present a model in which automated inference should help all users of an online learning community to improve performance (Pardanjac et al., 2010).

Model of communication

FITCS

FITCS exists for more than five years now. It was originally designed for distance learning students, but in time, it became the most popular way of communication for all FIT students. FITCS consists of several units, and one of them is reserved for communication on curriculum subjects. That part was designed for knowledge and information sharing. FITCS is now numbering around 800 active students. Their communication is grouped by the semester of study, where students can exchange experience on subjects, and personal interests, such as computer networks, security, etc.

In our previous research of online knowledge sharing, we explored the parts of FITCS concerned with first year subjects.

The reason for choosing freshmen was simple: they need more help at the beginning, and if their knowledge sharing works out, we argued that the rest certainly will too.

Additionally, in order to analyze behavior of large groups, in the end we focused on freshmen (average of around 250 active users per year), and the most difficult subjects from both fall and spring semesters.

Therefore, in this paper we base our model on those experiences.

Social network model

For the purpose of our research, we explored various possibilities and modeled communication at FITCS as directed and undirected, weighted and non-weighted graphs, but in the end, we chose the undirected non-weighted graph, where students and educators are nodes, and communication in one topic links all of the involved users.

We argued that it is not important who is answering to whom, or who initiated the topic, but that the importance lies in the fact that all users share interest in the topic. That is the reason we chose undirected graph. In addition, since users communicate inside one topic, we argued that the topic is the smallest unit and we did not weight the links, for it was irrelevant. Nevertheless, we suggest attaching the number of posts in the sub forum to each user.

Data analysis

Types of analysis

In this analysis, we suggest usage of the node degree, and number of posts for both students and educators, and students’ success at the exam.

We suggest calculating the node degree for each user, and ordering the degrees from highest to lowest. Furthermore, since we expect our network to be scale-free, we suggest dividing degree sequence into quartiles, and we base further inference on such division.

The user with node degree much greater than the rest (approximately among top five to ten, depending of number of users) we call hub.

Hubs are users that are very communicative and enthusiastic, and can be either students or educators. If educators are hubs, than their position in the forum is said to be too enthusiastic. It is known that educators should be moderators in the network. For the purpose of this research, the above means that their degree should be in second or third quartile and that they should write not less than one and not more than two posts per day on average.

From our previous research, we identified two types of student hubs:
users that post content relevant to the topic, and should be identified as potential demonstrators, and
spammers.

Nodes with degree zero we call isolated users; those users posted a topic and got no answer, and they did not participate in any other topic.

The difference in number of posts is related only to the previous analysis; initially it is set to zero.
In order to identify behaviour of students, in some parts of the analysis we include their results at exam (student’s success).

The model proposed in this paper results in structured data source. Structured data is easy to store in data layer adjusted to semantic and adaptive learning environment. The student model ontology (Figure 1) that is structuring student data contains a class RoleInSN. This class is reserved for data storage on the role of student in the online learning community (or social network), and implicitly on socialization. Such a data source is very useful for inference necessary in learning environment adaptive characteristics development (Radosav & Junuz 2011).

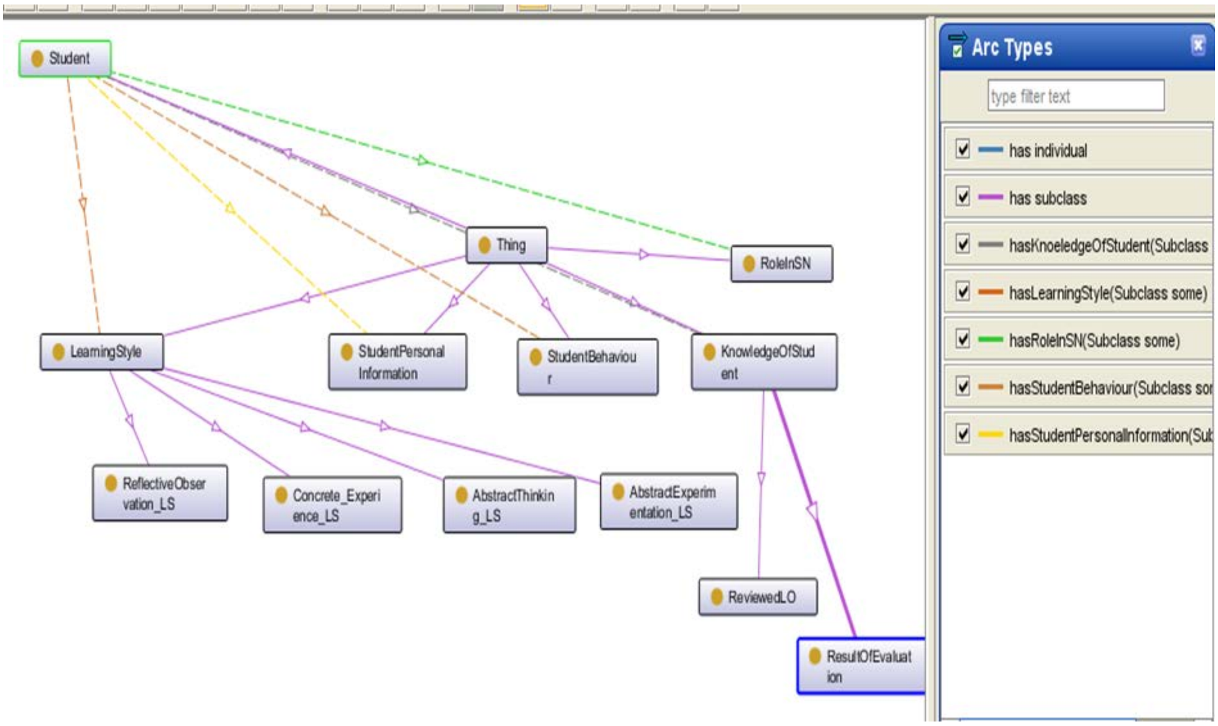

Fig. 1. Student model ontology of FIT learning environment (Radosav & Junuz 2011).

Scheduling of analysis

There should be two types of the analysis:
periodical activity analysis, the simplest, performed twice a month,
success and activity analysis, performed after the mid-term exams, and

For periodical activity analysis, we suggest exploration of node degree and number of posts for each user. This analysis should provide insight into activity of both students and educators, and should provide outputs in the form of automated messages to all users

The success and activity analysis provides insight into the success of the knowledge sharing community. We schedule it after the mid-term in order to help students improve at the final exams, if needed. The outputs are three types of messages:
prizes for successful students, and reminders for unsuccessful ones,
messages to educators concerning both successful and unsuccessful students, and
messages to educators, concerning their role.

The records of all performed analysis for each user should be stored, and sent to relevant department after the end of semester:
reports for students to their tutors, and
reports for educators to management.

Model for inference

For the simplicity, we present inference in the form of algorithm.

Periodical activity analysis

4.1.1. Inference on educators' activity

IF ((degree in the lowest quartile) OR (the difference in number of post is less than 10))
Send reminder to communicate more;

ELSE
IF (educator is hub)
Send reminder to communicate less and become moderator;
ELSE
Send note to keep up the good work.

4.1.2. Inference on students' activity

IF (degree in the lowest quartile)
IF (difference of number of posts greater than 10)
Send reminder to keep up the good work (students active within a group that suits them);
ELSE
Send reminder to student to communicate more;
Send reminder to educator to check the situation, and offer alternative ways of tutoring if needed;
ELSE
IF ((student is hub) OR (difference of number of posts greater than 30))
Send reminder to educator to check content of hubs' posts;
IF (content is not spam)
Send reminder to student to keep up the good work;
Send reminder to educator to monitor the student's activity (student is potential demonstrator);
ELSE
Ban user for seven days! (this is a spammer).

Success and activity analysis

The inference on educators' activity is the same as in 4.1.1.

4.2.1. Inference on students' activity

IF (student is successful at the exam)
Send note to keep up the good work;
IF (student is hub)
Send note to educator to pay special attention to the student;
ELSE
Send reminder to educator that this student is not interested in such way of learning and knowledge sharing;
ELSE
IF (student is hub)
Ban from the forum till the end of semester (this student is spammer);
ELSE IF (student's degree in lowest quartile or zero)
Send reminder to educator to check on this student's status, and offer alternative help.

Conclusions

This work presents a model for automated inference based on SNA in a large-scale online learning community, FITCS. The goal of the model is to improve performance of students at the final exams. The SNA part is concerned with the data modeling and deployment of basic graph characteristics in order to analyze activity of online learning community users. Additionally, we also analyze success at mid-term exams, in order to improve students' performance, if needed.

The model is designed to monitor activity of students and educators in periodical activity analysis. The outputs are in the form of reminders sent to all users according their activity. The outputs are cumulated, and at the end of semester, they grow into the report of users' role.

The additional analysis, after the mid-term exams serves to checks if activity matches performance. It has crucial role in directing both students and educators towards the common goal: success at the final exams.

The presented model enables inference on user attributes, which are stored in the proposed student model ontology. As such, the model is a step in the development of semantic and adaptive learning environment.

Acknowledgements

Safet Krkic, the pioneer of distance learning in Bosnia and Herzegovina, inspired this work. The Faculty of Information Technologies, Mostar, supports it.

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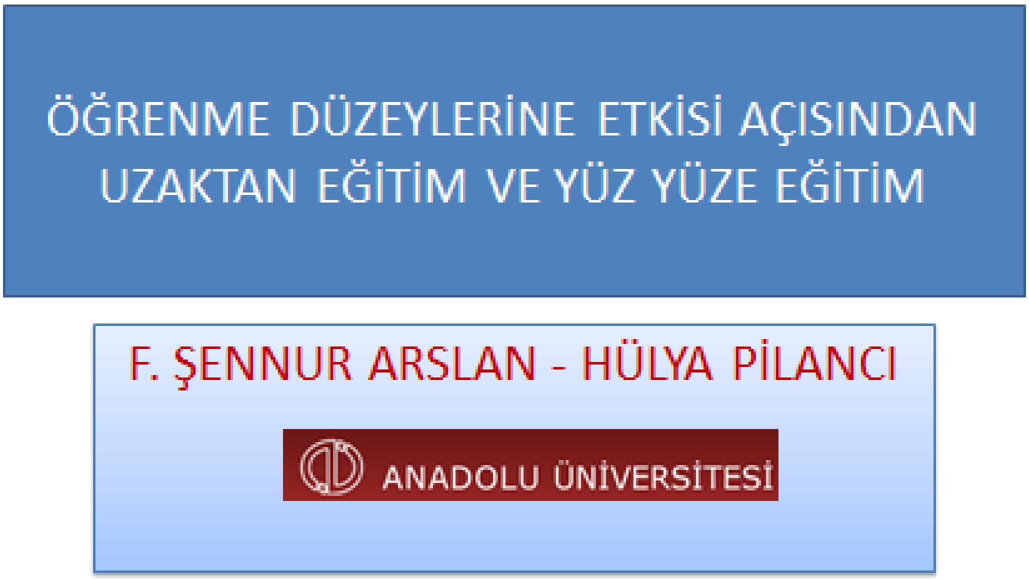
ÖĞRENME DÜZEYLERİNE ETKİSİ AÇISINDAN UZAKTAN EĞİTİM VE YÜZ YÜZE EĞİTİM

Şennur Arslan, Hülya Pilancı



Uzaktan Eğitim ve Yüz Yüze Eğitim

Uzaktan eğitim ile yüz yüze eğitimin temel farkı birçok kaynakta genellikle zaman ve mekân ayrılığı olarak tanımlanmıştır. Bunun yanı sıra uzaktan eğitim, teknoloji ile birlikte gelişen bir sistemdir. Teknolojinin kullanımı; araçlar, değerlendirme yöntemleri ve eğitim planlaması gibi konularda uzaktan eğitimi, yüz yüze yapılan eğitime eşit hatta daha verimli bir duruma getirebilmektedir.

Çalışmanın Amacı

Bu çalışmanın temel amacı, uzaktan eğitim sistemi ile verilen bir dersin yüz yüze eğitimle verilen biçimi arasındaki farkı öğrenci başarısı açısından değerlendirmektir.

Karşılaştırılan Dersler

● Açıköğretim Fakültesi Türk Dili ve Edebiyatı Programı - Türkçe Ses Bilgisi Dersi

●Edebiyat Fakültesi Türk Dili ve Edebiyatı Bölümü - Türkçe Ses Bilgisi Dersi

DERS MALZEMELERİ	
Edebiyat Fakültesi Türk Dili ve Edebiyatı Bölümü	Açıköğretim Fakültesi Türk Dili ve Edebiyatı Programı
. DERS KİTABI: Üniteler Test ve Alıştırmalar Yararlanılabilecek Kaynaklann Listesi İnternet Adresleri . DERS ANLATIMI: Düz Anlatım Tartışma	. DERS KİTABI: Üniteler Test ve Alıştırmalar Yararlanılabilecek Kaynakların Listesi İnternet Adresleri

Çalışmanın Yöntemi

2011-2012 Öğretim Yılında, Açıköğretim Fakültesi Türk Dili ve Edebiyatı Programı - Türkçe Ses Bilgisi

Dersi ile Edebiyat Fakültesi Türk Dili ve Edebiyatı Bölümü - Türkçe Ses Bilgisi Dersinde her iki gruba paralel 15 soru sorulmuştur. Açıköğretim Fakültesi Türk Dili ve Edebiyatı Programı’nda 578 öğrenciden oluşan bir grup ile Edebiyat Fakültesi Türk Dili ve Edebiyatı Bölümü’nde sınava katılan 111 öğrencinin sınav sonuçları analiz edilerek değerlendirilmiştir.

Soru Örneği

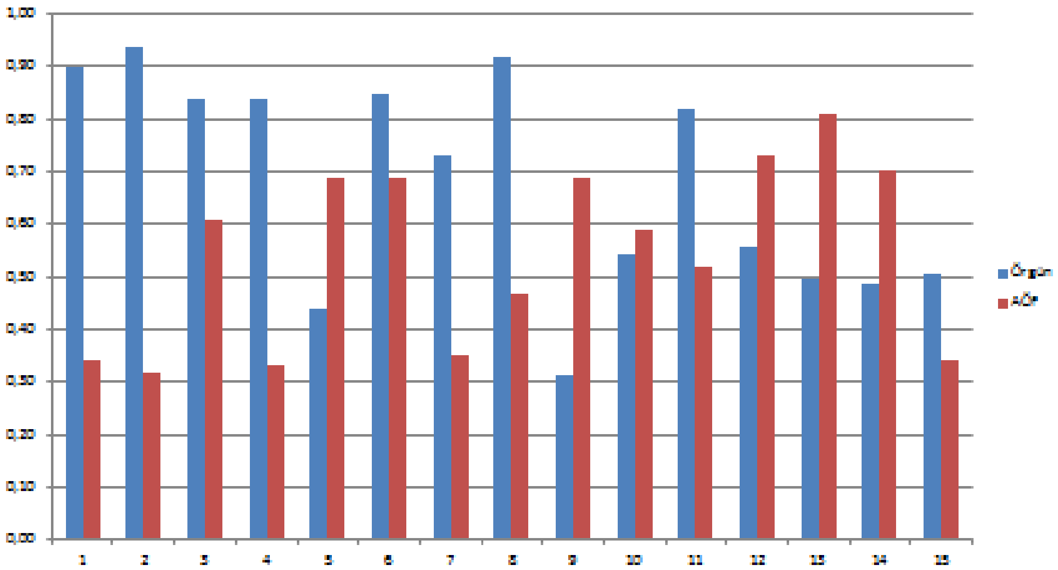
Açıköğretim Fakültesi Türk Dili ve Edebiyatı Programı	Edebiyat Fakültesi Türk Dili ve Edebiyatı Bölümü
Aşağıdaki sözcüklerin hangisinde başka bir sesten gelişmiş ikinci ünsüz yoktur?	Aşağıdaki sözcüklerin hangisinde başka bir sesten gelişmiş ikinci ünsüz yoktur?
A) öfke	A) öfke
B) yanıt	B) parmak
C) parmak	C) yol
D) demir	D) demir
E) hangi	E) sancak

Paralel Sorularda Başarı Durumu

ÖRGÜN - UZAKTAN

1	0,90	0,34
2	0,94	0,32
3	0,84	0,61
4	0,84	0,33
5	0,44	0,69
6	0,85	0,69
7	0,73	0,35
8	0,92	0,47
9	0,32	0,69
10	0,54	0,59
11	0,82	0,52
12	0,56	0,73
13	0,50	0,81
14	0,49	0,70
15	0,50	0,34

Paralel Sorularda Başarı Durumu-Grafik



ÖĞRENME DÜZEYLERİNE GÖRE

AÖF öğrencilerinin en başarılı oldukları soruların **hatırlama ve kavrama** düzeyindeki sorular olduğu tespit edilmiştir.

Hatırlama Düzeyi Soru Örneği

- Konuşma dilinin söylenip işitilebilen en küçük parçası aşağıdakilerden hangisidir?
- **a) ses**
- b) harf
- c) kelime
- d) hece
- e) ek

Kavrama Düzeyi Soru Örneği

- «ip-ipi, aç-açık» örneklerinde ötümlüleşme olmamasının nedeni aşağıdakilerden hangisidir?

a) Kök hecedeki ünlünün Ana Türkçe döneminde uzun olması

b) Kök hecedeki ünlünün Ana Türkçe döneminde kısa olması

c) Kelimelerin alıntı olması

d) Söz sonunda ötümsüz ünsüz bulunması

e) Kök hecedeki ünlünün dar olması

Sonuç

Sonuç olarak, iki grubun ortalamaları karşılaştırıldı ve aradaki farkın rastlantısal mı, yoksa istatistiksel olarak mı anlamlı olduğuna karar vermek için «bağımlı iki örnek t testi» uygulandı.

T - Testi Sonuçları

Sonuç olarak, iki grubun ortalamaları karşılaştırıldı ve aradaki farkın rastlantısal mı, yoksa istatistiksel olarak mı anlamlı olduğuna karar vermek için «bağımlı iki örnek t testi» uygulandı.

Hipotezler :

- H_0 : AÖF öğrencileri ile örgün öğrencilerin bu sorulara verdiği cevaplar açısından istatistiksel anlamlı bir fark yoktur.
- H_1 : AÖF öğrencileri ile örgün öğrencilerin bu sorulara verdiği cevaplar açısından istatistiksel anlamlı bir fark vardır.

T - Testi Sonuçları

- test değeri t=1,1518
- bu değere ait olasılık değeri= 0,151

Bu değer, anlamlılık düzeyi 0,05'ten büyük olduğu için H_0 hipotezini doğrulamaktadır.

Sonuç olarak:

H_0 : AÖF öğrencileri ile örgün öğrencilerin bu sorulara verdiği cevaplar açısından istatistiksel anlamlı bir fark yoktur.

ONTOLOGIES FOR PERSONALIZATION: A NEW CHALLENGE FOR INSTRUCTIONAL DESIGNERS

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Abstract

In e-learning environments, instructional design has evolved from "one instructional design for many learners" to "one design for one learner" or " many designs for one learner". By using the capabilities of semantic web, World Wide Web led the interchange of information about data (e.i., metadata) as well as documents. Such capabilities also indicated a new kind of challenge for instructional designers to design a common framework that allows content to be shared and reused within and across applications.

Keywords: ontology, personalization, instructional design

Introduction

Personalization is described as adapting learning experience to different learners by analyzing knowledge, skills and learning preferences of individuals (Devedsic, 2006). Personalized learning remove time, location and other constraints in teaching process and aims to tailor teaching for each learner's constantly changing needs and skills (Sampson, Karagiannidis, & Kinshuk, 2002).

In e-learning environments, instructional design has evolved from "one instructional design for many learners" to "one design for one learner" or " many designs for one learner". By using the capabilities of semantic web, World Wide Web led the interchange of information about data (e.i., metadata) as well as documents. Such capabilities also indicated a new kind of challenge for instructional designers to design a common framework that allows content to be shared and reused within and across applications. Yet, instructional designers have some challenges in designing instructional environments, ie.. the need for better, understanding the nature and the outcomes of the interaction between learners and content, designing learning object and navigational paths, monitoring and analyzing the learning progress.

In order to make an e-learning environment personalized there needs to be;

– Regular and constant data monitoring and analysis tools (Learning Analytics),

– Determining cognitive and non-cognitive personal characteristics accurately, (Learner characteristics)

– Learners' interaction with –designed- medium: i.e., learning outcomes (Learning & Instruction)

– Tools to diagnose and/or guide learners with study or navigational paths (Ontology and Designing Navigational Paths).

To conclude, it is essential to develop a design framework for personalization. In general, we need ontolog(ies), a learner model, a learning object design model, and learning analytics. In what follows, I will outline the nature and the functions of each one of these components briefly.

Ontologies

One of the possibilities of personalizing the learning process is ontologies based on semantic web. An ontology is an explicit specification of a conceptualization (Gruber, 1995) or a model (Musen, 1998), which is used for structuring and modeling of a particular domain that is shared by a group of people in an organization

(O'Leary, 1998). The underlying technology of these systems is the use of a learner model where the information of learner goals, preferences or needs is kept in learner data (Martins, et.al, 2008).
There are various learner and user models in the literature. Yet, it was claimed that, these models are generally either too generic or too complex to handle and they are lack of addressing to model learning object based instructional systems (Kaya and Altun, 2011). Kaya and Altun (2011) proposed an ontology based learner model for e-learning systems which incorporates an instructional learning object design model (figure 1):

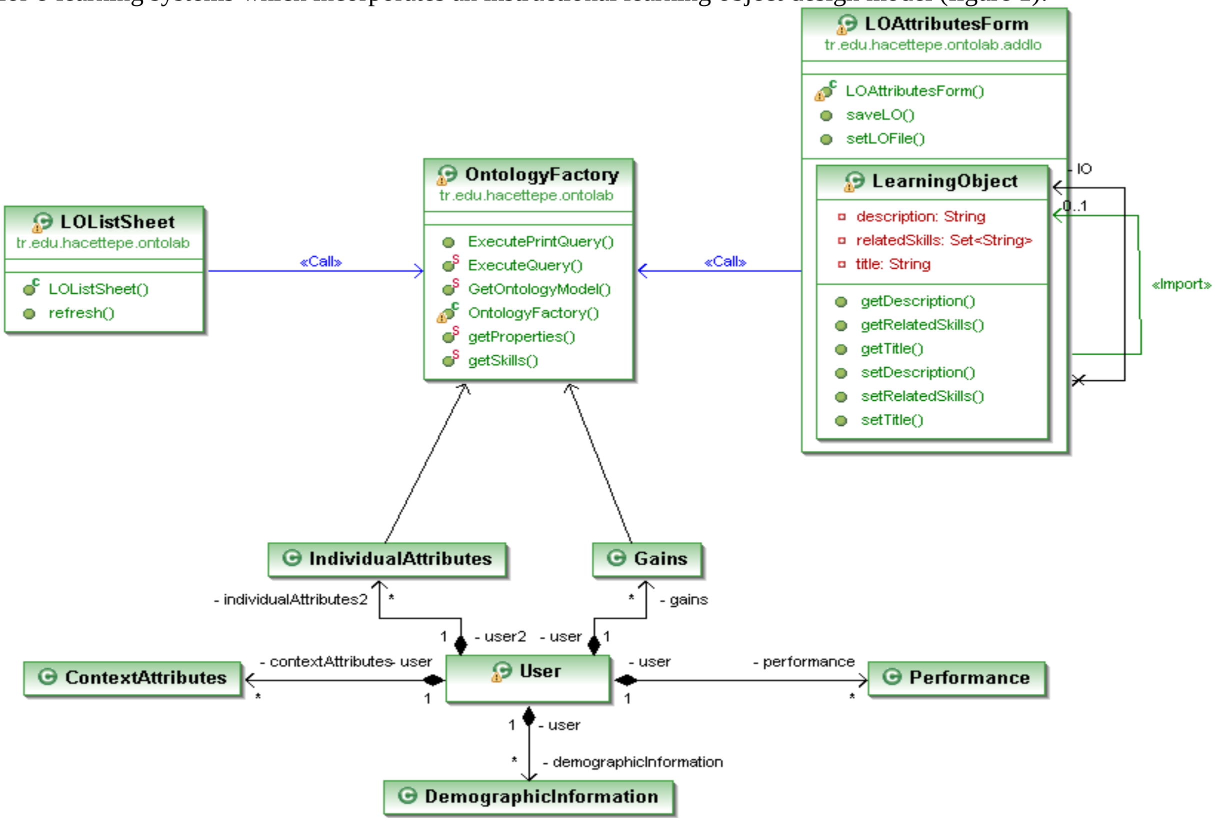

Figure 1: Diagram of user model.

Demographic information, current learner status, expectations (learning goals), individual attributes, performance and the context attributes are the essential data that are kept about the user embedded in that model. This model is suggested to being ontology based to provide reasoning and inference functionalities.

Similiarly, Aşkar, Altun, Kalınyazgan and Pekince (2010) developed a model for K-12 curricula based on Personalized Ontological Learning Environments (PoleONTO). In POLEonto, learning processes were analyzed as a set of cognitive skills, which were articulated in the curriculum and applied by instructors. In POLEonto context, skill is defined as the interaction and any processes between persons and concepts. For example, the concept of "summary" is stated in one's mind; yet, they can write about it, they can use summary in other contexts (i.e., essay or composition writing), which is creative thinking. Summary can be manipulated to develop a plan by using its types and functions, which requires decision making. PoleONTO is suggested to propose a new method to separate learner expectations by determining domain concepts.

Aşkar and Altun (2009) developed the CogSkillNet within POLEonto environment; and, discussed how CogSkillNet can be modeled in the e-learning domain. CogSkillNet is an ontology of skills embedded within the curriculum of K-12 education.

In CogSkillNet context, integrated actions represent higher order thinking skills such as problem solving, scientific thinking, and critical thinking (Fig 2)

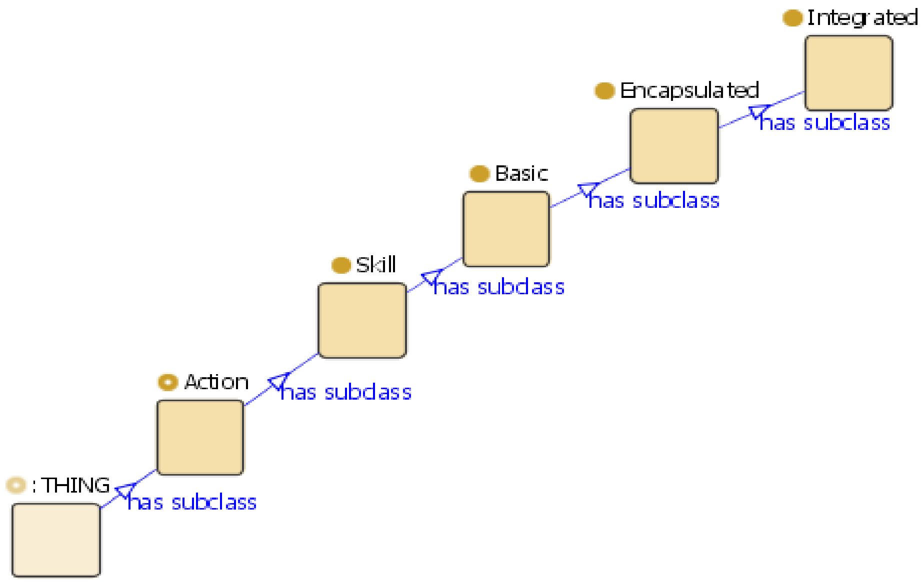

Figure 2: Class Hierarchy in CogSkillNet

Skills in CogSkillNet include actions, processes (aka relations and relation types) and delegations as instances. Base actions are pre-defined, universal sets of functions. The following figure represents the conceptual framework of instances in CogSkillNet (fig 3).

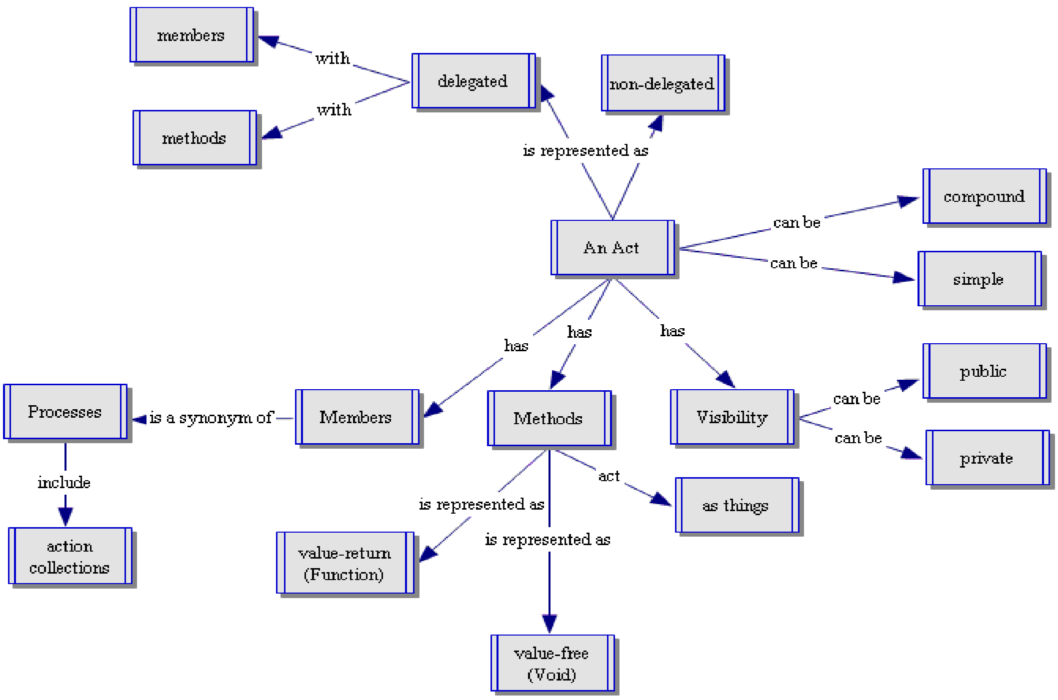

Figure 3: Conceptual Framework of Instances

CogskillNet is proposed to provide learners navigation guidance for their learning path based on their progress through cognitive skills and also enabling evaluators to base their assessment process and diagnose the deficiencies in students' learning as far as cognitive skills.

Learning Objects

A learning object is defined as "…any entity, digital or non-digital, that may be used for learning, education or training" (IEEE Learning Technology Standards Committee, 2001) and also as digital resources that can be reused to support learning (Wiley, 2001).

All learning objects need to have an instructional purpose to be re-used within different instructional settings and each learning object should appropriately support learning through the possible inclusion of educational objectives, content, resources, and assessment.

The fundamental issues about learning objects in instructional design process are; “how to store each learning object so that they can further become accessible through different digital learning and/or content management systems or different delivery modes”, “what should be the size of the learning object (granuality)” and “how can the context be modeled”.

In a study, Aşkar and Altun (2008) highlighted the design processes of learning objects by using the learning space as a metaphor, The proposed model to of learning space metaphor is surrounded by skills and concepts in a K-12 subject domain. Instead of using taxonomical classification for skills and concepts, ontological relations and reasoning is essential in order to navigate within this space with “appropriately small” granules (See Figure 4).

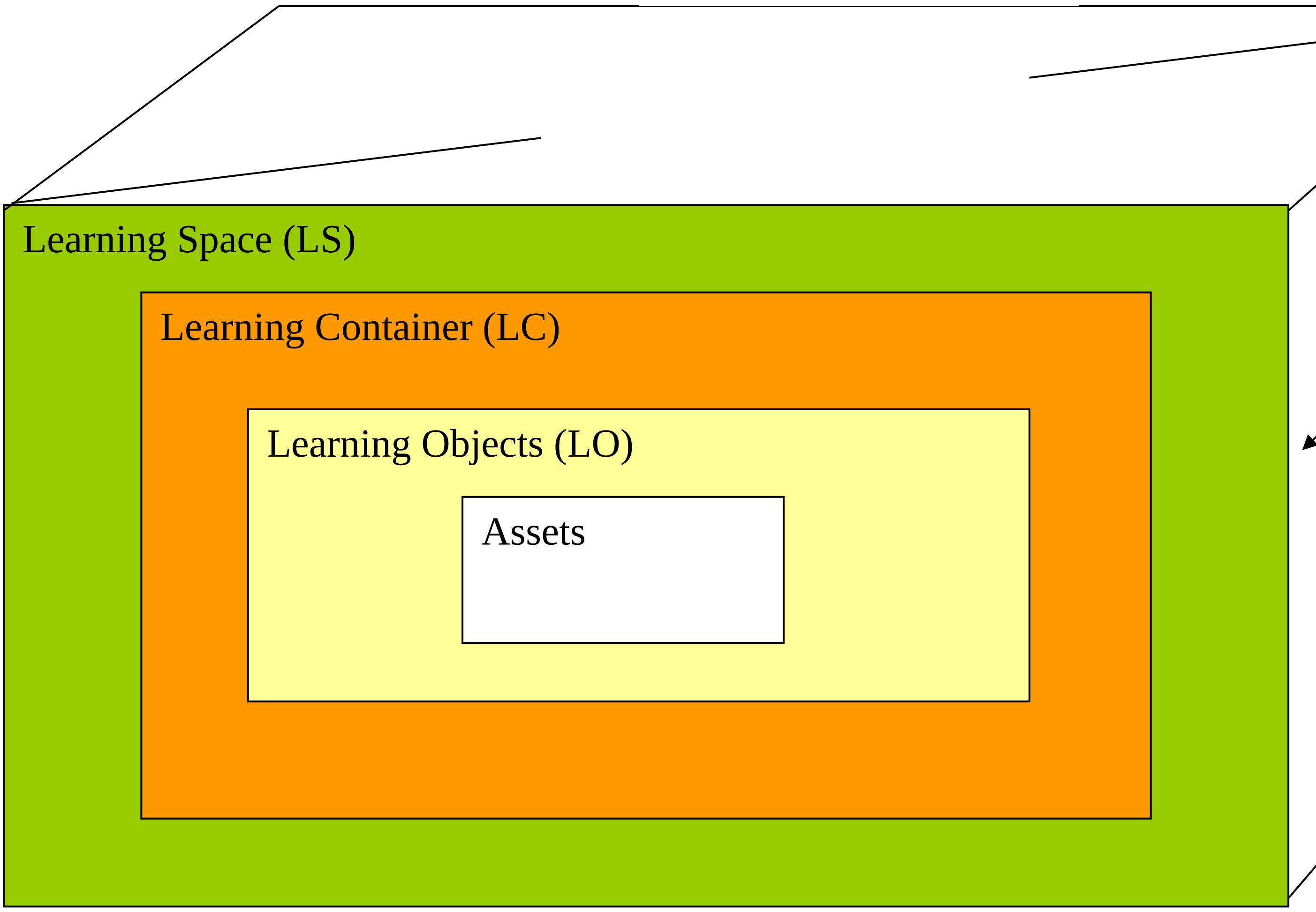

Figure 4: Learning Space

This learning space model stated to creating a meaningful combination of concept-concept, concept-skill, or skill only granules to represent an educational expectation (or standard). As a result this model proposed a separation of learning expectations as concepts and skills based on their ontological relations in a specific domain. Since each expectation include at least a skill and/or concept(s), such an ontologic relationship might enable designers to develop instructionally meaningful and reusable learning objects.

Learning Characteristics:

Determining cognitive and non-cognitive personal characteristics accurately and transforming them into a learning design is a fundamental issue for instructional designers. To design better adaptive e-learning environments, the role of the user as an individual and their characteristics had become the focus. Since individuals have differences both in cognitive and non cognitive characteristics, their learning processes also different from each other. So, in a uniform standard learning environment learning outcomes will not be same
.
The basic cognitive characteristics of individuals are their working memory capacity, attention level, spatial abilities, perception, language acquisition etc. on the other hand non cognitive characteristics can be specified as motivation, attitudes, fear, like, anxiety, self efficacy etc.

There have been different studies showing importance of individual differences in designing learning environments and learning processes. In a study, Sönmez, Altun, Mazman (2012) investigated the effect of individuals' prior knowledge and experiences on their visual search performances. A visual search task on identifying the phases of mitosis from a microscope view with two different background contrasts was used. as a result, it was found that high prior knowledge group was able to recognize and identify the phases of mitosis correctly in a shorter period of time in comparison to low level prior knowledge group. However, no difference was found between groups for the low color contrast slides. The results revealed that for novices, who are lack of expertise in interpreting microscope images, prior knowledge has an effect when high contrast images were in question.

In another study, Mutlu and Altun (2010) investigated the effect of multimedia instructional designs prepared according to the attention types (focused - split) on recall performances of learners with various short term memory spans (high – medium - low) was investigated. The findings indicated that multimedia instructional designs were effective on recall performances. Learners showed higher recall performances in the multimedia instructional designs prepared on the focused attention type. However, no significant difference was observed in learners' recall performances in terms of their short term memory spans. Significant differences were observed between multimedia usage periods of learners applied different multimedia.

Uz and Altun (2011) studied the effect of various navigation environments (static-dynamic) on recall performances of students with different object location memory spans (high-low). In this study, 3-dimensional dynamic environments and static environments were used as navigation environments. Dynamic environment was applied to half of the students with low and high object location memory span and static environment was applied to the other half. After that, spatial knowledge recall performances of all the students were evaluated. The results showed that overall, participants had higher recall scores in 2D. Once controlled their location memory, however, results indicate that higher location memory group had higher recall scores in 2D, but did not change for low group. Male participants were advantageous over females in 3-D.

Torun and Altun (2012) investigate the effects of levels of processing and navigation design type on recall and retention in e-learning environments. The participants' performances of free recall, title recognition, location memory and their retention are measured via two different navigational layout design structured E-learning environments with the same content (story) by giving participants the instructional tasks which were designed in shallow, medium and deep levels of processing. The results of this study showed that left side navigation menu yielded better results in free recall, heading recognition, and location memory and deep level of processing yields better recall performances. Memory performances are affected depending on the design of the given instruction (levels of processing).

To conclude individual characteristics are important in understanding and designing the learning materials and learning environments. However, effect of individual differences could be sensitive to the design of the learning environment.

Learner Assessment:

Learner assessment describes any processes that appraise an individual's knowledge, understanding, abilities or skills. Neuropsychological assessment is the one of the assessment types which is based on determining the strengths and weaknesses in one's cognitive functions (such as, memory types, attention levels, language ability etc.). There are different neuropsychological test to measure cognitive functions which are essential in learning process. Some of the tests are paper pencil based while some other could be computerized.
Since e-learning environments are computer based environments, while studying effects of cognitive function of individuals in e-learning process computer based test could be more compatible for measuring those functions.

Neuropsychological assessments are frequently being used as test batteries in computer based environments. Keeping data in computer environment would provide following and regular controlling of individual progress for longitude research (Aşkar, Altun, Cangöz, Türksoy, Çevik, 2009). So adapting neuropsychological test into computer based environment through validity and reliability studies and making standardization studies will contribute to this process.

Aşkar, Altun, Cangöz, Çevik, Kaya and Türksoy (2012) aimed to assess whether a computerized battery of neuropsychological tests could produce similar results as the conventional forms. Comparisons carried out with two neuropsychological tests: Line Orientation Test and Enhanced Cued Recall Test. Results showed that the Enhanced Cued Recall Test-Computer-based did not correlate with the Enhanced Cued Recall Test-Paper-and-pencil results. Line Orientation Test-Computer-based scores, on the other hand, did correlate significantly with the Line Orientation Test-Paper-and-pencil version. In both tests, scores were higher on paper-and-pencil tests compared to computer-based tests. Total score difference between modalities was statistically significant for both Enhanced Cued Recall Tests and for the Line Orientation Test. In both computer-based tests, it took less time for participants to complete the tests.

Conclusion

Personalization can be a valuable tool to facilitate lifelong learning with just-in-time and on-the-job training, as well. Different frameworks and learner (and group) characteristics will drive the method of personalization. Instructional designers must have a clear understanding of the learning needs and chracteristics of each student. Learning paths must then be created that match with individual learners.

Lastly, it is important to remember that personalization can be expensive and time-consuming if not properly developed and maintained.

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OUTCOMES OF USING A SOMATOSENSORY VIDEO GAME ON ENHANCING SELECTIVE ATTENTION OF INSTITUTIONAL-DWELLING ELDERLY WITH DISABILITIES

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Abstract

The aim of this paper was to explore the effectiveness of a somatosensory video game, Xbox 360TM, on enhancing selective attention of institutional-dwelling elderly with disabilities. Thirty-eight participants aged 65~92 were recruited to complete attention tests in Vienna Test System. Eighteen participants voluntarily completed 30-minute Xbox games 3 times per week for a total of 4 or 8 weeks. Significant improvements in selective attention were found in both experimental groups and 8-week group had stronger one-month carry-forward effects (p < .05). The results conclude that using somatosensory video games is a viable approach to promote selective attention of institutional-dwelling elderly with disabilities.

Keywords: somatosensory video game; eldery; selective attention; Vienna Test, Xbox

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Introduction

The issue of an aged and ageing population is of international concern and considered one of the foremost challenges globally. According to UN investigation, aged and aging populations increase 2.6% every year and will be more than child population in 2045 (United Nation [UN], 2009). In Taiwan, more than 2 million older adults aged more than 65 years also old reached 10.7% of total population in 2010 (Directorate-General of Budget, Accounting and Statistics, Executive Yuan, 2011). Therefore, with this dramatically growing trend, the concept of health promotion for aged and aging population has been one of the significant issues to address in Taiwan. Among all health promotion concerns of older population, selective attention has been noticed in recent studies because its positive contribution on fall prevention (Liu-Ambrose, Nagamatsu, Hsu, & Bolandzadeh, 2012).

Green and Bavelier (2003) stated that playing video games effectively increases players' visual skills and attentions. Related research also identified that video games have positive outcomes on promoting short-term memory, selective attention and motivation for older adults (Gamberini, Barresi, Majer, & Scarpetta, 2008; Ijsselsteijn, Nap, de Kort, & Poels, 2007). Miller (2005) also used the "HiFi" video game on 95 health older adults (mean = 80 years old) and found the significant improvements on memory and attentions with one hour per day for 8 weeks. Therefore, this study proposes to use a somatosensory video game to enhance selective attention of institutional-dwelling elderly with disabilities.

Method

Participants

A total of 58 participants were recruited at the beginning of this study but 10 subjects withdrew in the first month and another 10 subjects withdrew in the second month because of health issues and the willingness to join. Non-random purposive sampling was utilized in this study and all participants with disabilities were pre-approved by the medical/managing staffs and signed informed consent forms approved by the human subjects committee at the Taipei Physical College (Approval Reference No. 20110023) before participating in the study. In order to complete video game interventions and tests in the study, participants were required to have verbal communication ability and basic physical functions to participate and to be approved by head nurses. After receiving both consent forms from the participant and his/her family member, the elderly were asked to choose to be in the control group or experimental groups. According to their willingness and health condition during the three months period, 10, 8, and 20 older adults completed 8-week, 4-week video game training and control group tests, respectively.

Intervention

A quasi-experimental design was used in this study. The two experimental groups voluntarily agreed to complete 4- and 8-week somatosensory video game trainings three sessions per week, for 30 minute each session which included 5-minute warm up, 20-minute interactive gaming, and 5-minute cool down during their free time. Control group did not receive any additional training but maintained regular daily schedules and programs that were provided by the nursing home. In the study, "Xbox-360 Kinect" was selected to be the interventional modality. Three games, mouse mayhem, following the arrow, and matchmaker, were three chosen games in "Dr. Kawashima's Body and Brain Exercises" which were appropriate for older adults with wheelchair (Fig. 1).

Those games were selected by the professionals and staff who had long-term care professional working experiences with this population. Mouse mayhem is a game to "touch" mice that will pop out from four different pipes located at four different corners on the TV screen. In the game, there are three kinds of mice. Regular green and gold mice are allowed to touch and get points, but the gold mouse with hedgehog hair shall not be touched or points will be deducted. The total time allowed for one game is one minute. In Follow the arrow, red arrows pop out from five different directions and players have to point out those arrows within 5 seconds to get points. Totally 20 questions within one minute shall be answered in each game. Matchmaker uses lots of colorful pop-out figures on the screen and asks players to match the same figures by using both hands to get points. There are 15 pop-outs in each game, and time will be recorded to justify players' performance. Table 1 showed the training plans in this study.

Fig 1. Three games: (a) Mouse mayhem; (b) Follow the arrow; (c) Matchmaker

Table 1. Somatosensory video games training plans

Time	Intervention program
week 1	Mouse mayhem x 12
week 2	Mouse mayhem x 5
	Follow the arrow x 5
week 3	Mouse mayhem x 3
	Matchmaker x 3
	Follow the arrow x 5
week 4	Mouse mayhem x 4
	Matchmaker x 4
	Follow the arrow x 4
week 5-week8	Mouse mayhem x 4
(only 8-week group)	Matchmaker x 4
	Follow the arrow x 4

Measurement: Vienna Test System (COG-S9)

The selective attention in this study was measured by Vienna Test system which is based on the theoretical model of Reulecke (1991). Energy, function and precision are three components, which demonstrated their selective attention by showing their demanding energy, performing a task, and the quality of task performance. Examinee use the response panel as the input device. An animated instruction phase and an error-sensitive practice phase lead on to the task itself. In the test forms with flexible working time the respondent's task is to compare an abstract figure with a model and to decide whether the two are identical. Once the answer has been entered the next item follows automatically. In the test forms with fixed working time a reaction is required only if the figure is identical with the model. Once the presentation time has expired the next item follows automatically. It is not possible to omit an item or to go back to a preceding one.

The majority of reliability being over r = .95. Many studies of different aspects of validity (content validity, convergent and discriminant validity, construct validity, criterion validity) have been carried out. A number of studies carried out in the field of traffic psychology also confirm the validity of the test (Schuhfried, 2010). S9 is one of seven test forms contains very simple, unvarying stimulus questions which have a seven-minute time limit. The scoring of S9 includes total "reactions" (correct and incorrect reactions) and percentage "incorrect reactions". The results includes eight scores which are sum reactions, sum correct reactions, sum incorrect reactions, sum hits, sum correct rejections, percentage incorrect reactions, mean time correct reactions, and mean time incorrect reactions.

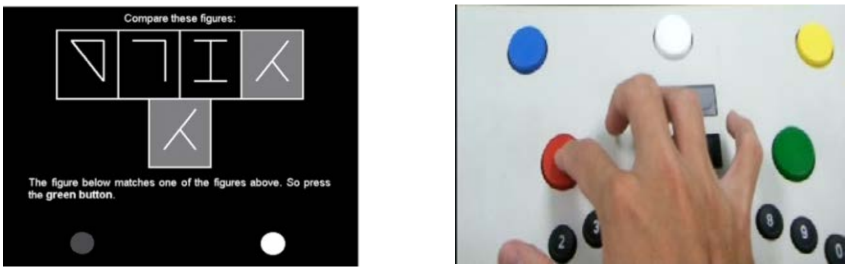

Fig 2. Vienna Test System (a) examination screen; (b) response panel

Measurement: Mini-Mental State Examination (MMSE)

The mini-mental state examination (MMSE) test is a 30-point questionnaire that is used to screen for cognitive impairments and dementia in nursing homes and other older institutions. MMSE is also used to estimate the severity of cognitive impairments at a specific time and to follow the course of cognitive changes in an individual over time. The current standard MMSE form published by Psychological Assessment Resources is based on its original 1975 conceptualization with minor subsequent modifications by the authors and translated into 10 different languages. Within 5 to 10 minutes, examinees are requested to complete questions in five areas included orientation to time, registration to place, attention and calculation, recall, language, repetition and complex commands. According to Folstein, M. F, Folstein, S. E and Fanjiang (2001), the scores ranged from 24 to 30 means no cognitive impairment (NCI), 18 to 23 stands for mind cognitive impairment (MCI) and 0-17 represents severe cognitive impairment (SCI). Therefore, it is an effective way to document an individual's cogitative impairments and mental states. In this study, traditional Chinese version were used and administrated by registered nurses.

Data analysis

SPSS 18.0 was used for statistical analysis that included descriptive statistics, Chi-square test, Kruskal-Wallis Test, Mann-Whitney U test, Spearman rank correlation coefficients, and Wilcoxon matched-pairs signed-rank test.

Findings

Demographic Background of the Participants

At the end of this study, 10 and 8 participants completed 4-week and 8-week interventions respectively in the experimental groups and 20 participants in the control group completed pre- and post-tests. Table 2 shows the demographic information of the participants. According to the results, there are no significant differences in their ages and body weights, but Mini-Mental Status Examination (MMSE) did have significant differences between the groups (Table 3).

Table 2. Participant demographics (N = 38)

Items	Groups	Means (SD)	χ^2
Age(y)	8-week group (n = 10)	81.20 (6.22)	1.54
	4-week group (n = 8)	77.25 (7.15)	
	Controls (n = 20)	80.25 (6.94)	
Weight(kg)	8-week group (n = 10)	56.35 (7.53)	0.11
	4-week group (n = 8)	57.59 (12.88)	
	Controls (n = 20)	58.84 (13.81)	
MMSE	8-week group (n = 10)	26.70 (4.08)	9.08*
	4-week group (n = 8)	19.50 (5.53)	
	Controls (n = 20)	22.40 (4.98)	

*p < .05

Selective Attention and MMSE

The relationship between selection and mental states was examined and found that seven items demonstrated significant collections, except percentage incorrect reactions (p < .05). Therefore, two experimental groups were divided as three sub-groups (NCI, MCI and SCI) to examine the impacts of different durations of interventions on selective attention. Table 4 showed the results of MMSE in three groups.

Table 3. Relationship between selective attention and mental states (N = 38)

Items	MMSE
Sum reactions	.59***
Percentage incorrect reactions	-.25
Sum correct reactions	.60***
Sum incorrect reactions	.28*
Mean time correct reactions	-.57***
Mean time incorrect reactions	-.51***
Sum hits	.53***
Sum correct rejections	.53***

*p < .05; ***p < .001

Table 4. Sub-groups divided by the levels of MMSE in experimental groups (N = 38)

MMSE	8-week group (n = 10)	4-week group (n = 8)	Controls (n = 20)
NCI	8	1	9
MCI	2	6	8
SCI	0	1	3

Effects of 8-week Interventions for elderly with NCI on Selective Attentions

According to the results, the 8-week group with NCI demonstrated significant immediate effects in seven items of selective attention before and after the intervention (p < .05). In order to understand the carry-forward effects, the differences of selective attention before and after withdrawal were examined and found that 8 items of selective attention did not have significant regression (p < .05). In terms of comparison of pre-intervention and after withdrawal, 8-week group with NCI demonstrated significant overall effects, except sum correct reaction (p < .05).

Table 5. Changes of scores in 8 items in three effects in 8-week group with NCI (n = 8)

Items	Immediate Effects		Carry-forward Effects		Overall Effects	
	z score	ΔX	z score	ΔX	z score	ΔX
Sum reactions	-2.38*	+33.2%	-0.56	-1.8%	-2.10*	+30.8%
Percentage incorrect reactions	-2.10*	-42.5%	-1.12	-16.7%	-2.10*	-52.1%
Sum correct reactions	-2.52*	+44.6%	-0.42	+0.7%	-2.52*	+45.5%
Sum incorrect reactions	-1.75	-40.8%	-0.85	-22.6%	-1.40	-54.2%
Mean time correct reactions	-2.38*	-32.5%	-0.28	+1.0%	-2.17*	-31.8%
Mean time incorrect reactions	-2.52*	-42.3%	-0.84	+18.8%	-1.54	-31.5%
Sum hits	-2.52*	+39.8%	-0.14	+1.9%	-2.24*	+42.5%
Sum correct rejections	-2.38*	+46.7%	-0.35	+0.1%	-2.52*	+46.9%

*p < .05

Effects of 4-week Interventions for elderly with MCI on Selective Attentions

According to the results (Table 6), 4-week with MCI groups demonstrated significant immediate effects in five items of selective attention before and after the intervention (p < .05). This group was also examined differences of scores before and after withdrawal in order to understand the carry-forward effects. Sum reactions, sum correct reactions, sum hits, sum correct rejections had significant regression after one-month withdrawal. In terms of comparison of pre-intervention and after withdrawal, this group only had one significant effect in sum correct reaction.

Table 6. Changes of scores in 8 items in three effects in 4-week group with MCI (n = 6)

Items	Immediate Effects		Carry-forward Effects		Overall Effects	
	z score	ΔX	z score	ΔX	z score	ΔX
Sum reactions	-2.20*	+289.4%	-1.99*	-35.0%	-1.78	+153.0%
Percentage incorrect reactions	-0.73	-18.9%	-1.14	+30.3%	-0.31	+5.7%
Sum correct reactions	-2.20*	+307.8%	-1.99*	-35.0%	-1.99*	+165.3%
Sum incorrect reactions	-1.48	+245.0%	-.11	-35.3%	-1.78	+123.2%
Mean time correct reactions	-2.20*	-77.7%	-1.78	+45.9%	-1.78	-67.5%
Mean time incorrect reactions	-1.57	-48.0%	-1.37	+29.6%	-1.15	-32.6%
Sum hits	-1.99*	+302.0%	-2.21*	-38.9%	-1.15	+145.5%
Sum correct rejections	-2.20*	+309.9%	-1.99*	-33.5%	-1.78	+172.7%

*p < .05

Overall Effects of 8-week and 4-week Interventions on Selective Attentions

In order to understand the impacts of interventions with different durations, three groups were examined their differences in 8 items. Sum reactions, sum correct reactions, sum hits, sum correct rejections, percentage incorrect reactions, mean time correct reactions, and mean time incorrect reactions are 7 items had significant improvements in 8-week group with NCI. Sum correct reactions was the only one item significantly changed in 4-week group with MCI. In the control group, there is no significant improvement in all 8 items.

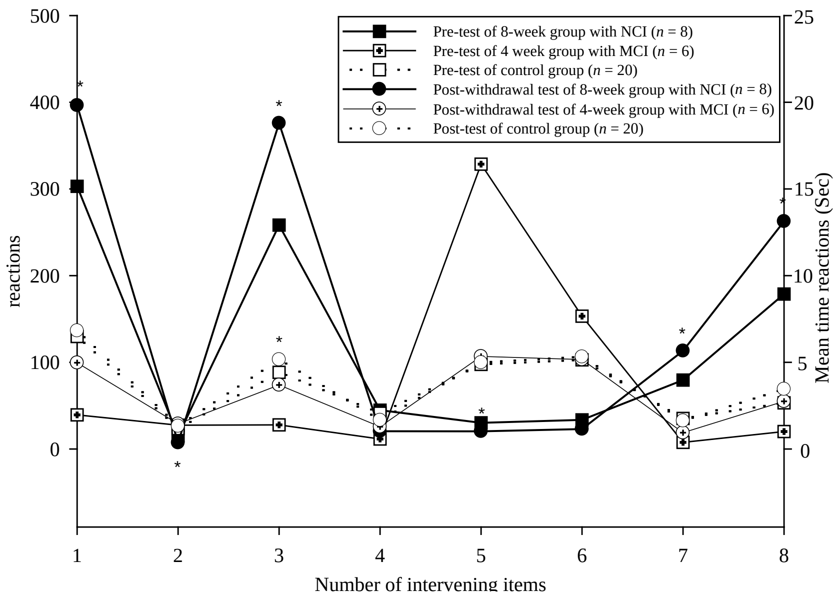

Fig 3. Overall Effects. 1. Sum reactions; 2. Percentage incorrect reactions; 3. Sum correct reactions; 4. Sum incorrect reactions; 5. Mean time correct reactions; 6. Mean time incorrect reactions; 7. Sum hits; 8. Sum correct rejections. a, 8-week group with NCI (n = 8) improved significantly on number 1,2,3,5,7,8 (p < .05). b, 4-week group with MCI (n = 6) improved significantly only on number 3.

Conclusion

In this study, we found that somatosensory video game trainings can significantly improved some aspects of selective attention on elderly with MCI and had limited carry-forward and overall effects with 4-week intervention. However, 8-week intervention had much better promising outcomes on immediate, carry-forward and overall effects on elderly with NCI. The findings suggested that more than 8 weeks somatosensory video game interventions are valuable to promote selective attention for older adults. However, there is still a strong need to continue somatosensory video game related research on older adults with different levels of MMSE. Furthermore, continuing innovative clinical-/intervention-type studies and practice-based somatosensory video game interventions in different settings (e.g. community, home-based) are recommended to explore sustainable health promotion strategies for this aged and aging society.

Acknowledgment

The authors would like to thank the Changhua Nursing Home, Ministry of the Interior, Taiwan, the Graduate Institute of Sport and Health and the Graduate Institute of Applied Sport Science, National Changhua University of Education for supporting this study. In addition, this work was supported in part by the National Science Council (NSC), Taiwan, under Grant NSC 100-2511-S-018 -030 and NSC 101-2511-S-018-009-MY2.

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PRELIMINARY DEVELOPMENT OF HEALTH EDUCATION IN CURBING OBESITY AMONG PRESCHOOL CHILDREN

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Abstract

An obese preschool child may grow up to be an obese adult. The factors of obesity among preschool children have been documented as one of the factors that will lead to the risks of hypertension, psychosocial disturbances and heart complications that increase adult morbidity and mortality. Preliminary data were collected to identify the components needed in the construction of preschool health education in preventing obesity. Four main components were obtained: i) dietary, ii) physical development, iii) psychosocial development, and iv) physical activities. Therefore, a health education based on the above components will be developed as a guideline in order to assist with the problem of obesity among the preschool children.

Keywords: Health education; preschool children; obesity

Introduction

Obesity is an issue that may cause various problems among adults and also children. At the end 2009, the problem of obesity in Malaysia continued to increase especially among children aged 7 – 10 years old with 6.6% increment for the children aged 7 and 13.88% for the children aged 10 years old (Priya, 2010). Must (2006) report that 20% of deaths among adults are due to coronary disease and atherosclerosis which are associated with childhood obesity. Most worrying, preschool children who are facing obesity will normally grow up as obese adults who are exposed to dangerous diseases such as hypertension, diabetes, heart complications, and cancer (Zulkifli, 2011). A study by Whitaker et al (2007) showed that obese children between the ages of 3 – 6 are significantly at high risk of obesity in their adulthood. This issue was supported by Chee et al (2008) who stated that children with obesity problem are at risk to continually be obese when they are growing up that will lead to risk of having chronic diseases such as cardiovascular, gastrointestinal, endocrinology or orthopaedic diseases for long run or in the future.

A study by Martorell et al (2000) showed that 32 out of 50 developing countries have high prevalence of obesity among children at the ages between 1 to 5 years old. This high prevalence of obesity has become a public health problem among preschool children especially in the United State of America. Canning et al (2004) also reported similar issue where 25.6% of preschool children between the ages of 3 – 5 years old have excessive body weight or obese. Meanwhile, a retrospective cohort studies conducted by Manios et al (2007) aimed to record the prevalence of obesity and the relationship between obesity and parents' level of education, parents' body mass index (BMI), and the living area of preschool children in Greece. The study showed that 31.9% of children between the ages of 1 – 5 years old are at the risk of being obese. Other than that, Manios et al (2007) also reported that parents' body mass index is the factor that will cause the children to face with the risk of excessive body weight at very young age (1-2 years old). It shows that obesity at the age of 1 – 2 years old will increase the risk of obesity among the teenagers and adults in the future. The study suggested that the prevention of obesity should start at preschool level through the preparation of health programmes. Hence, this study aims to identify the components needed in constructing preschool children health education programme in preventing obesity.

Obese Preschool Children

Without realising it, obesity is a major contributing factor to metabolic syndrome faced by many Asians (Lian, 2012).Obesity is often associated with diseases such as cardiovascular disease, respiratory problems, and diabetes. Thus, children with obesity are at high risk of having the mentioned diseases. The issue that needs to be taken seriously is that children with obesity will normally have overweight problem when they grow up (Department of Information, 2008). According to World Health Organisation (WHO), it is estimated that in year 2015, approximately 2.3 billion of people in the world will have overweight problem and approximately 700 million of them will have obesity problem (Dewan Masyarakat, 2010).

If the problem of obesity affected the adults, they would find the best alternative that would help to reduce their weight. However, if this happened to children especially preschool children, it would be mostly ignored by their parents (Lian, 2010). Various techniques and methods can be used in preventing obesity such as taking healthier food (vegetables and fruits), reducing the time spent for watching television, ensuring that the children are active in routine activities, and exercising. Despite of that, it is difficult to convey this knowledge to the parents as they have the perception that obesity among preschool children is not a big problem (Department of Information, 2008). Therefore, the researchers agreed that the inculcation of health education programme should start in nurseries and day care centres and the effort should be continued by parents at home. The pass studies which were conducted outside Malaysia had also prepared various programmes as prevention methods and techniques in the nurseries and preschools in their countries. It is also hoped that these programmes can be used as guidelines for the researchers to develop health education programmes suitable with Malaysian context.

Health Programmes as Obesity Prevention Methods among Preschool Children

3.1 Aerobic Exercise Programme

A study by Mo-suwan et al (1998) was conducted to examine the effects of school-based aerobic exercise programmes to children with obesity index. The study did not use behavioural framework or theory as guideline in conducting the intervention programme. The study was conducted by using randomised controlled trial on 292 children from 2 preschools in Hat Yai, Songkhla district, southern Thailand. Obese children in the study were defined as percentile ≥ 95 triceps skinfold (TSF) for their age and gender.

The study was conducted on year 2 preschool children (4-5 years old); 29.3 weeks in the first school and 30 weeks on the second school and overall 9 months of intervention conducted on the samples. The children were divided into two groups: intervention group (n=145) and controlled group (n=147). The exercise programmes were prepared based on the concept of cardio-respiratory fitness for children between the ages of 6 – 17 years old with the minimum of 20 minutes of energetic physical activities ≥ 3 times a week. “Superkids/Superfit” exercise programme was introduced and conducted to restore physical fitness. The controlled group was allocated 1 hour of Physical Education per week meanwhile the intervention group was allocated with 1 hour of Physical Education per week with 15 minutes of walk before the morning classes started and 20 minutes of aerobic dance after their nap. The programme was conducted 3 times per week and the aerobic exercise session was conducted by trained staff.

Mo-suwan et al (1998) only ensured that 1 hour of Physical Education including swimming lesson per week. However dietary aspect was not controlled in the study. The children were provided with lunch and 2 snacks and they were allowed to bring additional snack. Data were collected by using a set of questionnaire filled by the parents. Anthropometric Outcome assessment was used on the children to measure their weight, height and triceps skinfold thickness in order to measure their portliness. The measurements were taken four times: the beginning of intervention, before semester break, beginning of second semester, and by the end of intervention. Detecto Scale and Stadiometer were used to measure weight and height. Meanwhile TSF were measured by using Harpenden Calliper. BMI calculation method was based on method of Moore et al (1995) and Wilcoxon Signed-Rank was used for data analysis.

The result of the study showed no significant BMI difference (mean ± SD): 16.25 ± 2.35 to 15.76 ± 2.46 for intervention group, and 16.36 ± 2.22 to 15.94 ± 2.26 for controlled group. Obese children (percentile > 95^{th} TSF) in intervention group had their weight decreased from 12.2% to 8.8%. Meanwhile for the controlled group, the percentage of weight lost was from 11.7% to 9.7%. Statistical test showed no significant difference in body weight status between intervention group and controlled group, p = 0.179. The analysis also showed that the augmentation of BMI slope among female children from intervention group was lesser than controlled group (odds ratio, 0.32; 95% CI, 0.18, 0.56). Mo-suwan et al (1998) concluded that the intervention study did not show significant changes in weight/height^3, TSF, and BMI slope for male children. However, the prevalence of obesity by using 95^{th} National Centre for Health Statistics Triceps-Skinfold-Thickness Cutoff were found to decrease for intervention group (which performed exercises) and controlled group.

3.2 Parenting Support Programme: Diet and Exercise

Intervention study by Harvey-Berino & Rourke (2003) were conducted on 40 mother-child pairs to observe whether parental exposure to parenting skill support programme can be used to prevent obesity. A programme known as “Obesity Prevention plus Parenting Support (OPPS)” was conducted on Native American children as intervention group and the results were compared to the group which only undergone Parenting Support (PS). This programme encouraged discussion on children dietary and exercise reported by their parents. It was a pilot study which used the concept of home visits based on Adelarian Parent-Education Model. The model was adapted and became the main focus of the study to examine the influence of parents towards children’s behaviour.

The intervention was conducted for 16 week with children aged 9 to 36 months. Convenient Sampling was used where the children were chosen through advertisements in media, day-care programmes, and clinics for mother and child special nutrition supply. The participation of the study was random (volunteer) and based on the criteria of the study: family with children aged between 9 – 36 months old; children who were able to walk; mothers with BMI not more than 25 kg/m^2; and mothers who agreed to fulfil all treatment appointments. The mother-child pairs were divided into controlled and intervention groups. Controlled group practiced Parenting Support, PS (actively using parental curriculum) and not focused on dietary and behaviours towards exercise for 1 hour per week. Meanwhile, intervention group practices Parenting Support added with additional practices for mothers in children dietary and exercise aspects, OPPS for 1 hour per week. Assessments were made by the end of week 0 and week 16 of the treatment. There were 11 topics on parental education used in the intervention which were: Parenting: A Special Job, Ages and Stages of Children, Parenting Style, Preventing Problems before They Start, Building a Bond, Self-care or Care of the Caregiver, Discipline, Rules, Routines, Special Problems, Power of Encouragement. Obese children were defined as children with percentile ≥ 95^{th} for weight and height. Height and weight were measured by using Stadiometer and Recumbent Length Board which was plotted based on the growth chart of National Centre for Health Statistics (National Centre for Health Statistics, 2003). Weight to height Z score was measured by using Epi Info 2000. Dietary diary was analysed dieticians from Vermont University to obtain total calorie and fat intake. Physical activities were measured by using TriTrac Accelerometers and were recorded in the same time as dietary diary records.

The results of the study showed that mean score for weight to height Z score for intervention group decreased 0.27 ± 1.1 (SD), but increased for children in controlled group 0.31 ± 1.1 (SD), p = 0.06. Prevalence of obesity in intervention decreased from 15% (n=3) to 5% (n=1) but was found to increase in controlled group from 25% (n=5) to 30% (n=6), p=not significant. There was no significant difference in children's fat intake, physical activities, or mothers' weight and BMI between intervention and controlled group. Harvey-Berino & Rourke (2003) concluded that the findings of the study in a whole showed that the preschool children had slight decreased in weight status and energy intake after OPPS programme was conducted on them.

3.3 'Brocodile, the Crocodile' Programme: Dietary and Physical Activities

Intervention study by Dennison et al (2004) was conducted to observe the impact of duration for watching television to the weight status decrease among obese children in the outskirt of north New York. The study was designed based on documented facts which stated that obesity risk factors among children were related to the duration the children spent to watch television. Dennison et al (2004) developed 'Brocodile, the Crocodile' programme to promote health and the programme was conducted within 39 weeks.

The study did not use behavioural framework or theory as guideline in conducting intervention. Samples of the study were consisted of 163 children aged between 2.5 to 5.5 years old and included 16 preschools and day-care facilities. Children from 8 schools were included in controlled group and children from another 8 schools were included in intervention group. The study did not define obesity but it measured adiposity by using BMI and TSF. Intervention was conducted by promoting nutritious meal for 1 hour per week and by utilising 7 out 39 sessions for children and teacher interaction which was designed to reduce the duration spent on watching television. Interaction and promotion on physical activities were conducted in 32 out of 39 sessions with 30 minutes of musical activities, 10 minutes for snacking and 20 minutes to be involved in interactive educational session. Meanwhile, controlled group was exposed to topics like safety, injury prevention, and health. All samples were measured through baseline and were followed up by using the same protocol. A set of questionnaire was distributed to the parents in order to gather baseline and follow up information regarding the average time spent by the children watching television or video, playing video or computer games, surfing internet throughout the week, eating behaviour while watching television, and whether the television was placed in the children's bedroom or not. Parents were instructed to keep a week diary on the children's behaviours while watching television throughout the duration of the study to raise their awareness on the children's behaviours while watching television. The children were provided with weekly calendar with stickers as a reward if they did not watch television. Controlled variables in the study were gender, age and media use before intervention. Data were collected through reports made by parents on their children's activity in watching television. The heights of the children were measured by using portable stadiometer meanwhile their weights were measured by using digital scale. All measurements were conducted twice and mean score was used for the analysis. The measurements used were based on the guidelines from World Health Organisation (WHO). TSF was measured by using Gibson's Protocol. Meanwhile, Z score for BMI was measured based on the growth chart by Centre for Disease Control and Prevention. Data of the study were analysed by using Statistical Package for Social Science (SPSS).

The results of the study showed that the duration spent in watching television for intervention group decreased (mean = 3.1 hours per week), while the duration spent by controlled group increased (mean = 1.6 hours per week). There was significant relationship between parents and children in the frequency of snack intake while watching television ($p < 0.001$) on baseline data. The study also found out that there was no significant difference in BMI changes between controlled and intervention group. Dennison et al (2004) summarised that intervention in preschool level should be conducted as such programme will be able to reduce the frequency of the children to spend their time watching television or video.

3.4 'Weight Control Intervention' Programme: Diet, Exercise and Physical Activities

Fitzgibbon et al (2005) has conducted a study to examine the effects of intervention (healthy diet and physical activities) on the changes of body mass index (BMI) among preschool children. 12 preschools represented Chicago, Illinois for the intervention programme (N=420, n = 35 per school). Six of the preschools were categorised in weight control intervention (WCI) and another six were classified in general health intervention

(GHI). The study was conducted on children aged between 3 to 5 years old and follow up were conducted after 1 and 2 years. After a year of intervention, the total number of children involved was 289 and after 2 years, 300 children were involved in this study. The samples were consisted of overweight children together with children with normal weight.

The study was conducted based on randomised controlled trial design and the schools involved were paired based on the class size. A sample from each pair was chosen randomly for intervention from intervention group (WCI) and a sample was randomly chosen to be controlled (GHI) in order to get the main outcome for BMI changes. Other than that, Fitzgibbon et al (2005) also wanted to observe the percentage calorie intake from fat and saturated fat (grams/1000kcal) by the children (remembered by parents), physical activities (frequency and intensity per week), and watching television behaviours (hours per day). In the study, obesity was defined as percentile BMI $\geq 85^{th}$ for age and gender, but only the changed value of BMI and Z score were used as outcome of the study. Intervention involved was designed based on the information gathered from preschool educator, children specialists, nutritionists, exercise physiologist, community health experts, medical experts, and focus group. Children from WCI schools were intervened within 14 weeks (40 minutes; 3 times a week) by using healthy dietary component and exercise. In each week, the intervention covered dietary topic of ‘go and grow’, fruits and reduction of time spent to watch television. The 3 times a week lesson plans were merged with two main components: 1) 20 minutes of lesson which expose healthy diet, exercise and activity concepts, and 2) 20 minutes of continuous physical activities by including activities related to colours, puppets and activities based on the 7 tiers of food pyramid. Puppet concept was used to bring the sense of adventure to the children and in the same time to vary the activities. For physical activities component, activities like warm up with teacher’s guides was conducted for 5 minutes, aerobic for 10 minutes and cool down activities were conducted for 5 minutes. Teachers involved used various games and approaches such as ‘zoo visit’ where the children pretended to be different animals in the aerobic session. Parents who were involved in the intervention received weekly letters on the information on children’s exercises and diets as well as their assignments. The parents were to spend 5 – 15 minutes per day to complete the assignment and the details of the assignments were also included in the weekly letters. As for example, the parents were asked to observe fruit and vegetable intake among their children. The parents received $ 5.00 grocery shopping coupons for completed and returned assignments. Meanwhile, children in group GHI (controlled group) also practiced the activities within 14 weeks (20 minutes, once a week). These children learned various general health concepts like dental health, immunisation, safety belt awareness, and 911 procedures. Parents for the children involved also received monthly letters on GHI programmes without any information on diet and physical activities.

The measurement used in the study was Hip Hop to Health Jr. (Stolley et al, 2003), 2000 Centres for Disease Control (CDC) Growth Chart which used NutStat module of Epi Info 2000 (Kuczmarski et al, 2002) to measure BMI, Dietary Recall (Nutrition Data System for Research, 2002) to measure children’s food intake within 24 hours, and parents’ observation on frequency and intensity of the children’s routine activities and hours spent in watching television daily. Data were analysed by using SAS Proc Mixed and Statistical Package for Social Science: Two-sample T Test were conducted to test continuous variables and Chi-Square was used to test categorical variables.

The results of the analysis showed that in the Z score for adjusted model BMI in the first year of follow up (mean ± SE) was 0.08 (0.05) for intervention group while 0.16 (0.05) for controlled group with $p = 0.006$. In the second year of follow up, the Z score for changes (mean ± SE) in adjusted model BMI was 0.00 (0.04) for intervention group and 0.17 (0.04) for controlled group with $p = 0.015$. The percentage of saturated fat for the first year in intervention group decreased compared to controlled group; 11.6% vs. 12.8% ($p = 0.002$). In overall, there was no significant in the changes of BMI (0.05 kg/m^2 vs. 0.14 kg/m^2, $p = 0.234$) or BMI Z score (0.06 vs. 0.08, $p = 0.665$) after intervention (14 weeks). The results also showed that there were no significant changes in physical activities or watching television in 14 weeks, first year of follow up, or second year follow up after the intervention. In conclusion, Hip Hop to Health Jr. is one of the effective methods that can be used in preventing the augmentation of BMI among preschool children and is a good approach to prevent obesity among preschool minority children.

3.5 ‘Planet Health’ Programme: Diet and Physical Activities

Intervention study by Gortmaker, Peterson, Wiecha, Sobol, Dixit, Fox & Laird (2009) was conducted to examine the effects of intervention on school based health behaviours. It was conducted on 1295 children at the age between 6 to 10 years old. The intervention programme which was known as Planet Health was conducted by including male and female children with obesity. The study was conducted at 10 schools located in 4 communities in Boston, Massachusetts. The study was designed based on randomised controlled trials by including the school system whereby it was conducted in classrooms, during Physical Education period and within school curriculum. Random number table was used to divide the samples into intervention group (n = 5) and controlled group (n = 5). The intervention was conducted within 2 years and the data were collected at the beginning of intervention and followed up after 2 years.

The data were measured by using three instruments: 1) Body Mass Index (BMI) and Triceps Skinfolds (TSF) (World Health Organisation, 1995) were used to measure obesity among the samples and were known as the National Health Examination Survey of Children (NHES), ii) Nutrition and Your Health (US Department of Agriculture, 1995) was used to measure continuous diet intake based on dietary guidelines. This instrument was known as Food Survey and iii) American Academy of Paediatrics: Children, Adolescents and Television (1986) was used to measure behavioural changes on four aspects: watching television, physical activities, high fat diet intake, as well as fruit and vegetable intake. This instrument was known as Activity Survey. The study focused on behavioural-choice and social-cognitive theories aimed to alter individual behaviours. The concept in behavioural-choice theory was applied whereby the reduction of free time to diet may reduce obesity problems among children. Meanwhile the concept in social-choice theory was applied where social and environment factors influence psychosocial and behaviours of individuals at risk of obesity. Planet Health Programme was conducted on intervention group and the teachers were trained to use the programme in classrooms. Every theme was focused on one learning subject (art, language, mathematics, science and social) which were consisted of 16 out of 32 subjects added with 2 weeks of campaign to reduce the time spent to watch television. Behavioural objectives were also instilled in the lesson (targeted to change 4 aspects of behaviours) and the learning objectives were included in the activities for samples. The learning activities were conducted once or twice in a week with 45 minutes for each session. The data collected were analysed by using equation and regression analysis.

The results of the study showed that prevalence of obesity decreased among female children in intervention schools as compared to children in controlled schools (odd ratio, 0.47; 95% confidence interval, 0.24 – 0.93; p = .03), however there was no difference shown among male children between intervention and controlled group. The results also showed that the intervention programme had reduced the amount of time spent to watch television among male children, increased fruit and vegetable intake among female children, and slightly increased the energy intake among female children. The reduction of the time spent in watching television was a predicted factor for obesity changes and intermediate on the effects of intervention (odds ratio, 0.85; 95% confidence interval, 0.75 – 0.97; p = .02). In all, Planet Health Programme may be used to reduce the risk of obesity among female children. Therefore, the researchers of the study recommended that school based promotional approach via Planet Health Programme should be continued as this programme may help in reducing the risk of obesity among preschool children.

3.6 Parents Involvement on Obese Preschool Children

Golan & Crow (2004) studied on long term differences on excessive body weight based on family-based health-centred approach. Fifty out of sixty children aged between 7 – 12 years old took part in the original study which was followed up 7 years later. Data collected were analysed by using repeated measure ANOVA to examine the differences in the percentage of excessive body weight on different points. The results of the analysis showed that the mean for percentage of decreased excessive body weight in parents groups were greater than the children's group ($p < 0.05$). Seven years after the programme ended, the mean of decreased excessive body weight among the parents was 29.0% and 20.2% were reported for the children's group ($p < 0.05$). As a conclusion, obese children's treatment with the involvement of parents as exclusive transformation agent in long term is better that conventional approach.

Application of Components from Previous Researches in Health Education Programme to be Constructed

The researches above are intervention studies which used various programmes as methods or techniques in preventing obesity on preschool children. Table 1.0 is an overall display for the pass researches and indirectly summarised the application of components from previous studies in the health educational programme to be developed in this study.

Table 1.0: Summary for Application of Components from Previous Researches in the Health Educational Programme to be Developed

No.	Previous Studies	Intervention programmes as methods / techniques to prevent / cure obesity		
		Diet	Physical Activities	Exercise
1.	Mo-suwan et al (1999): Aerobic Exercise Programme			√
2.	Harvey-Berino & Rourke (2003): Parenting Support Programme	√		√
3.	Dennison et al (2004): 'Brocodile, the Crocodile' Programme	√	√	
4.	Fitzgibbon et al (2005): Weight Control Intervention Programme	√	√	√
5.	Gortmaker et al (2009): Planet Health Programme	√	√	
6.	Health educational programme to be developed	√	√	√

Referring to table 1.0, the studies conducted by Mo-suwan et al (1999), Harvey-Berino & Rourke (2003), Dennison et al (2004), and Gortmaker et al (2009) were intervention studies conducted outside Malaysia and were related to the prevention of obesity. These studies were conducted on preschool children and were mainly focusing on diet except for the study conducted by Mo-suwan which focussed on exercise component only. Exercise component was also used in the studies conducted by Harvey-Berino & Rourke (2003) and Fitzgibbon et al (2005). The study conducted by Harvey-Berino & Rourke is the only study which used Parenting Support approach combined with diet component in the programme developed. Meanwhile, the studies conducted by Dennison et al (2004), Fitzgibbon et al (2005) and Gortmaker et al (2009) used physical activities as one of the components in their programmes. Most of these researches above used BMI percentile $\geq$ 95 for weight and height with high fat level in body as the definition for obesity. Various instruments were used by all the researches above in examining the effects of intervention programmes on obese preschool children such as National Centre for Health Statistics (2003), children's dietary diary, growth chart from Centre for Disease Control and Prevention, Hip Hop to Health Jr., dietary recall, National Health Examination Survey of Children (NHES), activity survey, Nutrition & Your Health, and American Academy of Paediatrics: Children, Adolescents and Television survey. These instruments were chosen based on the suitability to the components measured in the programmes developed. The results on the researches above showed that the programmes developed were able to help in preventing obesity among preschool children. These studies also recommended that health promotional programmes in preventing obesity should be implemented starting at preschool level.

Therefore, the results of document analysis on these studies have given ideas to the current researchers to develop health educational programme which contains components related to diet, physical activities and exercise. However, the current researchers will rename these components with different names which are dietary (diet), psychosocial development (physical activities) and physical activities (exercise). In addition to that, the researchers will add another component known as physical development. This element will be included as the researchers will measure height, weight, and BMI and intended to observe the outcome from those measurements. In previous studies, those aspects were measured but were not named. The current researchers intended to name these aspects as they intended to see the outcome based on the variable that will be constructed. The researchers will also inculcate the factor of parents' involvement not only to encourage discussions on children's exercise and diet reported by them, but more to the involvement in activities planned by the researchers. In addition to that, the researchers will also include the involvement from related experts such as psychologists, nutritionists, paediatricians, and rehab therapist in assisting the researchers to strengthen all the components involved in the health educational programme that will be developed. Suggestions and recommendations from the experts will be gathered through series of structured interviews related to the components for health educational programme such as dietary, physical development, psychosocial development and physical activities. The researchers will conduct a study on children at the age of 3 – 6 years old. This study is going to use Hip Hop to Health Jr., 2000 Centres for Disease Control (CDC) Growth Chart, 24-hour activity diary and dietary recall. These instruments are chosen as they are assumed to be suitable with the components that are going to be measured in the programme that will be developed (Table 1.0).

Conclusion

In conclusion, components related to dietary, physical development, psychosocial development and physical activities are needed in the development of a health educational programme. Thus, the development of this health educational programme is hoped to be able to assist medical team, community and parents of preschool children in preventing obesity. It is recommended that a structured health education programme to be prepared and instilled in preschool curriculum to further aim in preventing obesity.

Acknowledgements

The authors acknowledged the provision of a Grant UKM-GUP-2011-301 for this study by Geran Universiti Penyelidikan, UKM.

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PRE-SERVICE BIOLOGY TEACHERS' ATTITUDES TOWARDS ICT USING IN BIOLOGY TEACHING

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Abstract

The aim of this study is to determine the pre-service biology teachers' attitudes towards ICT using in biology teaching in terms of various variables. The research group consist of 70 students who studying at Department of Biology Education of Ziya Gökalp Education Faculty in Dicle University. "Information and Communication Technology Attitudes Questionnaire-IAQ" (Kubiatko and Haláková, 2009) which includes 28 items was used as data collection tool. Cronbach's Alpha internal consistency coefficient of the scale was calculated to be 0.82. It was used SPSS 15.0 package program in the analysis of the data. The analysis of the data were made by t test and ANOVA techniques. Significance level was taken to be .05. The results indicate that; pre-service biology teachers have positive attitudes toward ICT using in biology teaching and although their attitudes do not differ regarding gender and class.

Keywords: Pre-service biology teachers, ICT, biology teaching.

Introduction

Current explosion of information has led to fundamental changes in education. These radical changes are seen especially in education systems. Memorization-based education systems designed within the framework of the information-loaded individual model are now replaced with systems that require research and interrogation. Today, what is important is not the information itself but how to access it. Thus, the fact that we live in a world of information and communication technologies has increased the importance of this situation. In this respect, the need for information and communication technologies that allow accessing, questioning and evaluating the information is of great significance (Özmusul, 2008).

The term "Information and Communication Technologies" refers to transferring, storing, revealing and sharing technology or accessing information. Information and communication technologies include radio, television, video, DVD, phone (fixed and mobile), satellite systems, computer and network equipment and software as well as the equipment and services provided by these technologies (such as video-conference and electronic mail) (UNESCO, 2006). Use of information and communication technologies (ICT) for instructional purposes has become a need for training individuals that constitute the information society. This need has made it compulsory to carry out teacher-training applications with a contemporary viewpoint, which is one of the most important dimensions of the social education process. Pre-service teachers are supposed to acquire the skills and knowledge necessary for ICT use in the pre-service learning processes and to use them for such different purposes as professional development both in their pre-service education period and in their professional life. In this respect, Pre-service teachers should be provided with opportunities to use technology in different contexts throughout their education (Çuhadar and Yücel, 2010). If our teachers, who are individuals directing the future, do not use education and communication technologies or are not sufficiently knowledgeable about this subject, our education system and people in our country can not carry out the necessary social developments and will get out of data and form an underdeveloped society taking the information from other counties. One of the basic goals of education is to train individuals who can not only benefit from but also science and technologies. If we do not achieve this goal, we can not train the individuals of an information society (İşman, 2008).

As biology includes complex relationships of unfamiliar and abstract concepts, it is quite difficult to learn and teach. In biology teaching, the fact that educational situations and biology concepts are abstract and complex causes students to experience difficulty in understanding certain subjects and to learn them via memorization

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without understanding (Kılıç and Sağlam, 2004). In order to solve this problem, the use of information and communication technologies is increasingly important. It is especially important in biology if computers can present the information visually. Well-prepared pictures, three-dimensional models, animations, interactive environments and so on help comprehend the target information more easily (Çömlekçioğlu and Bayraktaroğlu, 2001).

When ICT-aided applications reported in related literature are examined, it is seen that certain conceptual and technology-based factors (motivation, attitude, lack of technological sub-structure and so on) influence the application process and thus the quality of learning and academic achievement. One of these factors is attitude.

In general sense, attitude is a biased response of an individual to a specific object. Alport defines attitude as continuous readiness in mental and neural respects. According to Ralflinton, attitude is an implicit response. It could be negative-positive or neutral and can not be directly observed. In order to be able to decide on what attitudes an individual develops towards a specific object or event, the individual's response to that object should be observed in various environments. Attitude is resistant to change (Morgan, 1999). Computer or ICT attitude has been defined as a person's general evaluation or feeling of favor or antipathy toward computer Technologies and specific computer related activities (Kubiatko ve Haláková, 2009). The aim of this study is to determine the pre-service biology teachers' attitudes towards ICT using in biology teaching in terms of various variables.

2. Method

In the study, the survey model was used.

2.1. Research Group

The research group consist of 70 students who studying at Department of Biology Education of Ziya Gokalp Education Faculty in Dicle University in the academic year of 2011-2012.

2.2. Data Collection

"Information and Communication Technology Attitudes Questionnaire-IAQ" (Kubiatko ve Haláková, 2009) which includes 28 items was used as data collection tool. Every item in the questionnaire is 5-scale by Likert. Likert scale question comprised five points ranking following: ''strongly agree" (5 points), ''agree" (4 points), ''neutral" (3 points), ''disagree" (2 points), ''strongly disagree" (1 point). Several questions were constructed negatively. The evaluation of them was in reverse order. The scale consist of five dimensions namely: (D1) the positive influence of ICT; (D2) the negative influence of ICT; (D3) advantages of ICT; (D4) ICT used in biology lesson; (D5) disadvantages of ICT. Cronbach's Alpha internal consistency coefficient of the scale was calculated to be 0.82. It was used SPSS 15.0 package program in the analysis of the data. The analysis of the data were made by t test and ANOVA techniques. Significance level was taken to be .05.

3. Findings

3.1. Findings Regarding Attitudes towards ICT Using in Biology Teaching

The mean scores of the study group, the standard deviation and the minimum and maximum scores in the scale were calculated. The findings regarding the distribution of the scores of the participating students are presented in Table 1.

Table 1. The distribution of the scores of the study group

	n	$\overline{X}$	SD	Min.	Max.
D1	70	4,15	,573	2,86	5,00
D2		3,22	,835	1,50	4,50
D3		4,26	,676	2,75	5,00
D4		4,26	,648	2,75	5,00
D5		3,23	,723	1,40	4,40
Overall		**3,76**	**,507**	**2,77**	**4,69**

A total of 70 pre-service biology teachers participated in the study. The distribution of the scores of the participating students in the scale revealed that the lowest score obtained was 2.77, while the highest was 4.69. The mean score of the participants regarding the scale of Attitudes Towards ICT Using in Biology Teaching was found to be 3.76, and the standard deviation was calculated as 0.507. Depending on the mean score, it could be stated that the participating students has positive attitudes towards ICT using in Biology Teaching.

3.2. Findings Regarding Attitudes towards ICT Using in Biology Teaching by Gender

In order to determine whether the participants' scores regarding their attitudes towards ICT using in biology teaching differed by their gender, independent samples t-test was applied. The t-test results are presented in Table 2.

Table 2. The t-test results of Attitudes towards ICT Using in Biology Teaching by Gender

Group	n	$\overline{X}$	SD	dF	t	p
Male	46	3,71	,387	68	1,158	.251
Female	24	3,86	, 547			

As can be seen in Table 2, the mean score of the 46 male students participating in the study regarding their Attitudes Towards ICT Using in Biology Teaching was 3.71, while that of the 24 female students regarding their Attitudes Towards ICT Using in Biology Teaching was found to be 3.86. As a result of the independent samples t-test conducted to see whether this difference was significant or not, the t value was not found statistically significant ($p > .05$). This result demonstrated that scores of both male and female students regarding their Attitudes Towards ICT Using in Biology Teaching did not differ from each other.

3.3. Findings Regarding Attitudes towards ICT Using in Biology Teaching by Class Grades

In addition, the study also examined whether the participants' scores regarding their Attitudes Towards ICT Using in Biology Teaching differed depending on their class grades. The overall distribution of the scores with respect to the participants' class grades is presented in Table 3.

Table 3. The overall distribution of the scores by the participants' class grades

Class Grades	n	$\overline{X}$	SD
1	9	3,92	,480
2	14	3,83	,528
3	18	3,69	,331
4	14	3,73	,528
5	15	3,65	,507

According to Table 3, the students with the highest mean score regarding the Attitudes Towards ICT Using in Biology Teaching were the first-grade students with a mean score of 3.92, while those with the lowest mean score regarding the Attitudes Towards ICT Using in Biology Teaching were the fifth-grade students with a mean score of 3.65. In order to test whether the mean scores were statistically significant or not between the class grades, one-way analysis of variance (One-way ANOVA) was conducted. The results of this analysis are presented in Table 4.

Table 4. The ANOVA results of Attitudes towards ICT Using in Biology Teaching by Class Grades

	Sum of Squares	dF	Mean Square	F	p
Between Groups	,452	4	,113	,436	,782
Within Groups	16,849	65	,259		
Total	17,301	69			

As can be seen in Table 4, the F value (F=,436; p>.05) calculated via the analysis of the significance of the differences between the participants' scores regarding their Attitudes Towards ICT Using in Biology Teaching with respect to their class grades was not found statistically significant. This result revealed that the participants' scores regarding their Attitudes Towards ICT Using in Biology Teaching did not differ depending on their class grades.

4. Conclusion and Discussion

The results indicate that; pre-service biology teachers have positive attitudes towards ICT using in biology teaching and although their attitudes do not differ regarding gender and class.

Especially in biology courses, it is quite important to use visual elements (such as pictures, animations, videos and so on) for concretizing abstract concepts. The biggest source for obtaining these elements is considered to be information and communication technologies. For effective use of ICT, it could be stated that a biology teacher's positive attitudes will positively influence the teaching process of the biology course.

In one study conducted on teacher-training institutions' use of education and information technologies, Akpınar (2003) reported several problems. Some of these problems were as follows: pre-service teachers do not have sufficient knowledge about computer literacy; they lack efficient applications regarding the use of technological materials; faculties' negative attitudes influence pre-service teachers' attitudes towards technology; pre-service teachers are not informed sufficiently about the preparation and use of Internet-based materials that will contribute to their learning and to their professional development; pre-service teachers are not sufficiently aware of the necessity for interactive courses regarding technology use; and pre-service teachers as well as teachers do not use appropriate instructional tools (cited in Ertürk, 2007). As one of the most important steps in the integration of information and communication technologies into teacher training, pre-service teachers could be provided with specific contexts and technological sub-structures which will allow them learn technology by doing and experiencing. Research that will reveal the knowledge, skills and attitudes of pre-service teachers regarding the use of these technologies for instructional purposes will also provide the basis of the execution and planning of such instructional contexts (Çuhadar and Yücel, 2010).

In line with these findings, the following suggestions could be put forward:

- Increasing the number of applications to be carried out during pre-service teachers' undergraduate education to develop their ICT use skills and their attitudes towards ICT could increase their attitudes as well. In this respect, web-aided applications could be increased.
- Prior to web-aided applications to be carried out at universities, determining students' ICT attitude levels could increase the effectiveness of such applications.

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PROBLEM-SOLVING IN A MULTIMEDIA LEARNING ENVIRONMENT: THE MILE@HOME PROJECT

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Abstract

Problem-solving has been shown to be an effective teaching strategy to enhance the student learning process and inculcate students with skills to adapt to real-life situations. This paper presents the MILE@HOME project, which involved a problem-solving approach based on Cunningham, Duffy and Knuth's (1993) 7 pedagogical goals to engage students in their learning. Students worked in groups to solve a multimedia design problem. Results show that student exhibited high motivation, teamwork and enhance understanding for the project. Overall, the study showed positive encouragement of the use of such an approach in technology-backed classrooms.

Keywords: Interactive multimedia, MILE, Problem-solving, project learning, Malaysia, Constructivism

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Introduction: Problem-solving as an educational approach to engage students

The problem-solving method was developed in response to the weaknesses in the traditional directed instruction which is generally teacher-centred (Barrows, 1986; Boud & Feletti, 1999). Recent research has pointed out the gap between the skills that graduates have when they finish school, and the skills required for the workplace. Such research has shown that skills required in the workplace include creativity, critical-thinking, problem-solving and communication skills (Tan, 2007; Tan, Teo & Chye, 2009), many of which are lacking in today's graduates. New technology-oriented instructional strategies of teaching and learning have come into being (Mortera-Gutiérrez, 2006; Herrington, Oliver, Reeves & Woo, 2004) that enhance the learning process from the monotony of conventional learning (Dawson, 2008). As such, problem-solving is being adapted into the classrooms in order to engage students in their learning process. Research in Malaysian education has shown that constructivist-based approaches can lead to increased problem-solving skills and enhanced learning (Hong, Lai & Holton, 2003; Tan, 2007), and enabled teachers to better transfer their knowledge to their students in the classrooms (Herrington, Reeves & Oliver, 2010). Constructivist learning underpins the problem-solving approach where the problems presented are ill-structured, and students are encouraged to develop multiple perspectives and solutions to the problems (Savery & Duffy, 1995; Tan, 2007; Tan, Teo & Chye, 2009; Neo, 2010). Cunningham, Duffy & Knuth (1993), suggested seven pedagogical goals that should be present in such an environment, which would allow the problem-solving approach to allow student to experience constructivist skills. These include:

Provide experience in the knowledge construction process
Provide experience in and appreciation for, multiple perspectives
Embed learning in realistic and relevant contexts
Encourage ownership and voice in the learning process
Embed learning in social experience
Encourage the use of multiple modes of representation
Encourage self-awareness in the knowledge construction process

This shift in emphasis in teaching and learning has moved students from being the passive recipients of knowledge and information, as in the traditional directed instruction mode, towards the acquisition of knowledge and skills through a process of solving a complex task in a way which develops higher level cognitive processes such as defining and understanding, analysing, investigating, and solving a problem and presenting the solution (Tan 2007, Herrington, Reeves & Oliver, 2010). This has the effect of inculcating higher level thinking skills into the students. Another important aspect of this learning approach is that it places great emphasis on the social context of the learning environment. In this learning mode, social interactions enable students to learn with and from one another and this can lead to increased development of cognitive and intellectual skills, knowledge and understanding (Vygotsky, 1978).

Problem-solving learning environments are characterised by experiential learning, which result in affective objectives fulfilled. These include improved attention and focus to the content, increased motivation and engagement to the learning process, and an overall enjoyment and satisfaction for the task at hand (Neo, 2010). Problem-solving is also effective when the learning environment emphasises social and collaborative work among the students. These would enable students to learn with and from one another and this can lead to increased development of cognitive and intellectual skills, knowledge and understanding. It is through problem-solving that learning takes place, and that "the medium of learning is a social negotiation of meaning, not content…so knowledge emerges in the discourse of the community" (Jonassen 2007). The learning becomes a socially negotiated activity where students, peers and teachers evolve to being a learning community to construct solutions to the problems collectively.

In addition to this, if the learning environment presented has elements of authentic and relevant tasks to solve, the levels of engagement in the students are more likely to increase (Herrington, et.al (2004). In other words, students learn best when placed in an environment where they can work collaboratively with their peers and interact socially among themselves to discuss and exchange concepts and ideas to solve a realistic problem. Therefore, the problem-solving learning environment in this study emphasised a multimedia design project, embedded in a learning environment that allowed students to collaborate and communicate in groups. Such an environment would be reflecting real-life situations in the workplace, where working in groups to solve problem would be authentic and relevant.

Currently, with the advent of Web 2.0 technologies, students' problem-solving experiences can be further enhanced as they are enabled with collaborative and communication tools to organise, exchange, reflect, socialise and work together easily (Deitering & Huston, 2004; Kajder & Bull, 2004). As such, the MILE@HOME presents students with an online platform for students, with a two-fold objective: To allow students to learn from online interactive multimedia modules, and provide students with the ability to blog about their progress in their project and demonstrated their problem-solving processes.

The MILE@Home Project: Problem-solving with a multimedia design project

The problem-solving project was developed under the MILE@Home (Multimedia-mediated Interactive e-Learning Environment) project, a Telekom Malaysia Research & Development (TM R&D)-funded project with a grant of RM90,000. In the MILE@Home system, online modules where developed using authentic learning principles suggested by Herrington et al. (2004), which would allow students to engage in both their cognitive and affective learning processes. In addition, students were also provided with a dedicated blog space in the MILE system for them to blog about their project progress. This study was carried out with the cooperation of students from Multimedia University who were enrolled in an undergraduate class for 14 study weeks. The class had 36 students (n=53) and comprised of both local Malaysian students as well as international students and had an even distribution of male and female students. At the centre of this problem-solving learning environment is the multimedia design project which incorporates Cunningham, Duffy & Knuth's (1993) 7 pedagogical goals. These goals are adapted to the student's project development process as shown in Figure 1.

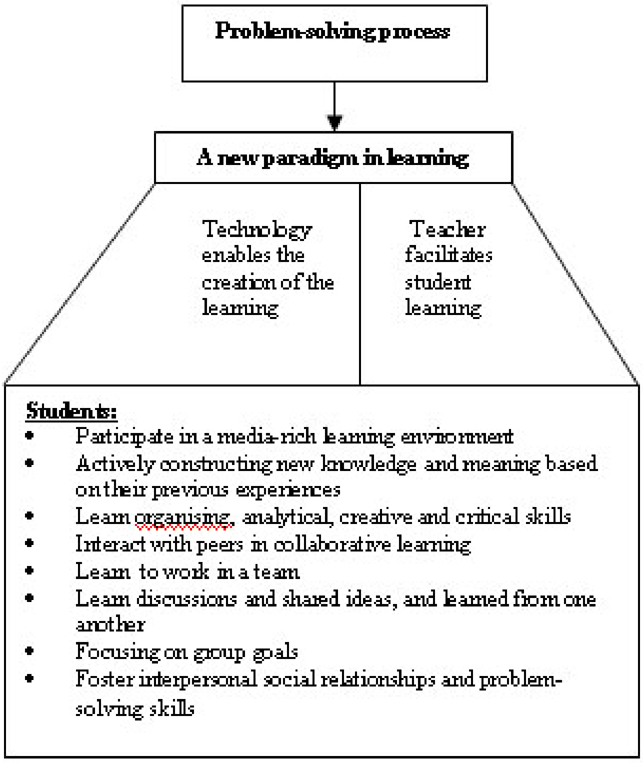

Figure 1 Problem-solving in a technology-backed student learning process

Students were given an authentic, ill-structured design problem in the form of a theme-based design project, "*Malaysian Culture*", to develop for the Malaysian Tourism Board. They were encouraged to decide on their own application's development approach and to form their own creative development teams with unique names. Lectures were provided for them via the MILE@Home learning system to give them content knowledge on the course syllabus. Figure 2 shows the MILE@Home's interactive modules to learn from.

Figure 2 The interactive modules in the MILE@HOME system

They were also required to set up blog accounts in the MILE@HOME learning management system to document their learning process. At the end of 14 weeks, students were to submit and present their final application on the project as well as their blog progress. Figure 3 shows an example of their blogs.

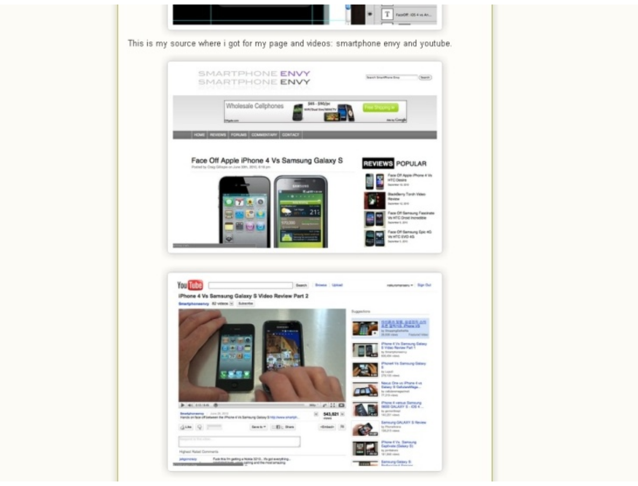

Figure 3 Blogging on their progress in the MILE@Home website

Analysis and Results

Students were given a survey questionnaire to assess their attitudes and perceptions towards the project and the learning environment. The survey was measured using a 5-point Likert Scale which begins with Strongly Disagree (1), Disagree (2), Undecided (3), Agree (4) and Strongly Agree (5). The sample size was 53 students (N=53). The data were analyzed using SPSS (Statistical Package for Social Sciences) version 11.0, and yielded a Cronbach Alpha coefficient of 0.821, which satisfied the requirement of survey reliability (Lim, Khine, Hew, Wong, Shanti & Lim, 2003.) The survey was conducted to gauge students on their perceptions towards the problem-solving experience of the project. Analysis on the survey items showed that the overall average means and percentages of responses towards these areas were favourable (i.e., students responding 'Agree' or 'Strongly Agree' in the scale). Table 1 shows the results of the survey.

Table 1 Survey results on problem-solving skills

No	Items (N=53) Cronbach Alpha = 0.821	Mean (m)	% (p)
1.	Able to apply skills learned	4.1	86.8
2.	Team solve problems in positive manner	4.0	83.0
3.	Able to be critical and reflective in thinking	4.0	81.1
4.	Willing to make improvements to keep project growing.	4.0	77.4
5.	Developed skills needed in real-world	3.9	79.2
6.	Team resolved problems together	3.9	79.2
7.	Increased team bonding via communication and collaboration	3.7	62.3
8.	Improved group management	3.6	62.3
9.	Improved presentation skills	3.6	56.6

From the results, students reported that working teams and blogs allowed them to solve their problems relating to their project. Students were very positive towards working in teams. 81.1% of students experienced critical-thinking skills (m=4.0) and an improvement in their presentation skills (m=3.6, p=56.6), and 77.4% of students reported a willingness to make improvements to keep project growing (m=4.0). Students also reported that the teams were able to resolve problems together (m=3.9, p=79.2) and positively (m=4.0, p=83). The survey also showed that a majority of them were able to manage their group effectively (m=3.6, p=62.3), and 62.3% reported that the smooth interactions in the group helped tighten the bond among their members (m=3.7). Students also reported that they were able to develop skills that were needed in real-world (m=3.9, p=79.2), as well as being able to apply their newly acquired skills in a more valuable manner on upcoming projects (m=4.1, p=86.8). These results were very encouraging as it showed that students were able to work together to solve their multimedia project design problem, and come away with contructisivist-based learning skills such as critical-thinking, teamwork, group management skills, presentation and communication skills, all of which would be relevant for them to use in their future work.

Students also reported that blogging their work allowed them to have "*diaries for our work.*", and created a learning environment whereby "*...everyone can see and comment is a good feeling…because it helps us to know our position*". Clearly, the development of the multimedia project, coupled with the ability to document their progress through blogs resulted in the students feeling motivated and reporting that they improved their learning, as stated in their comments below:

"*We are not into spoon-feeding, that is pretty bad because you don't get to learn. If you solve your own problem it will benefit you, you feel more satisfied, feel more like a university student.*"

"*Of course in a team, each member will do a part, everyone contribute something, and it will save us a lot of time. We can also discuss and meet up for the project. We can also learn from each other.*"

"*Blogs were useful since it helped the group discuss the process [and] helped my team and I work together better*".

Discussion

From the results obtained, it can be seen that the study showed strong support for using a multimedia project in a constructivist-based learning environment to foster problem-solving skills among students. In particular, students demonstrated a deeper understanding of their project's topic and in multimedia development, increased problem-solving and creative skills, and higher motivation towards the project. It can be observed that the 7 pedagogical goals posited by Cunningham et. al (1993) were effectively mapped to the students' project developmental activities to create a successful multimedia-enhanced problem-solving learning environment.

Learning was active and students were very much engaged in their learning process, as they reported that they were able to see the relevance of the project to the skills that they would need for their future work, and supports Herrington et al."s (2004) suggestions for effective e-learning environments. The development of the problem-solving environment via project-based learning also supported the incorporation of authentic learning strategies as it provided students with real-world complex situations which they would have to solve collaboratively and cooperatively. By working together to complete the project, students developed realistic teamwork and management skills integral to their careers.

Team effort was also an important element in the group's success as they had to work together to achieve their goals. They were encouraged to harness their own abilities to use media effectively when representing various pieces of information to convey a message to the audience and to work collaboratively and cooperatively together. In doing so, they would be constructing their own knowledge of their projects and taking an active part in their own learning process.

Web 2.0 technologies and social networking tools provided students the opportunity to communicate with each other and solicit constructive feedback. By uploading their progress onto the web and commenting their peers' work, students developed more reflection on their own work and thus paid more attention to the quality of their project, again supporting the reflection strategy by Herrington, Reeves & Oliver (2010).

Conclusion

In conclusion, the study was successful in demonstrating the importance of incorporating problem-solving approaches in order to enable students to acquire critical-thinking, creativity, teamwork and presentation skills, and create a learning environment where they are engaged in the content and process. Here the results provide very positive and encouraging results for using multimedia design projects in the classroom, and would be an effective learning framework for educators in Malaysia who are interested in enhancing their students' learning processes in a technology-backed environment.

Acknowledgements

This project was funding by TM Research & Development Fund, Malaysia. The authors would like to thank the undergraduate students of Multimedia University for their invaluable participation in this research study

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QUESTION TYPES USED IN THE INTERNET-BASED LANGUAGE TEACHING

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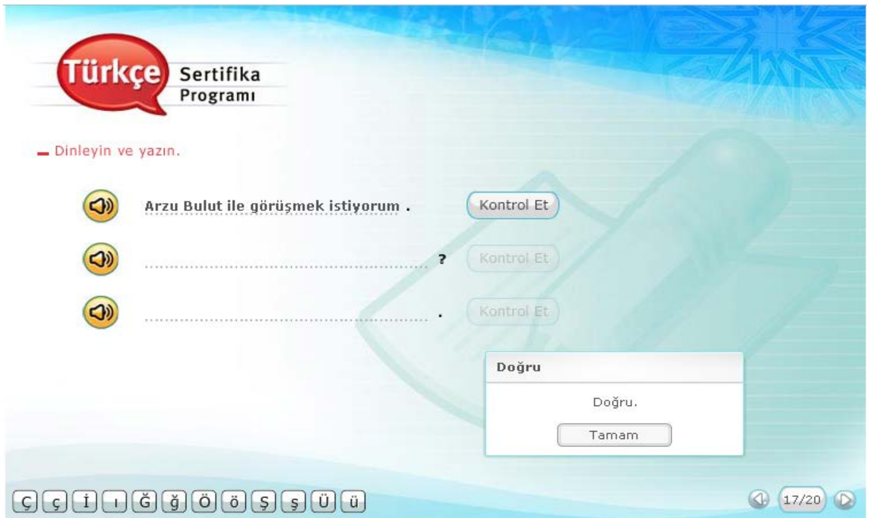
1. Introduction

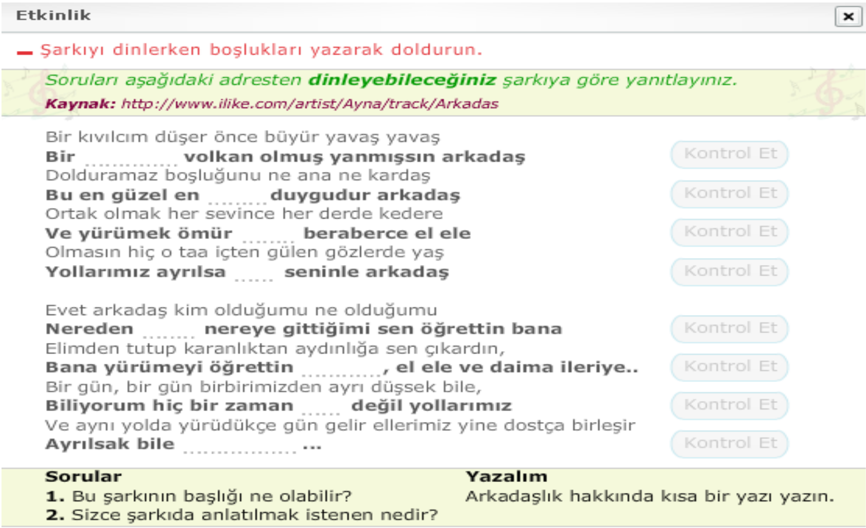
The Internet provides the facilities for listening, speaking, reading and writing which are four basic abilities for language learners to acquire. Internet-based language teaching that is suitable for using different materials in virtual classrooms, offers significant chances to improve communicative competence. Though having some disadvantages like access facilities, disconnection; Internet-based language teaching has many advantages like; efficiency, prompt feedback, being distinct from space and time, utility when the need arise, graphic, voice, visual assistant.

2. Question Types

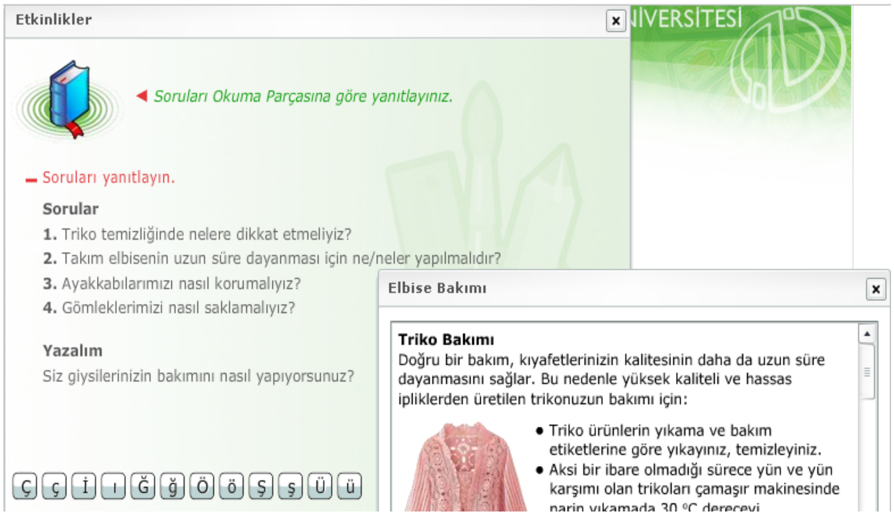
Exercises are important in language learning for improving language abilities. Online language exercises cover different types of questions like listenning comprehension, reading comprehension, writing, multiple-choice, true / false, yes – no, gap-filling, ordering, moving, match-up questions,crossword puzzle etc. In this paper, question types used in the Internet-based language teaching will be examines with their examples.

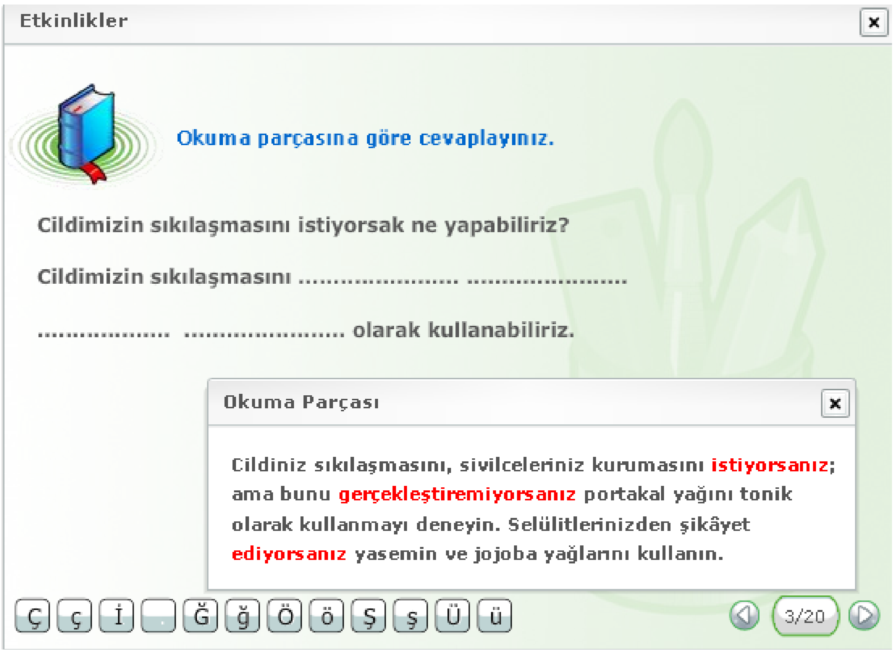
2.1. Listenning Comprehension





2.2. Reading Comprehension




Etkinlikler
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Cildimizin sıkılaşmasını istiyorsak ne yapabiliriz?
Cildimizin sıkılaşmasını ....
.... olarak kullanabiliriz.
Okuma Parçası
Cildiniz sıkılaşmasını, sivilceleriniz kurumasını istiyorsanız; ama bunu gerçekleştiremiyorsanız portakal yağını tonik olarak kullanmayı deneyin. Selülitlerinizden şikâyet ediyorsanız yasemin ve jojoba yağlarını kullanın.
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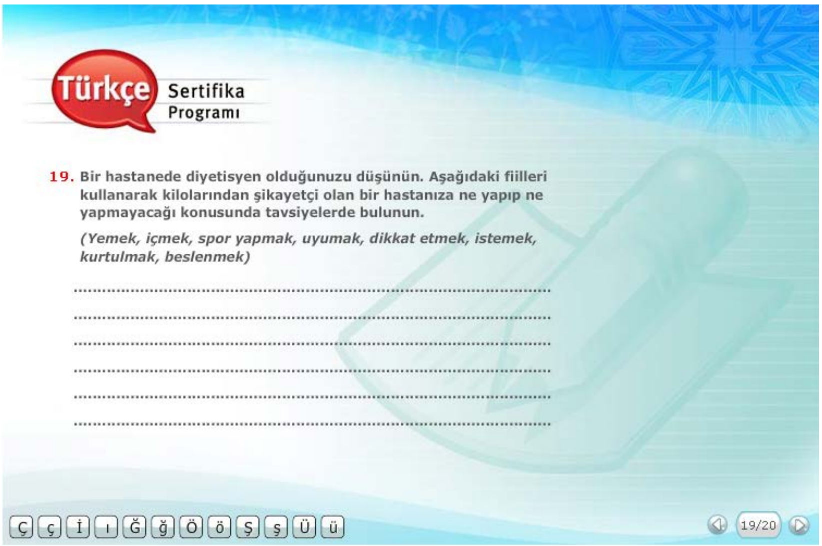
2.3. Writing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19. Bir hastanede diyetisyen olduğunuzu düşünün. Aşağıdaki fiilleri kullanarak kilolarından şikayetçi olan bir hastanıza ne yapıp ne yapmayacağı konusunda tavsiyelerde bulunun.
(Yemek, içmek, spor yapmak, uyumak, dikkat etmek, istemek, kurtulmak, beslenmek)
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Türkçe Sertifika Programı
Tabloda boş bırakılan yerleri yazarak doldurun.
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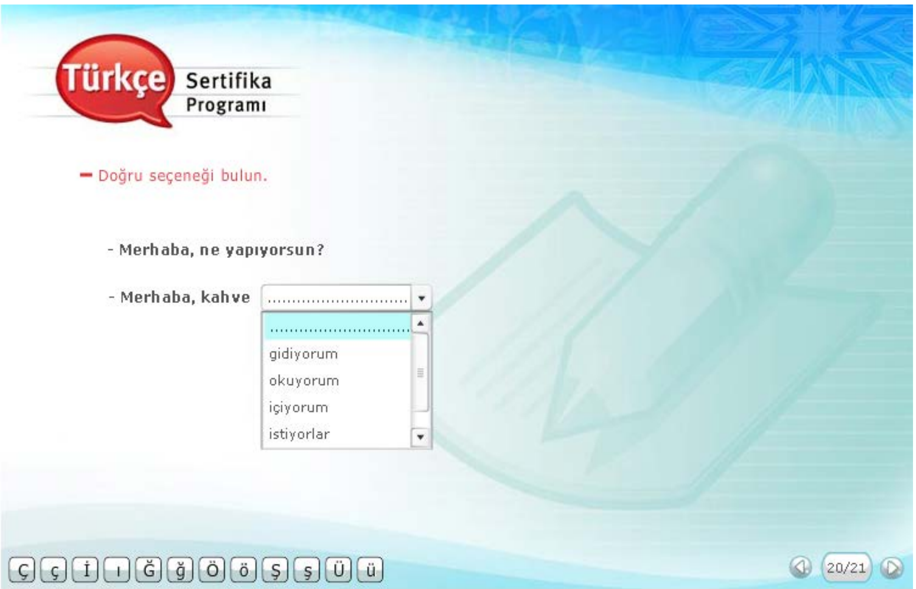
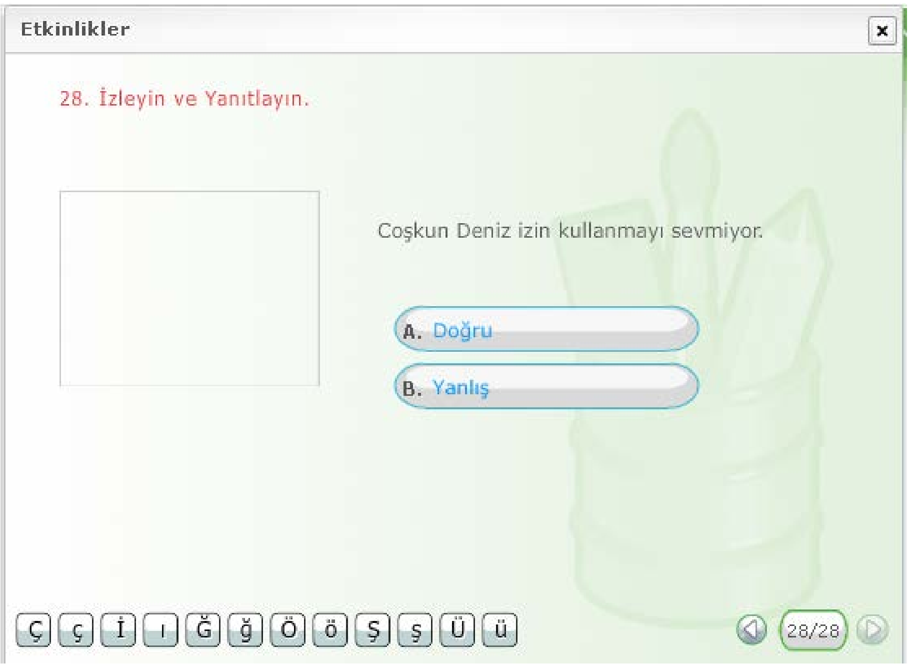
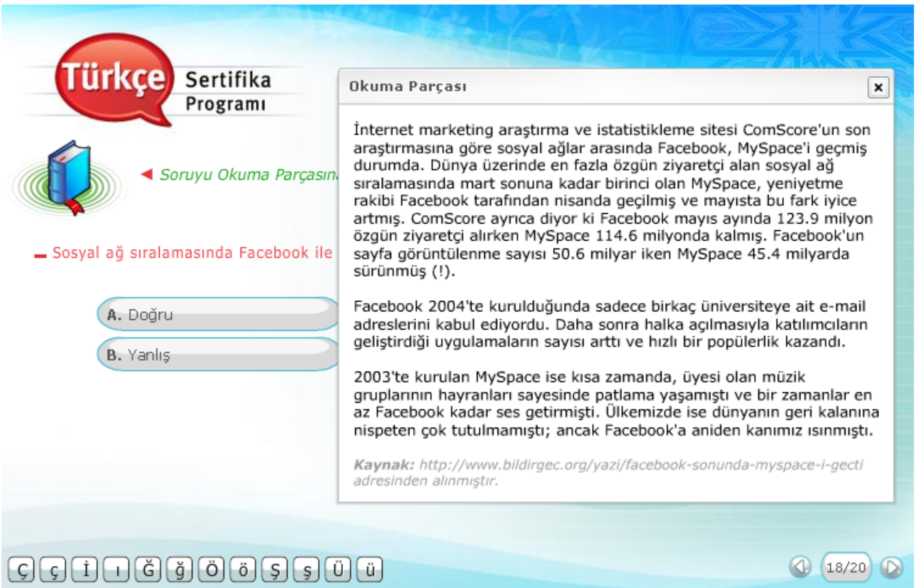
2.4. Multiple-choice Questions



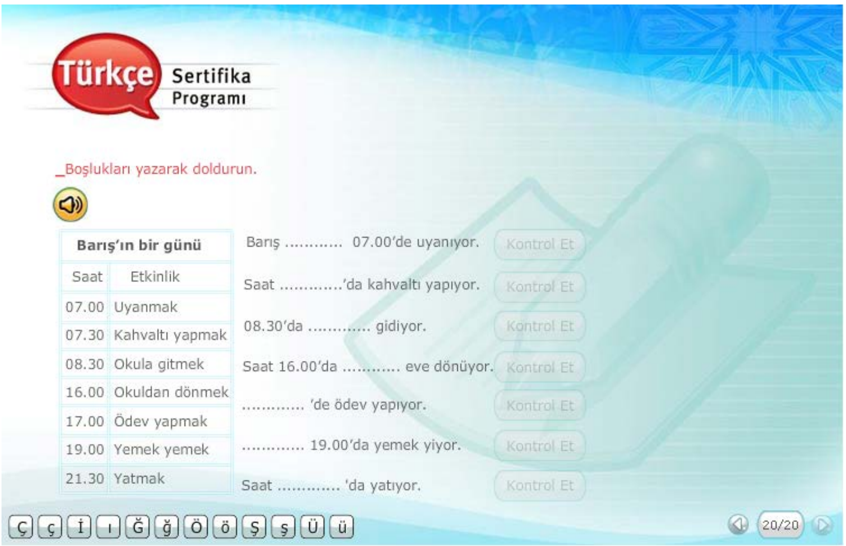
2.5. True / False Questions





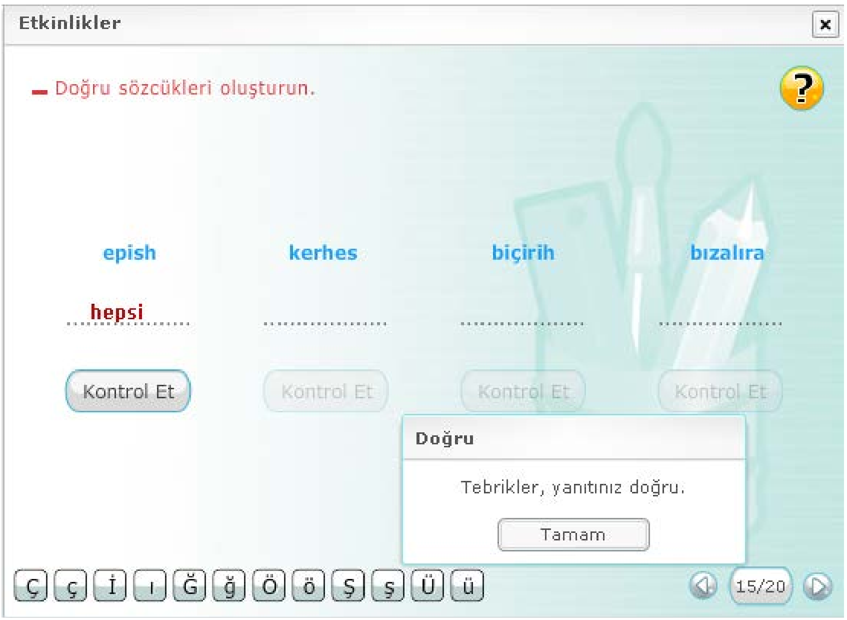
2.6. Yes – No Questions

2.7. Gap-filling



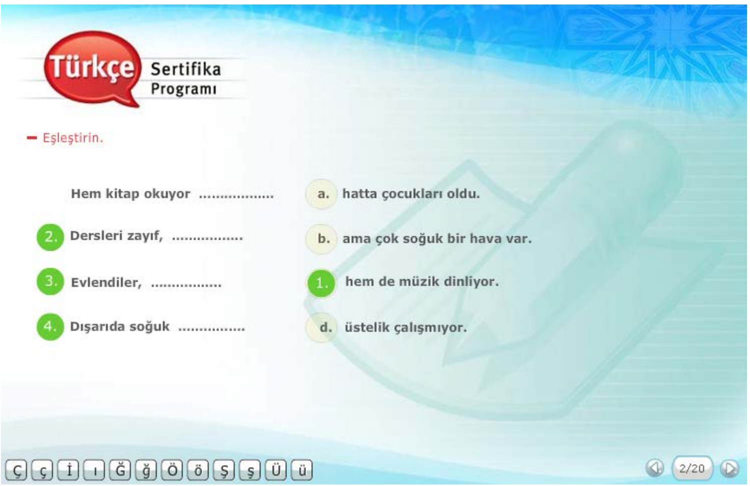
2.8. Putting in order

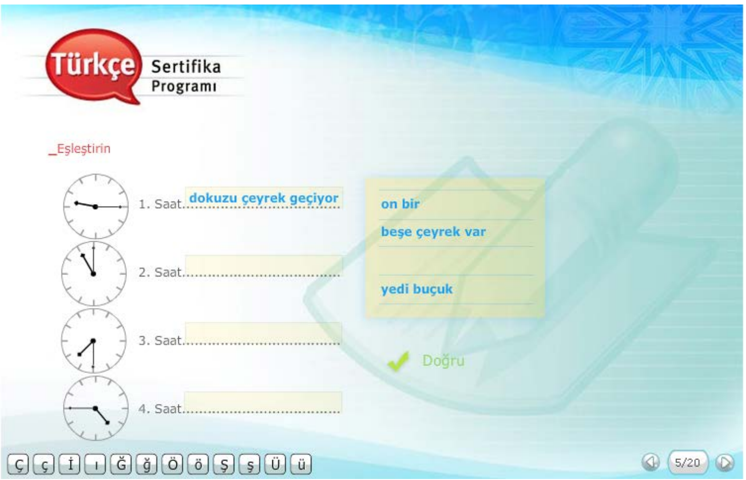

Türkçe Sertifika Programı
Kalıpları doğru sıralayın.
Bora:
Hande:
Bora:
Memnun oldum.
Merhaba, benim adım Bora, sizin adınız ne?
Merhaba, benim adım Hande.
Yanlış
13/14


Etkinlikler
Doğru sözcükleri oluşturun.
epish
kerhes
biçirih
bızalıra
hepsi
Kontrol Et
Kontrol Et
Kontrol Et
Kontrol Et
Doğru
Tebrikler, yanıtınız doğru.
Tamam
15/20

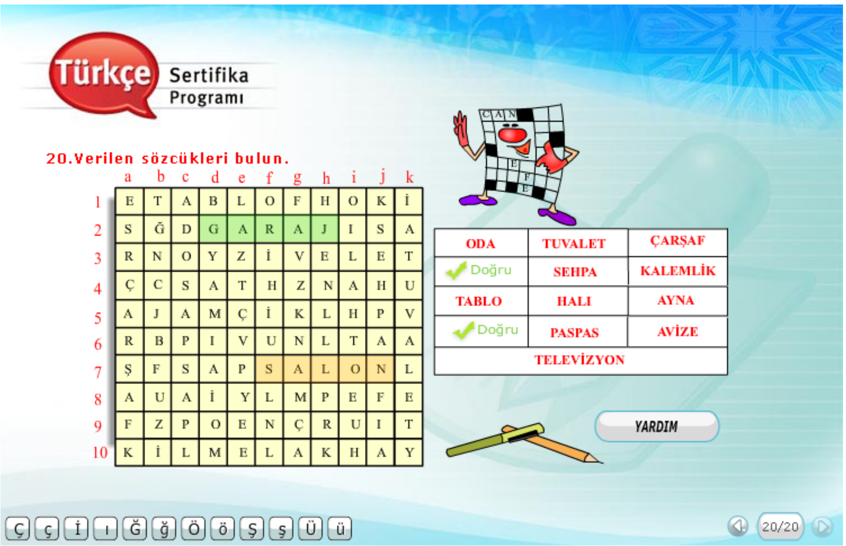
2.9. Moving

2.10. Match-up Questions





2.11. Crossword Puzzle



Etkinlik

Bulmacayı çözelim.

P İ Y A N G O

Ç E K İ L İ Ş

İ S T E K A

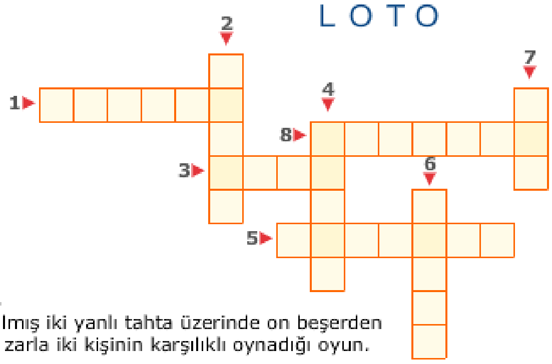
L O T O

E L E M E

G O L

T A V L A

P O K E R



S O R U L A R

1. Bilardo sopası.
2. Bölümlere ayrılmış iki yanlı tahta üzerinde on beşerden otuz pul ve iki zarla iki kişinin karşılıklı oynadığı oyun.
3. Talih oyunu.
4. Bir tür kağıt oyunu.
5. Kura, piyango çekme işi.
6. Seçme yarışı.
7. Futbol, hentbol maçlarında topun kaleye sokulmasıyla kazanılan sayı.
8. Düzenleyenlerce bastırılmış numaralı kağıtları satın alanlar içinden, kazananların kura ile belirlendiği talih oyunu.

REPLACING PAPER-BASED TESTING WITH COMPUTER-BASED TESTING IN ASSESSMENT: ARE WE DOING WRONG?

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Abstract

The standards for developing computerized-assessment required equivalent test scores to be established for the paper-based test (PBT) and computer-based test (CBT) modes. However, in most studies, the two modes were nearly identical, yet significant differences of test scores were observed. Therefore the validity of replacing PBT with CBT in educational assessment was questioned. This study employed an achievement test, a psychological test and a motivation questionnaire in a Solomon four-group design to examine validity of the CBT and its effects on test performance and motivation. The findings of this study provide evidences for the issue of CBT's validity in educational and psychological assessment.

Keywords: Assessment; computer-based testing; testing effect; performance; motivation

Introduction

The interest in developing and using computer-based test (CBT) in educational assessment in schools and educational institutions has heightened in recent years. Delivering assessments via computers is becoming more and more prevalent in educational assessment domain as changes are made in assessment methodologies that reflect practical changes in pedagogical methods (Kate Tzu, 2012; Genc, 2012; Hsiao, Tu & Chung, 2012; OECD, 2010). CBT is seen as a catalyst for change, bringing transformation of learning, pedagogy and curricula in educational institutions (Scheuermann & Pereira, 2008).

To establish a valid and reliable CBT, the International Guidelines on Computer-Based Testing (International Test Commission 2004) stated that equivalent test scores should be established for the conventional paper-based testing (PBT) and its computer-based mode. This set of testing standards is supported by the classical true-score test theory – the basis of computer-based and paper-based testing (Allen & Yen 1979). Under this theory, a test taker who takes the same test in the two modes is expected to obtain nearly identical test scores. The standards are also supported by empirical studies (OECD, 2010; Wilson, Genco, & Yager, 1985). For example, OECD (2010) reported that there were no difference in test performance between CBT and PBT among student participants (n = 5,878) from Denmark, Iceland and Korea.

Interestingly, however, in a review of educational and psychological measurement approaches, Bunderson, Inouye & Olsen (1989) reported that 48% of previous studies showed no difference between the two testing modes in test performance, 13% of studies showed the superiority of CBT and 39% of studies showed that PBT was superior. The concept of equivalence was supported by only nearly half of the studies, and the differences were ascertained in achievement tests such as science, language and mathematics tests, and also obviously in psychological tests such as personality and neuropsychological assessment (e.g. Friedrich & Bjornsson, 2008; Choi, Kim & Boo, 2003; DeAngelis, 2000).

A possible explanation for this phenomenon is either CBT has a low validity as an assessment tool for educational and psychological measurements, or there might have been other effect that confounded the effect of testing mode on test performance in these repeated-measures studies. As observed by Yu & Ohlund (2010), a possible confounding variable is testing effect; the effect of taking a pretest on taking a posttest that systematically confounds the treatment effect of CBT on test performance.

Testing effect in repeated-measures studies

A careful review to the literature discovered that most of testing mode comparability studies has been conducted using pretest-posttest experimental designs without identifying testing effects on test takers. Therefore, the findings might be misinterpreted. For example, in a study, a participant answered the same test four times for two pretests and two posttests, "each subject took the same pretest and posttest on paper and computer" (Al-Amri, 2008; *p*.29). The limitation of this design is testing effect might occur when a participant is tested at least twice on a same test, and the act of taking a pretest might influence the outcome of a posttest (Chua, 2011b; Yu & Ohlund, 2010; Shuttleworth, 2009), and it is a bias for a researcher to confidently conclude that there is a treatment effect although the result is significant. This issue needs further research because the Standards for Educational and Psychological Testing guidelines (APA, 1986) require that any effects due to computer administration be either eliminated or accounted for in the interpretation of test scores in any testing mode comparability study.

Effects of testing motivation on the relationship between testing modes and test performance

Another issue that needs to be clarified in a PBT and CBT comparability study, as raised by Wise and DeMars (2003) is motivational factors which might also have an impact on test performance. Wise and DeMars pointed out that regardless of how much psychometric care is applied to test development, or how equal the testing modes are, to the extent that test takers are not motivated to respond to the test (e.g. due to low efficacy or boredom), test score validity will be compromised. The test taker motivation model (Pintrich, 1989) specifies that the effort test takers will direct towards a test is a function of how well they feel they will do on the test, how they perceive the test to be, and it related to their affective reactions regarding the test. This is the theoretical model that underlies the relationship among motivation, testing mode and test performance. Besides that, the self-determination theory (Wenemark, Persson, Brage, Svensson & Kristenson, 2011) states that increases test-takers' motivation will increase the willingness to take the test or response rates, and thus it will enhance learning. Therefore, testing motivation is an aspect worth investigating in testing mode comparability studies because it can pose a threat to the validity of inferences made regarding assessment test results (Shuttleworth, 2009).

One of the barriers to the implementation of CBT in educational and psychological measurements in education is insufficient study of the equivalence of CBT and PBT (Bugbee, 1996). To overcome the potential for misinterpreting experimental results caused by testing effects, Yu & Ohlund (2010) strongly recommended the use of the Solomon four-group design. This design helps researchers to detect the occurrence of testing effects in an experimental study. Therefore, this study employed a Solomon four-group experimental design to examine the validity and effectiveness of CBT by comparing it with the PBT. It examined whether testing effects occur in CBT and PBT, and investigated the effects of testing motivation on the relationship between testing modes and test performance.

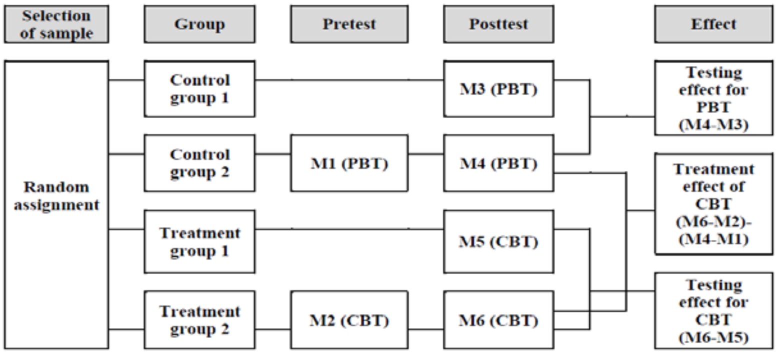
Method

4.1. Research Design

The Solomon four-group experimental design is "one of the best methods to identify testing effects in experimental designs" (Yu & Ohlund, 2010, p. 9). It consists of two basic categories of research designs: (1) two groups of participants who are given treatment and two groups of participants who are not given treatment and (2) two groups of participants who are given the pretest and two groups of participants who are not given the pretest. The advantage of this design compared to the basic two-group pretest and posttest design is that it is capable of identifying the occurrence of testing effect besides the treatment effects on experimental variables. It should be pointed out that besides identifying treatment effect, the intention of the design is to help researchers determine if testing effect occurs, that is, to detect whether the change in experimental variable is caused by the change in the treatment effect or testing effect.

The values of M4–M3 and M6–M5 (see Figure 1) are the testing effects for the control and treatment groups. If there are no differences between the values of M4 and M3 as well as M6 and M5, there are no testing effects. Therefore, the (M6–M2)–(M4–M1) value will give an estimation of the treatment effect. However, any difference between M4 and M3 or M6 and M5 is caused by the pretest effect in M1 and M2. In these cases, the researcher cannot simply conclude that the treatment has an effect on the experimental variables (test performance and testing motivation) if there is a significant treatment effect (testing mode) because there is a possibility that the changes in the experiment variables are caused by testing effects, and not by the treatment effects.

To eliminate the testing effects in examining treatment effect of CBT, if testing effect occurs in M4 (PBT posttest), then it will be replaced with M3. This is because the two PBT posttest scores are identical if testing effect does not occur in M4. The same applies to the CBT posttest. If testing effect occurs in M6, then it will be replaced with M5 in the treatment effect analysis.



Note: M = Measurement

Fig. 1. Design of the Study

To analyse the data for the design, two steps are needed: (1) A two independent samples t-test is performed to identify the testing effects (M4–M3) or (M6–M5) and (2) A Split-Plot ANOVA analysis is carried out to identify the treatment effects. A CBT treatment effect is detected if a significant interaction effect occurs. Split-Plot ANOVA is one of the most powerful quantitative research methods for testing causal hypotheses (Yu & Ohlund, 2010; Chua, 2009a).

4.2. Instruments of the Study

Three instruments used in this study were the Biology test, the YBRAINS test and the Testing Motivation Questionnaire.

The Biology Test - The Biology Test is an educational achievement test that consists of 40 multiple-choice items, each item for 2.5 score, with a total test score of 100. The items were developed from seven topics: (1) cell structure and cell organization, (2) movement of substances across the plasma membrane, (3) chemical composition of the cell, (4) nutrition, (5) respiration, (6) dynamic ecosystem and (7) endangered ecosystem. It collected data for the participants' test performance when they answered the Biology Test in PBT and CBT modes for the purpose of comparison. Its test-retest reliabilities (Pearson correlation coefficients) for PBT and CBT versions were .86 and .83.

The YBRAINS test - The YBRAINS test (Chua, 2011a) is a psychological test that collected test scores for critical thinking and creative thinking style when participants answered the test in PBT and CBT modes for the purpose of comparison. The PBT YBRAINS test was adapted to a CBT mode in 2009 (see Fig. 2). Both CBT and PBT deliver the same content. The computer-based YBRAINS has won two gold medals at green technology innovation expos, including at the 21st International Invention, Innovation and Technology Exhibition 2010 (ITEX'10, 2010).

The test consisted of 34 items which were used to measure simultaneously the critical and creative thinking styles of a participant. Each item of the test provided the participants with multiple choices – each choice representing a specialised trait of critical thinking or creative thinking style. Each participant was asked to indicate the specific traits that best described his or her own typical behaviour. The responses were then calculated to obtain critical thinking and creative thinking style scores.

For the CBT mode, the test was developed in a computer-based system using Visual Basic. When a participant responded to the test items, his thinking styles (critical and creative styles) would be shown instantly by the computer program. The test scores (critical thinking style and creative thinking style) were recorded in a Microsoft Access database immediately after a participant had completed the CBT test. For the PBT mode, the test score for each participant was calculated manually by the researcher using the same scoring format. Its test-retest reliabilities (Pearson correlation coefficient) for the PBT mode were .71 (critical thinking style) and .78 (creative thinking style), and for CBT versions were .77 (critical thinking style) and .82 (creative thinking style).

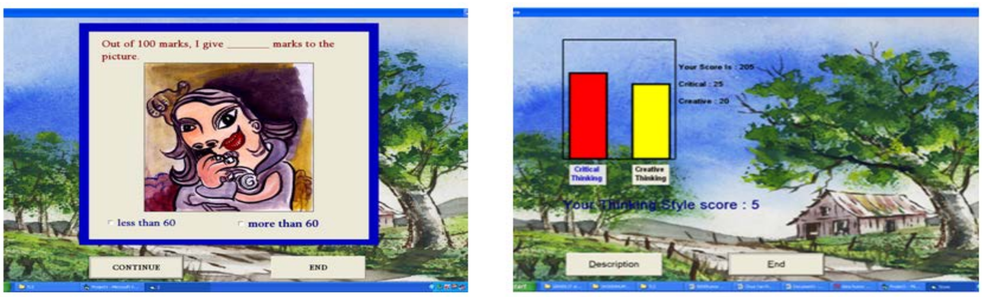


Fig. 2. An Example Test Item and the Results of the Test in Graphical Form

The Testing Motivation Questionnaire - The third instrument is the adapted version of the Testing Motivation Questionnaire or TMQ (Wigfield, Guthrie & McGough, 1996) (see Appendix A). It measured overall testing motivation and four motivation components (self-efficacy, extrinsic, intrinsic and social motivations) of the participants towards the two testing modes for comparison. The components consist of eleven dimensions of motivation. Challenge and efficacy are categorised under self-efficacy motivation. Curiosity, involvement, importance and work avoidance are categorised under intrinsic motivation. Competition, recognition and grades are listed under extrinsic motivation, and finally social and compliance are the dimensions of social motivation. Although questions have been raised about the factor structure of the motivation dimensions (Watkins & Coffey, 2004), several studies examining its validity and reliability have supported these eleven dimensions (Parault & Williams, 2009; Unrau & Schlackman, 2006; Wigfield & Guthrie, 1997). Based on the motivation dimensions, Wigfield, Guthrie & McGough (1996) developed a 54-item motivation questionnaire to examine a group of students' reading motivation. Since motivation is a universal human behaviour and is identical across disciplines (Guthrie & Wigfield, 1999, *p*. 199), the eleven dimensions were adapted into this study as the dimensions of testing motivation. The TMQ was developed based on a five-point Likert scale to assess participants' motivation towards the two testing modes. The scores ranged from 1 (very different from me) to 5 (a lot like me). The internal consistency reliabilities (Cronbach's alpha) for the eleven motivation dimensions in the PBT and CBT versions were ranged between .72 and 83.

4.3. Participants

The participants in this study were 140 Malaysian undergraduate student teachers from a teacher training institute located in Peninsular Malaysia. Among the participants, there were 61 males (43.57%) and 79 females (56.43%) with an average age of 21 years. The participants were randomly selected from a student teacher population (N = 219) based on the sample size determination table of Krejcie and Morgan (Chua, 2011b, *p*.211) at a 95% ($p < .05$) confidence level. They were enrolled in a teacher education programme (mathematics and science), and have the same educational history and background. They have the same level of computer applications skill and received formal computer instruction in their academic curriculum. Based on their performances in a biology monthly test and the recommendation of their lecturers, the student teachers with similar abilities were arranged into 35 equivalent groups (each with four equivalent participants). The four participants in each group were then assigned into four groups through a simple random sampling procedure, each with a sample size of 35. The four groups were then randomly assigned to two control and two treatment groups for the experimental study.

4.4. Procedures

At the first phase, control group 2 answered PBT mode of the Biology Test and YBRAINS test and treatment group 2 answered their CBT modes (pretests for test performance). Immediately after the tests, the two groups answered the TMQ questionnaire to identify their motivation towards the two testing modes (pretests for testing motivation). Two week later, at the second phase, the four groups answered the Biology Test and the YBRAINS test. The two control groups answered the PBT modes and the two treatment groups answered the CBT modes (posttests for test performance). Immediately after the tests, the four groups answered the same TMQ questionnaire to identify their motivation towards the two testing modes (posttests for testing motivation).

A key advantage of the control-treatment repeated-measures experimental design is that individual differences between participants are removed as a potential confounding variable during the course of the experiment (PsychoMetrics, 2010). These individual differences include history and maturity effects. History effects refer to external events (e.g. reading books, watching TV programme or exposure to other sources) that can affect the responses of the research participants, while maturity effects refer to changes in a participant's behaviour during the course of the experiment (Chua, 2009b; Dane, 1990).

Results

Testing Effect

The data in Table 1 indicates that there were no significant testing effects on the scores of the achievement and psychological tests for PBT and CBT modes ($p>.05$).

However, significant testing effect were found in overall testing motivation [$t(68)=-8.89$, $p=.00$; $d=2.16$] and its three motivation components, that is, self-efficacy [$t(68)=-6.48$, $p=.00$; $d=1.57$], intrinsic motivation [$t(68)=-4.81$, $p=.00$; $d=1.17$] and social motivation [$t(68)=-4.27$, $p=.01$; $d=1.04$] with large testing effect (Cohen's $d>.80$). More specifically, significant testing effects occurred in six of the eleven motivation dimensions, namely efficacy, curiosity, involvement, work avoidance, competition and compliance. The negative mean difference values for overall testing motivation and its three components; self-efficacy motivation; intrinsic motivation and social motivation show that the PBT posttest motivation scores were lower than their pretest scores, and it indicates that fatigue testing effects occurred in the PBT. It means that the participants were less motivated to complete the PBT posttest. On the other hand, no significant testing effects were found in the CBT for total testing motivation and all the four testing motivation components.

Table 1. Testing effects for PBT and CBT modes on test performance and testing motivation

Subscale	Testing Effect for PBT					Testing Effect for CBT				
	Control group 1	Control group 2	Mean Dif.	T test	Effect size (d)	Treatment group 1	Treatment group 2	Mean dif.	T test	Effect size (d)
	Mean (*SD*)	Mean (*SD*)		t value at df = 68		Mean (*SD*)	Mean (*SD*)		t value at df = 68	
Performance										
Biology score	68.2 (12.1)	64.7 (12.1)	-3.50	-1.22	-.29	69.55(13.2)	68.1 (13.2)	-1.43	-.42	.10
Critical style	10.1 (1.5)	9.9 (2.1)	-.18	-.52	.13	10.2 (1.5)	10.3 (1.6)	.11	.21	.05
Creative style	11.2 (1.3.)	11.1 (1.1)	-.04	.15	.04	11.2 (2.37)	12.8 (2.2)	1.52	.98	.23
Motivation	133.5 (11.2)	115.6 (9.0)	-17.89	-8.89**	2.16	155.1 (13.1)	158.8 (13.1)	3.64	1.32	.32
1. Self-efficacy	20.5 (2.1)	16.5 (2.5)	-3.97	-6.48**	1.57	25.6 (3.5)	26.4 (3.6)	.71	1.07	.26
Challenge	10.7 (2.3)	11.6 (2.8)	.87	.58	.14	13.6 (2.4)	13.8 (2.5)	.19	.25	.06
Efficacy	9.7 (3.6)	4.8 (1.5)	-4.84	-8.46**	2.05	12.0 (1.5)	12.5 (1.7)	.52	1.16	.28
2. Intrinsic	46.8 (6.4)	38.0 (6.8)	-8.74	-4.81**	1.17	63.0 (5.7)	62.0 (6.0)	-.99	1.47	.36
Curiosity	13.1 (2.5)	5.6 (2.3)	-7.50	-13.34**	3.23	18.5 (2.2)	19.4 (2.2)	.91	1.36	.33
Importance	15.2 (4.8)	15.2 (3.1)	.00	.24	.06	14.5 (3.5)	15.2 (3.6)	.72	.99	.24
Involvement	11.7 (2.7)	7.3 (3.2)	-4.45	-6.17**	1.50	17.3 (2.6)	17.4 (2.8)	.13	.15	.04
W. avoidance	6.5 (1.6)	9.7 (2.3)	3.21	7.01**	1.70	12.6 (3.4)	9.8 (3.3)	-2.75	- .83**	.92
3. Extrinsic	37.1 (5.3)	36.5 (4.2)	-.68	-.81	.20	35.2 (3.4)	35.9 (3.5)	.71	.63	.15
Competition	19.48 (1.34)	18.34 (1.17)	-1.14	-2.31*	.56	17.3 (2.1)	17.7 (1.1)	.34	-.91	.22
Recognition	9.25 (2.87)	9.48 (3.17)	.23	.30	.07	8.9 (3.1)	9.6 (3.1)	.75	.86	.21
Grade	8.46 (1.09)	8.69 (1.19)	.23	-2.43	.60	8.8 (1.3)	8.5 (1.2)	-.38	-1.53	.37
4. Social	29.06 (3.31)	24.56 (3.62)	-4.50	-4.27*	1.04	31.2 (3.2)	34.5 (3.6)	3.21	1.44	.35
Social	12.23 (2.34)	12.87 (2.16)	.64	.67	.16	16.51 (3.35)	17.88 (3.51)	1.37	1.36	.33
Compliance	16.83 (2.59)	11.69 (2.27)	-5.14	-7.40**	1.79	14.78 (2.32)	16.62 (2.47)	1.84	1.08	.26

Notes: *p<.05, **p<.01. The values of Cohen's d effect size were calculated based on the mean and standard deviation scores. Cohen (1988) defined effect sizes as "small when d = .21 to .49," "medium when d = .50 - .79," and "large when $d \geq .80$".

5.2. Treatment Effect

The results of the Split-Plot ANOVA analysis (multivariate analysis of variance using the Pillai's Trace test) after eliminating the testing effects (as shown in Table 2) indicate that no significant treatment effects were found in test performance for biology score and the two thinking style sub-scales.

As a whole, significant treatment effect occurred in total testing motivation [F(1, 68)=15.68, p<.01; d=.69]. The CBT significantly increased self-efficacy motivation [F(1, 68)=23.26, p<.01; d=.94], intrinsic motivation [F(1, 68)=27.59, p<.01; d=1.10] and social motivation [F(1, 68)=38.52, p<.01; d=1.22] of the participants. The data also indicates that treatment effects significantly occurred in five of the eleven test motivation dimensions, they are challenge, efficacy, curiosity, involvement and social, and the treatment effect sizes were medium to large (d values were between .57 to 1.37). It indicates that the CBT mode has significantly increased the motivation level of the participants.

Table 2. Split-Plot ANOVA analysis results for the effect of CBT on test performance and testing motivation

Subscale	Control		Treatment		Pillai's Trace Test	Treatment effect size (Cohen's d)
	Pre	Post	Pre	Post	Interaction effect (F-ratio value at df = 1, 68)	
	Mean (*SD*)	Mean (*SD*)	Mean (*SD*)	Mean (*SD*)		
Performance						
Biology score	67.5 (12.8)	68.2 (12.1)	68.5 (13.1)	68.9 (12.7)	.26	-.03
Critical style	9.8 (1.4)	10.1 (1.5)	9.7 (1.3)	10.3 (1.4)	.12	.28
Creative style	10.9 (1.2)	11.2 (1.3)	11.4 (1.2)	11.7 (2.6)	.28	-.11
Motivation	124.9 (18.5)	133.5 (11.2)	131.4 (16.1)	150.1 (13.6)	15.68**	.69
1. Self-efficacy M.	17.5 (4.8)	20.5 (2.1)	17.1 (4.5)	24.1 (3.3)	23.26**	.94
Challenge	9.7 (2.8)	10.7 (2.3)	9.5 (2.9)	13.8 (2.7)	28.35**	1.11
Efficacy	7.7 (2.1)	9.7 (3.6)	7.5 (2.7)	11.2 (2.7)	13.27**	.67
2. Intrinsic M.	44.1 (9.1)	46.8 (6.4)	51.5 (4.9)	58.3 (4.4)	27.59**	1.10
Curiosity	12.2 (2.8)	13.1 (2.5)	12.8 (2.6)	16.2 (2.2)	26.52**	1.06
Importance	12.5 (3.3)	15.2 (4.8)	13.7 (2.7)	15.5 (3.6)	1.74	.15
Involvement	11.8 (3.7)	11.7 (2.7)	12.7 (2.6)	14.2 (2.7)	12.71**	.57
Work avoidance	7.3 (2.4)	6.5 (1.6)	12.2 (3.3)	12.2 (3.1)	2.74	.40
3. Extrinsic M.	33.5 (3.1)	37.1 (5.3)	33.9 (3.4)	34.9 (3.5)	2.06	-.55
Competition	17.3 (4.1)	19.4 (1.3)	17.6 (1.4)	17.2 (1.8)	.69	-.92
Recognition	7.5 (2.2)	9.2 (2.8)	7.9 (2.2)	9.1 (3.0)	1.22	-.22
Grade	8.6 (1.5)	8.4 (1.0)	8.3 (1.6)	8.5 (1.3)	.57	.29

4. Social M.	28.7 (4.3)	29.0 (3.3)	28.3 (4.0)	33.7 (4.2)	38.52**	1.22
Social	12.3 (2.7)	12.2 (2.3)	12.4 (3.4)	17.1 (3.5)	39.51**	1.37
Compliance	16.3 (2.5)	16.8 (2.5)	16.2 (3.8)	16.6 (3.5)	.87	-.08

Notes: *p<.05, **p<.01

To further understand the association among test performance and testing motivation, a Pearson Product-moment inter-correlation test was conducted (see Table 3). Besides that, since there was a treatment effect of CBT on testing motivation, an Analysis of Covariance (see Table 4) was performed to identify whether testing motivation is a moderator variable for the association between testing mode and test performance.

Table 3. Pearson Product-moment Inter-correlation between test performance and testing motivation

Correlation	Test Performance		
	Biology Score	Critical Style	Creative Style
Testing Motivation	-.20	-.17	.13

Table 4. Analysis of Covariance for testing motivation towards the effect of CBT on test performance

Score	Source	Mean Square	F(1, 31)	p
Biology test	Testing motivation	494.99	2.32	.13
	Testing mode	434.83	2.04	.15
Critical style	Testing motivation	.40	.24	.62
	Testing mode	.35	.21	.64
Creative style	Testing motivation	.52	.76	.38
	Testing mode	.32	.471	.49

Table 3 indicates that there were no significant correlation between the three test performance scores with and testing motivation. It means answering the test with greater testing motivation would not necessary help a test taker to achieve a higher test performance score. Furthermore, the data in Table 4 shows that there were no significant main effects of CBT on the three test performance scores and testing motivation was not a significant moderator for the effect of CBT on test performances of the achievement test and psychological test.

Discussion

Results of the analyses indicate that no significant testing and treatment effects were found for test performance in the two testing modes. In other words, the test scores were consistent over time and across the two testing modes. It shows that a participant who sits for both the CBT and PBT would most probably yield similar pretest and posttest scores. The two CBT tests are valid in terms of test performance and can be used as a replacement for their PBT.

The results also indicate that the achievement test and psychological test have fulfilled the requirements of the international guidelines on computer-based testing (International Test Commission 2004) and consistent with true-score test theory (Allen & Yen, 1979) that parallel tests are required to show nearly equal mean scores. However, it does not support the suggestion of some researchers (e.g. Clariana & Wallace, 2002) that it is not necessary that equivalent measures be produced from CBT and PBT versions; at the same time it suggests that it is the responsibility of instructional designers to craft and design high-quality CBTs that parallel the conventional PBTs, and extensively pilot test them to ensure equality before implementing computer-based testing.

The results of this study also provide an explanation for why some previous studies have revealed a significant difference between the two testing modes in test performance although theoretically no difference should be observed. Testing effects did occur in this testing mode comparability study although none was identified and reported by the researchers of past studies; instead they found significant treatment effects. However, for the researchers to conclude that CBT has an effect on the experimental variables (test performance) is misleading because there is a possibility that the changes in the experiment variables are caused by testing effects, and not by the treatment effects. Thus, the findings of these studies might have been jeopardised by testing effects and misinterpreted.

The findings also show that the CBT mode is more stable and consistent in terms of internal and external validity because no testing effects were found in all of the four testing motivation components. For treatment effect, the results indicate that there was a significant treatment effect on testing motivation. The CBT had increased the participants' self-efficacy, intrinsic and social motivation. It reflects the ability of the CBT to stimulate the participants to answer the CBT posttest with higher concentration.

However, answering the tests with greater testing motivation did not help a test taker to achieve higher scores; no significant treatment effects were found in the two tests. This is another interesting finding, that testing motivation is not a catalyst for the effect of testing mode on test performance. The study rejects the prediction of some previous studies that motivation level of test takers to answer the CBT and PBT might have an impact on test performances (e.g. Wise & DeMars, 2003). It provides evidence that testing motivation is not a moderator of the relationship between testing mode and test performance. It is consistent with the finding of OECD (2010), that the effects of motivational factors on the relationship between testing mode and test performance are insignificant and either very weak or non-existent.

Since testing is an aid to learning and it is a practice that is part and parcel of a good educational system, an advantage of using CBT, as generated from this study is that it produces more valid test results for repeated measures and increases test-takers' motivation which will, in turn, heighten their willingness to be tested and increases testing participation rate. Based on the results of this study, computer-based testing can be used as a valid replacement for the conventional paper-based testing in educational institutions.

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ROLE OF ATTITUDE IN UTILIZATION OF JUSUR LMS IN SAUDI ARABIAN UNIVERSITIES

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Abstract

The purpose of this study was to determine the faculty members' utilization of *Jusur* LMS and their attitudes toward using *Jusur* LMS in Saudi Arabian universities. The article also examines whether *Jusur* LMS utilization is affected by attitude and demographic variables such as computer experience and age. This study is quantitative in nature and employs a descriptive co-relational research design. The sample of this study consists of 454 faculty members. Data were gathered through a questionnaire, and the findings indicated that the faculty members' attitude is more significantly related to the utilization of *Jusur* LMS rather than to the demographic variables. Further analysis also reveals that the overall attitude toward *Jusur* LMS is significantly better at predicting frequency than the volume of *Jusur* LMS utilization. In addition to attitude, computer experience appears to exert only little influence on *Jusur* LMS utilization.

Keywords: Jusur Learning Management System; Attitude toward Jusur LMS; Jusur LMS Utilization; Saudi Higher Education Introduction

Introduction

The adoption of new Information Technology (IT) software such as Jusur LMS for the specific purpose of implementing it in the public educational arena is generally based on the assumption that the majority of faculty members would immediately and readily integrate it into their teaching processes. Whether or not this assumption translates into a reality, however, depends partly on the faculty members' attitude toward Jusur LMS. Attempts of successful Jusur LMS implementation must take into account the extent to which faculty members are aware if it and have accepted it as an instructional tool (Asiri, Mahmud, Abu-Bakar, & Ayub, 2012). Hence, the decision makers in the Saudi Arabian Ministry of Higher Education should be cautioned as not to readily assume that the implementation of Jusue LMS as a new e-learning tool is taking place automatically. It needs to be ascertained at this stage of development whether faculty members in general have a positive or a negative attitude toward Jusur LMS. Only then appropriate and timely measures can be taken to increase the level of awareness and acceptance in order to ensure that the implementation of Jusur LMS does not remain in name only. Attitude toward technology have been widely investigated by the researchers, because it appeared to be a significant factor in the attention to use of Information Technology (IT). According to Zhao, Pugh, Sheldon and Byers (2002), the attitudes of the faculty members play a key role in the successful of any plan aimed at implementing technology in an educational program.
Jusur LMS has been developed according to universal standards (fig.1.). The six main functions which can be achieved through the Jusur LMS environment which are as follows:

- Log in: registering students at a portal.
- Scheduling: planning courses and determining teaching methods.
- Delivery: making the course available for users.
- Tracking: following up student progress and issuing performance reports.
- Communication: students share and exchange information through forums, emails and file sharing.
- Evaluation: testing students through quizzes and examinations and grading them.

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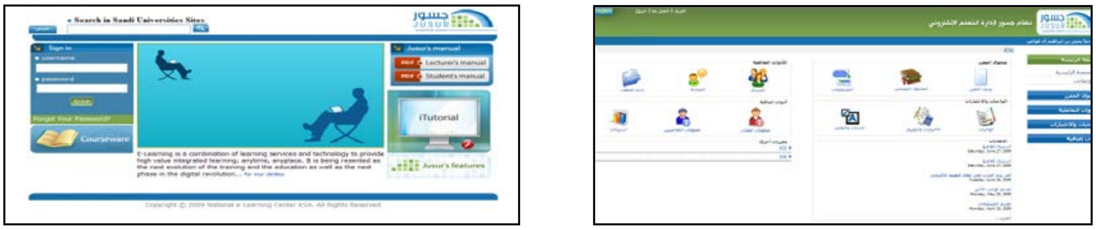

Fig. 1. (a) Screenshot of *Jusur's* main interface design. (b) Screenshot of *Jusur's* tools

Al-Khalifa (2010) surveyed the advantages of Jusur LMS from the perspective of students. She reported that students viewed that Jusur was user friendly, easy to operate, helped students to complete the task quickly, offered technical support in the form of error messages, enabled users to access information and activities at anytime and anywhere. On the other hand, Al-Salum (2009) pointed out the limitations of Jusur LMS features, such as accommodating only English and Arabic language content and the instructors' dependence on the support centre.

According to Al-Judi (2011), the majority of Saudi Arabian faculty members did not use *Jusur* LMS to design interactive online courses and required additional training in creating interactive e-courses with *Jusur* LMS. Furthermore, the faculty's overall utilization of *Jusur* LMS had not yet reached the required level. Similar results were reported by Woodsa, Bakerb and Hopperc (2004) who highlighted that the faculty use of innovative technology for teaching purposes still lay below the satisfactory level.

In previous studies, the utilization of technology has been measured in several ways. For instance, Turner, Kitchenham, Brereton, Charters and Budgen (2010) asserted that the actual utilization of a technology, specifically that of computer networks, could be measured using either objective or subjective formats. Objective measures are usually generated by using the system's tracking tools to calculate the number of times faculty staff logged on to the system, while the subjective measures of usage are based upon individual opinion, usually documented via a completed questionnaire. Other researchers like Jones and Hubona (2006) contended that the actual utilization of a system should rather be assessed while dividing it into two sub-dimensions of frequency and volume based on the time and the period in which the system is used. They believed that the individual beliefs variables could explain frequency of usage better than volume of usage.

The Saudi Arabian Ministry of Higher Education has introduced *Jusur* LMS four years ago. However, its successful implementation strongly depends on the attitude of faculty members towards *Jusur* LMS. This paper examines the relationship between the end-users' attitude and *Jusur* LMS utilization in Saudi Arabian universities. Other variables such as computer experience and age are also investigated to test their effects on *Jusur* LMS utilization.

Literature Review

2.1. The Role of Attitude toward Jusur *LMS*

According to Fishbein and Ajzen, "attitude can be described as predisposition to respond in a consistently or unfavorable manner with respect to a given object" (Fishbein & Ajzen, 1975, p. 6). Schafer and Tait (1986) refer to attitude as a set of feelings and tendencies that influence a person's decision toward people, ideas, or objects. These feelings and tendencies can be positive or negative and can be formed in relation to objects or people. The attitudes variable consists of the three components affection, cognition, and behaviour. The affective component usually represents an individual's emotional response or liking to a person or object, the cognitive component reflects a person's factual knowledge of a person or object, and the behavioural component involves a person's overt behaviour directed toward a person or object (Zimbardo, Ebbesen, & Maslach, 1977). AI-Khaldi and AI-Jabri (1998) asserted that individual attitude consists of what a person feels about an object (affective), think (cognitive), and plan to do in the future (behavioral).

The success of any initiative intended at implementing technology in an educational program depends strongly upon the attitudes of the faculty members involved (Al-Erieni, 1999; Clay, 1999; Davis, Bagozzi, & Warshaw, 1989; Hamdi, 2002; Zhao, et al., 2002). Faculty members who hold positive attitudes toward technology in general feel comfortable using it and are more ready to overcome arising obstacles (Albirini, 2006; Hamdi, 1991). Teo (2008) examined the attitudes towards the use of computers shared by pre-service teachers and found that a significant relationship existed between the overall attitudes and the level of computer confidence. AI-Khaldi and AI-Jabri (1998) reported that the instructors' attitude did not only relate to the use of computer among the users but could also predict their computer usage. Faculty members with positive attitudes toward technology felt comfortable using it and were more ready to overcome arising obstacles (Albirini, 2006).

According to Hamdi (1991), one of the major challenges to the use of IT in education are the instructors' attitudes toward technology. She stated that the instructors' positive attitudes toward technology could only be enhanced if they were aware of their new roles as supervisors and facilitators of a technological model of instruction. Pac (2008) noted that if educators perceived a proposed technology system as fulfilling their own or their students' needs, they were more likely to incorporate it into their teaching.

Since positive attitude predicts the actual use of technology, the attitude factor has been widely measured in the arena of technology use (Kim, Chun, & Song, 2009; Porter & Donthu, 2006; Yang & Yoo, 2004). For example, Yang and Yoo (2004) investigated the relationship between the affective attitudes and the cognitive attitudes of users and the extent of their usage of technology. They found that technology usage was more predicted by cognitive attitudes than affective attitudes. Moreover, Porter and Donthu (2006) concluded that the users' attitude toward using the Internet was positively associated with their usage. McGill and Klobas (2009) examined the role of task–technology fit in Learning Management System (LMS) success and found that the users' utilization of LMS was affected by their attitude toward LMS. In the same context, Kim et al. (2009) categorized attitudes toward using technology into strong and weak attitudes. Strong attitudes fully mediated the effect on using technology, while weak attitudes seemed to be only partially related to the use of a system. Hence, if faculty members have formed positive attitudes toward *Jusur* LMS, they are more likely to be motivated to use *Jusur* LMS.

2.2. Computer experience and age variables

According to Henry and Basile (1994), demographic factors and user characteristics are also likely to have an impact on the use of technology. Variables such as age and computer experience have been identified as non-attitudinal variables affecting technology use. In respect to age it was observed that young faculty members working as lecturers or assistant professors were more likely to use innovative technology than older faculty members (Al-Saif, 2005). Porter and Donthu (2006) observed that more senior faculty members chose to avoid the use of computer and internet caused by perceived levels of difficulty and anxiety associated with the former. Al-Gahtani, Hubona and Wang (2007) and Teo (2008), on the other hand, did not observe any age impact among instructors in their behavioural intention to use technology.

Computer experience has been also identified as another factor influencing the extent to which faculty members use IT in their lecture halls (Al-Khaldi & Al-Jabri, 1998; Burton-Jones & Hubona, 2006; Teo, 2008; Tondeur, Hermans, Braak, & Valcke, 2008; van-Braak, 2001). For example, Al -Khaldi and Al-Jabri (1998) found that the extent of computer experience directly affected the utilization of technology used in instruction. Tsai and Tsai (2010) found that individuals who used the internet more than two hours per day tended to use computer technology more than those who has less experience in this field. Similarly, van-Braak's (2001) study revealed a positive relationship between computer experience and use in respect to those faculty members who frequently used such networks at home. Hence, it can be established that age and computer experience play a key role in the use of *Jusur* LMS among Saudi Arabian faculty members.

The study

A wide array of studies has investigated the beliefs and attitudes of faculty members towards different sets of ICT. Thus far, the investigations on the faculty members' attitudes towards *Jusur* LMS in Saudi Arabia are limited. The theoretical foundation of this research is based on the research of Albirini (2006) and Burton-Jones and Hubona (2006). The purpose of this study was to determine the faculty members' level of *Jusur* LMS utilization as well as the faculty's attitudes toward using *Jusur* LMS in Saudi Arabian higher education. It furthermore aimed at examining the relationship between the faculty members' utilization of *Jusur* LMS in relation to their attitudes. Additionally, the faculty members' personal characteristics such as age, experience in using computer were also included in order to determine their effects on *Jusur* LMS utilization. Finally, studying how the overall attitude could predict the frequency of utilization more than volume of usage seems to be important. This study aimed at answering the following research questions:

What is the faculty members' utilization level of *Jusur* LMS?
What are the faculty members' attitudes toward *Jusur* LMS in education?
Is there a significant relationship between the parts of attitude scale and utilization of *Jusur* LMS?
Is there a significant relationship between characteristics of faculty members including age and years of computer experience and utilization of *Jusur* LMS?
Does the overall attitude predict the frequency more than volume of utilization?

Methodology

This study is quantitative in nature and employs a descriptive co-relational research design. The target population for this study counts 18328 faculty members teaching at 11 Saudi Arabian public universities applying *Jusur* LMS for teaching and learning procedures in May 2011. The selected universities are geographically located in the central, western, northern, and southern region of Saudi Arabia.

By using the proportional stratified cluster sampling, one university of each region is chosen randomly, and the number of participants from each university determined in proportion to the population size. The data are subsequently subjected to descriptive and inferential analysis. Descriptive analysis involves frequencies, percentages, means, and standard deviation, while inferential analysis includes Pearson's product-moment correlation coefficient, and simple linear regression. The obtained quantitative data are analyzed by using the Statistical Package for Social Sciences (SPSS) Version 19.0.

4.1 *Respondents*

Anticipating that a certain percentage of prospective participants would not respond to the questionnaire, 70% more faculty members than necessary to achieve the minimum sample size were invited to participate in the survey. The research instrument was in the form of an online questionnaire. In collaboration with the National Center for E-learning and Distance Learning (NCEL) in Saudi Arabia, a total of 666 faculty members were emailed the link to the survey questionnaire on 15 June 2011. The individuals in question were employed at four selected Saudi Arabian public universities, and out of this 454 responses were valid and analyzed. The response rate amounted to 68.2%.

4.2 *Instruments*

A utilization scale was developed to obtain the information needed for the study. The design of the questionnaire was guided by reviewing past literature (Al-Asmari, 2005; Burton-Jones & Hubona, 2006; Chang, 2008; Coulter, 2004; Turner, et al., 2010). It consisted of 18 numbered items and was divided into two sections, namely frequency (13 items) and volume of utilization (5 items). Frequency of *Jusur* LMS use was measured by the number of times (e.g. twice per month) a faculty member utilized the system in the teaching and learning process. Volume referred to amount of time (e.g. 60 minutes per visit) spent by a faculty member using *Jusur* LMS over the same period. Both these two sub-scales were a 5 point *Likert* scale. In the frequency domain, respondents could rate their usage as always (> three times/month), often (thrice/month), sometimes (twice/month), rarely (once/month) or never (not at all). The volume of utilization domain, on the other hand, could be rated by the respondents as either "Never", "Less than 30 minutes /visit", "31 – 60 minutes /visit", "61-90 minutes/visit" or "More than 90 minutes/visit". In regard of validity, utilization scales was evaluated primarily on content validity by a panel of three expert judges In terms of reliability, the Cronbach's alpha reliability coefficients for these frequency and volume sub-scales were 0.79, 0.83 respectively, 0.87 alpha coefficient was rustle for the whole scale.

In respect to the attitude scale, a well documented instrument was adopted as the basis for designing the questionnaire for this study. Albirini's (2006) Attitude Scale was modified to meet the attitude objective of this investigation whose explicit permission to use and modify the instrument was obtained beforehand. The Attitude Toward Using *Jusur* LMS Scale was divided into three different domains which were affect (1-5 items), cognition (6-13 items), and behavior (14-20 items). The scale was a 5 point *Likert* scale (from 5 = strongly agree to 1 = strongly disagree). Eight items were formulated negatively, while the remaining items were formulated positively. In terms of reliability, Cronbach's alpha reliability coefficients for the three sub-scales were: affect = 0.81, cognition = 0.87, and behavior = 0.82, while the Cronbach's alpha value for overall scale was 0.90.

Result

5.1. *Utilization of Jusur LMS*

Based on mean scores, the Utilization Scale was categorized into three levels, namely low, moderate, and high *Jusur* LMS usage. Mean scores within the range of 2.34 to 3.67 were considered as being at a moderate level, mean scores below 2.34 as a low level, and mean scores above 3.67 a high level. Table .1 illustrates that the faculty members' volume of usage was at a moderate level with a mean score of 2.58 (S.D=.86). This indicates that seventy-eight point eight (78.8%) of the faculty members spent one hour or less on average per visit in the *Jusur* environment while browsing its features, chatting with students, teaching synchronously, discussing in forums, and reviewing student reports.

Table 1. Distribution of mean scores on the Volume of *Jusur* LMS Utilization Sub-scale

Scale	Percent (%)					Mean	SD
	Never	<30*	31-60*	61-90*	>90*		
Volume of Utilization	8.1	39.6	39.2	11.2	1.8	2.58	.86

* Minutes per one visit.

In terms of frequency of *Jusur* LMS utilization, the responses also reflected a moderate level (M= 2.93, SD= 1.04). 65% of the respondents used *Jusur* LMS sometimes (40.3%) or rarely (24.7%). This suggests that more than half of respondents utilized the *Jusur* LMS tools (e.g. Announcement tool, Assignment tool, Grade Book tool) at an average frequency of one or twice a month.

Table 2. Distribution of mean scores on the Frequency of *Jusur* LMS Utilization Sub-scale

Scale	Percent (%)					Mean	SD
	Never	Rarely	Sometimes	Often	Always		
Frequency of Utilization	8.6	24.7	40.3	18.5	7.9	2.93	1.04

5.2. *Jusur* LMS Attitude

As Table 1 illustrates, faculty members' overall attitudes toward *Jusur* LMS were positive with a mean score of 3.84 (SD = 1.15). The respondents' positive attitudes were evident within the affective (mean = 3.75), cognitive (mean = 3.82) and behavioral (mean = 3.73) domains. About 66.1% of the respondents had positive (33.9%) or highly positive (32.2%) affect toward computers. These respondents felt comfortable with *Jusur* LMS, were excited about the adoption of *Jusur* LMS in their universities, considered using *Jusur* LMS enjoyable, liked to talk with others about *Jusur* LMS, and liked to use it in teaching. Within the cognitive domain, most of the respondents agreed (26.4%) and strongly agreed (36.8%) that *Jusur* LMS saved time and effort, enhanced students' learning progress, was a fast and efficient means of getting information, should be used in all subject matters, improved the quality of learning in universities, was worth the time spent on learning it, was needed in the classroom, and generally did more good than harm. In the behavioral domain, the majority of the respondents expressed positive (40.7%) or highly positive (27.1%) behavioral intentions. They would do things by *Jusur* LMS rather than by hand, learn about it, use it as much as possible, intend to employ *Jusur* LMS in the near future, prefer teaching their students online rather than face to face.

Table 3. Distribution of mean scores on the attitude toward Jusur LMS scale

Scale	Percent (%)					Mean	SD
	SD	D	N	A	SA		
Affect	8.4	5.9	19.6	33.9	32.2	3.75	1.21
Cognition	7.0	4.4	25.3	26.4	36.8	3.82	1.81
Behavior	6.8	7.7	17.6	40.7	27.1	3.73	1.14
Overall attitude	6.6	4.8	20.7	33.9	33.9	3.84	1.15

SD, strongly disagree (1); D, disagree (2); N, neutral (3); A, agree (4); SA, strongly agree (5).

5.3 *Correlation*

This study also explored the correlation between the faculty members' utilization of *Jusur* LMS and their attitude, computer experience, and age. In Table 4, a summary of the correlation between faculty responses' scores on general *Jusur* LMS utilization scale and attitude, computer experience, and age. The overall attitude is related to *Jusur* LMS utilization, indicated by a correlation coefficient of .501 at $\alpha = .01$. Moreover, each one of the three attitude components is significantly and correlated with *Jusur* LMS utilization, implying that faculty members who had a positive attitude toward *Jusur* LMS tended to use the system more often or frequently. The computer experience variable also reflected a slightly positive relationship to the use of *Jusur* LMS, while the faculty members' age did not correlate with their *Jusur* LMS usage.

Table 4. Correlation of faculty members' utilization, attitude, computer experience, and age

Scale	Attitude constructs			Computer Experience	Age
	Affect	Cognition	Behavior		

Jusur LMS Utilization	.541**	.442**	.451**	.146**	-.037
	(.0001)	(.0001)	(.0001)	(.001)	(.426)

**p< .01

5.4 *Regression* analysis

Table 5 summarizes the results of the linear regression analyses used to compare the influence of the overall attitude on two dependent variables, namely the volume and frequency of *Jusur* LMS usage. Overall, attitude accounted for 13% and 22% of the variance in volume and frequency usage respectively. It suggests that the overall users' attitude could explain frequency usage scores twice more than volume of use. The attitude factor contributed significantly to both volume of usage (β=.36, p <.0001) and frequency of use (β=.47, p <.0001). The significant positive betas indicate that respondents scoring higher on the attitude factor were more likely to frequently utilize the system for the teaching and learning process (frequency) or to spend a reasonable amount of time using the *Jusur* LMS over the same period (volume).

Table 5. Simple linear regression analyses using overall attitude scores to predict volume and frequency of *Jusur* LMS utilization.

Dependent Variable	Adjusted R^2	Independent Variable	β	Sig.
Volume of utilization	.13	Overall Attitude	.36	.0001
Frequency of utilization	.22	Overall Attitude	.47	.0001

Discussion and Conclusion

The above results suggest that the utilization of *Jusur* LMS in Saudi Arabian universities has reached a moderate level. In other words, faculty members use it on average twice a month for less than one hour. The respondents showed positive attitudes toward the use of *Jusur* LMS. The respondents' positive attitudes were evident within the affective, cognitive and behavioral domains. The faculty members seemed to have welcomed the introduction of Jusur LMS in their universities. The majority of faculty members considered *Jusur* LMS a viable instructional tool which helped them to achieve the learning goals. The finding of this research confirmed those of Al-Khaldi and Al-Jabri (1998), Albirini (2006), Davis et al. (1989), Kim et al. (2009), Teo (2008), and Yang and Yoo (2004).

The findings of the study also indicated a strong and positive correlation between faculty members' utilization and their attitude toward *Jusur* LMS. This result lies within the limits of the expected as most research conducted worldwide has emphasized that a positive attitude toward a new technology is important for its successful implementation (Al-Khaldi & Al-Jabri, 1998; Davis, et al., 1989; Hamdi, 2002; Pac, 2008; Shapka & Ferrari, 2003; Teo, 2008; Zhao, et al., 2002). The positive attitudes towards *Jusur* LMS shared by faculty members constitutes a critical factor in the effective utilization of technology. Thus, an essential factor for the successful implementation of *Jusur* LMS in Saudi Arabian universities is developing a positive attitude toward this system.

In general, demographic variables seem to be less related to the utilization of *Jusur* LMS. No significant relationship could be established for user age and *Jusur* LMS utilization. This finding is in line with Al-Gahtani, Hubona and Wang (2007) who also could not confirm a direct or indirect relationship between the age of Saudi Arabian faculty members and the performance expectancy of computer use. Teo (2008) also did not observe any age impact on the instructors' intention to use technology. On the other hand, computer experience was found to be significantly related to the overall level of use of use, even though the strength of this correlation was small. In other words, faculty members with many years of computer experience tended to utilize *Jusur* LMS more frequently in their teaching practice and vice versa. The extent of computer experience directly affected the utilization of technology used in instruction (Al-Khaldi & Al-Jabri, 1998; Burton-Jones & Hubona, 2006; Teo, 2008; Tondeur, et al., 2008). Hence, experienced faculty members were more likely to integrate *Jusur* LMS into their teaching than those with less experience.

The different influence of the factor of faculty members' attitude in predicting volume and frequency usage constitutes an interesting finding in this study. Frequency usage is most closely associated with overall attitude toward *Jusur* LMS. The faculty members who like *Jusur* LMS, possess sufficient knowledge of it, and plan to use it, are likely to utilize its tools more frequently, for example its assignment tool when uploading or downloading projects or term papers, and its file exchange tool to share the course documents with their students. The overall attitude did not explain a great variance on the volume scores which was consistent with Burton-Jones and Hubona's (2006) findings that the total of volume use of e-mail and processing systems among instructors was lower than their usage frequency of the same systems, adding that “volume is influenced by more factors than frequency” (p. 710).

The above results have practical implications for educational organizations in Saudi Arabia that aim at encouraging the utilization of *Jusur* LMS among academic staff. Universities should take the existing attitudes of faculty staff into account before deciding whether the system is going to be utilized or not. This would direct their attention and hence their developmental programs in using *Jusur* LMS towards two directions in which to exert their efforts. Firstly, they need to encourage those faculty members with negative attitudes to use *Jusur* LMS by providing them with basic information about the system and its benefits. Reluctant staff should not feel coerced to use the system in their classrooms and should be given priority in attending workshops. Secondly, teaching staff already professing positive attitudes towards *Jusur* LMS should be supported in view of further developments and improvements of the already existing environment. Positive faculty members should come to understand the developmental process as sustainable and they being part and parcel of it.

Acknowledgements

We would like to express our indebtedness for the respondents who gave us their time to complete the surveys. We are also grateful for the members of National Centre of E-learning and Distance Education for their kind assistance in ensuring the completion of this study. We also indebted to Dr. Abdulkafi Albirini for his explicit permission to use and modify the instrument of this study.

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SANAL ÂLEMDE “YAZMAK”

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Yazma süreci, dilin kurallarını uygulama açısından konuşma sürecine göre daha dikkatli olmayı gerekli kılmaktadır. Konuşma sırasında dilbilgisi açısından yapılabilecek yanlışlıkların daha az fark edilmesi, bu yanlışların kimi zaman dinleyicinin yardımıyla giderilebilmesi ve konuşma etkinliği süresince iletişimin daha çok önem kazanması, dilbilgisel yapıların geri plana atılabilmesi söz konusuyken; yazma sürecinde yazının kalıcılığı, yazanın tek başınalığı yazma becerisini dilbilgisel açıdan zor bir beceri haline getirmektedir.

Bilişsel açıdan bakıldığında, yazma sürecindeki zorluk; bu becerinin konuşma becerisi gibi okul öncesinde ve doğal bir şekilde kazanılmayıp okulla birlikte ve bir öğrenme süreciyle kazanılmasından kaynaklanmaktadır.

Yazma becerisini geliştirmede öğrencilerin güçlük çekmelerinin yalnızca yazmanın doğasından kaynaklanan sorunlara bağlı olmadığı da ileri sürülmektedir. Bilindiği gibi, yazılı anlatım becerilerinin temelleri, ilköğretim döneminde ana dili öğretiminin gerçekleştiği dil derslerinde atılmaktadır. Bu derslerde yapılan yazma uygulamalarının, öğrencilerin yazmaya karşı olumsuz tutum geliştirmelerine, yazmayı zor bir beceri olarak algılamalarına neden olduğu belirtilmektedir.

Günümüzde, iletişimde telefon ve bilgisayar teknolojilerinin kullanılması, okuma ve yazma eylemlerinde de önemli gelişmelere neden olmuştur. Bu teknolojiler, her yaştan bireyin hem teknik hem de işlevsel becerilerini uygulamasına ve sürdürmesine sınırsız bir ortam sunmuştur. Özellikle bilgisayar teknolojileri kesme, kopyalama, yapıştırma, arama, bulma, yanlış yazımı kontrol etme, düzeltme gibi yazma eylemini kolaylaştırıcı, dil yanlışlarını giderici birçok aracı da taşımaktadır.

Bilgisayar kullanıcıları, eğitim amaçlı bir yazma eyleminde genellikle bu araçlardan yararlanmaktadır. Yazma eylemi, eğitim dışında bir amaç için gerçekleştirildiğinde, özellikle sohbet ve mesajlarda, bu dikkat ve özen kaybolmaktadır. Kimi araştırmacılar, bu tutumun dil açısından "endişe verici boyutta" olduğunu vurgulanmaktadır.

Aşağıda, Türk Dili ve Edebiyatı Bölümünden çalışmamıza katılan 18- 24 yaş arasındaki 75 Üniversite öğrencisinin dijital okur yazarlıkları ve sanal dünyada geliştirdikleri yazma eğilimleri incelenmeye çalışılacaktır.

Katılımcılar

Toplam	Kadın	%	Erkek	%
75	54	72	21	28

Katılımcıların Dijital Okur Yazarlık Özellikleri

İstenmeyen mesajları engellemeyi biliyor musunuz?

	Evet	%	Hayır	%	Çok az	%	Boş
Kadın	42	77.7	6	11.1	6	11.1	-
Erkek	16	76.1	2	9.5	3	14.2	-

İnternet güvenliğini sağlayacak bilgilere sahip misiniz?

	Evet	%	Hayır	%	Çok az	%	Boş
Kadın	25	46.2	10	18.5	19	35.1	-
Erkek	15	71.4	2	9.5	4	19	-

Kullandığınız web sayfalarını sık kullanılanlara eklemeyi biliyor musunuz?

	Evet	%	Hayır	%	Çok az	%	Boş
Kadın	40	74	5	9.2	9	16.6	-
Erkek	17	80.9	2	9.5	2	9.5	-

Sosyal paylaşım ağlarında profilinizdeki gizlilik ayarlarını değiştirmeyi biliyor musunuz?

	Evet	%	Hayır	%	Çok az	%	Boş
Kadın	40	74	5	9.2	9	16.6	-

Erkek	17	80.9	2	9.5	2	9.5	-

Sörf geçmişini silmeyi biliyor musunuz?

	Evet	%	Hayır	%	Çok az	%	Boş
Kadın	41	75.9	11	20.3	2	3.7	-
Erkek	16	76.1	3	14.2	2	9.5	-

İnternet sitelerinde eriştiğiniz bilgilerin doğruluğunu başka kaynaklarla test ediyor musunuz?

	Evet	%	Hayır	%	Bazen	%	Boş
Kadın	32	59.2	6	11.1	16	29.6	-
Erkek	13	61.9	2	9.5	4	19	-

Dijital okur yazarlık ölçütü olarak kabul edilen yukarıdaki 6 sorunun tamamına 12 erkek (57.1), 9 (16.6) kadın öğrenci olumlu cevap vermiştir. Bu oran, tüm öğrencilerde %28'dir.

Katılımcıların Yazma Eğilimleri

Bilgisayarda ödev hazırlarken yazım kurallarına ve noktalama işaretlerine dikkat ediyor musunuz?

	Evet	%	Hayır	%	Bazen	%	Boş
Kadın	45	83.3	1	1.8	7	12.9	1
Erkek	16	76.1	3	14.2	2	9.5	-

Bilgisayarda mesaj yazarken yazım kurallarına ve noktalama işaretlerine dikkat ediyor musunuz?

	Evet	%	Hayır	%	Bazen	%	Boş
Kadın	25	46.2	10	18.5	18	33.3	1
Erkek	11	52.3	4	19	6	28.5	-

Sosyal paylaşım sitelerinde (facebook, twitter, blog gibi) yazarken yazım kurallarına ve noktalama işaretlerine dikkat ediyor musunuz?

	Evet	%	Hayır	%	Bazen	%	Boş

Kadın	25	**46.2**	12	**22.2**	16	**29.6**	1
Erkek	10	**47.6**	4	**19**	7	**33.3**	-

Bilgisayarda yazarken, yazım kurallarına ve noktalama işaretlerine dikkat etme sıralaması; ödev yazma - mesaj yazma - sosyal paylaşım sitelerine yazma'dır.

Bilgisayarda yazarken hangisini ihmal edebiliyorsunuz?

	Yazım Kuralları	%	Noktalama İşaretleri	%	Boş
Kadın	17	**31.4**	36	**66.6**	1
Erkek	5	**23.8**	16	**76.1**	-

Bilgisayarda yazarken noktalama işaretlerinin yazım kurallarına göre daha fazla ihmal edilebildiği belirlenmiştir.

Mesajlarda ya da sosyal paylaşım sitelerine yazarken kısaltma kullanıyor musunuz?

	Evet	%	Hayır	%	Boş
Kadın	36	**66.6**	17	**31.4**	1
Erkek	16	**76.1**	5	**23.8**	1

Erkek öğrencilerde %76.1, kadın öğrencilerde %66.6 kısaltma yapma eğilimi belirlenmiştir. Buna karşılık "Kısaltma kullanmıyorum." (6 öğrenci)
"Kısaltma yapmıyorum." (3 öğrenci)
"Hiç kısaltma kullanmıyorum." (3 öğrenci)
"Asla kullanmam." (1 öğrenci) notlarının yazıldığı da görülmüştür.

En Sık Yapılan Kısaltmalar

Kısaltma	Anlamı	Kadın	%	Erkek	%
slm	selam	22	40.7	9	42.8
mrb/mrhb	merhaba	13	24	2	9.5
msj	mesaj	12	22.2	8	38
ok	okey	10	18.5	4	19
nbr	ne haber	10	18.5	3	14.2
tm	tamam	7	12.9	10	47.6
msn	messenger	7	12.9	5	23.8
evt	evet	5	9.2	5	23.8
sms	short message service	6	11.1	3	14.2
aeo	Allah'a emanet ol	3	5.5	5	23.8
kib	kendine iyi bak	2	3.7	5	23.8
as	Aleyküm selam	3	5.5	1	4.7
sa	Selamün aleyküm	1	1.8	3	14.2
by/bb	bay bay	1	1.8	3	14.2
gzl	güzel	4	7.4	-	-

cnm	canım	3	5.5	-	-
Iii/ii	iyi	2	3.7	-	-
HdAo	Haydi Allah'a emanet ol	2	3.7	-	-
old	oldu	2	3.7	-	-
nslsn	nasılsın	2	3.7	-	-
npyn	ne yapıyorsun	1	1.8	-	-
gelcem	geleceğim	1	1.8	-	
ypyrm	yapıyorum	1	1.8	-	

Sonuç olarak;

. Türk Dili ve Edebiyatı bölümü öğrencisi 54 kadın, 21 erkek öğrencinin katıldığı bu çalışmada öğrencilerin dijital okur yazarlık oranını %28 olarak tespit edilmiştir.

. Öğrencilerin yazım kuralları ve noktalama işaretlerine dikkat etme eğilimi ödev yazma – mesaj yazma – sosyal paylaşım sitelerine yazma sıralamasıyla azalmaktadır.

. Öğrenciler, bilgisayarda yazarken noktalama işaretlerini yazım kurallarına göre daha fazla ihmal edilebilmektedir.

. Öğrenciler kısaltma yapmaya eğilimlidir ve bu eğilim erkek öğrencilerde daha yüksek, kız öğrencilerde ise daha çeşitlidir.

Yararlanılan Kaynaklar

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SCIENCE AND TECHNOLOGY TEACHER CANDIDATES' PERCEPTIONS ABOUT SCIENCE AND TECHNOLOGY

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Abstract

In this study, it is aimed that defining science and technology teacher candidates' perceptions about science and technology. Study designed as phenomenological research. Research population consisted of 93 sophomores who enrolled Science – Technology Program and Planning course. To obtain research data, a form, which contains open-ended questions, was developed by researcher. Form contains questions about the explanation of opinion's about science, technology and relationship between science and technology. Research data collected by administering this form. Content analysis was applied to obtained data. According to result, teacher candidates define science as which consists of physic, chemistry and biology. And they define technology as applications, inventions and/or improvements facilitate life. In addition to all of teacher candidates state that there is a relation between science and technology.

Keywords: science, technology, literate, teacher candidate

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Introduction

Educating next generation as science and technology literate person is an important issue nowadays. Technology, which is improved in unbelievable speed, requires that individuals should be a person who can keep up with the improvement and responsible person. To prepare students to a world, which is mostly dependent to science and technology, education is the most important thing. Especially science education plays a key role in promoting sensitivity to, and a personal sense of responsibility for, local and wider environments (Sese, 1999). Science, appears as a phenomenon when the human life begun, is a field, as was in the past, which arranges humans life systematically. Science takes place in the center of human life.

In Turkey, science education curriculum has revised and the name of the curriculum and department has changed to Science and Technology curriculum and department, in curriculum as is in developed countries, relation between science and technology emphasized and it is aimed to provide necessary skills and knowledge which are required to be counted as science and technological literate person (MEB,2004).

AAAS defined scientific literate person as is familiar with natural world, can understand basic principle and key concepts of science, can think in scientifically, can realize the advancements in science, technology and mathematic (Castelão, 2002). In todays society, to participate the society requires educated person and especially requires scientific and technological literate person (Bretz, 1994).

Relationship between science and technology is continuous and endless. Science produces knowledge for itself and technology use this knowledge to solve teal life problems. As of course science uses technology to produce knowledge and technology use scientific knowledge to produce solution. So science and technology is connected and by their concepts and processes they are different (Bybee, 2000). ITEA (2000) define the relationship between science and technology, as “Science is practices of natural world, whereas technology improves humans capabilities to change the world. Science and technology are different concepts but they survive together. And technology is more than applied science.” In national science education standards technology defined as “Purpose of technology, to fulfill human needs, modifying the natural world” (NRC, 1996). Holland (2004) state that people should educate as should adapt innovation which comes with technological improvements, can define and solve the problems, at the same time can decide appropriately in a different situations which affect their lives and futures (Wang, 2003).

In an ideal science class to realize efficient learning process, teacher candidates should be educated about technological knowledge and skills beside content knowledge. Since educators’ responsibility is to educate people as qualified person, educators should be educated about technology and technology usage (Salamun, 2004).

Purpose

It can obviously be seen scientific and technological advancements affect human being lives and indisputably it will affect our lives in the future. When we consider that need to educate child to come up with scientific and technological innovations arise, in this process science and technology lesson’s play a key role. When different curriculum reform movements are reviewed, to educate all students as a scientific and technological literate person can be seen as a program goal (NRC, 1996). In this context, viewpoint of science and technology teacher candidates who educate next generation literate person, are critically important. So, in this study, it is aimed that defining science and technology teacher candidates’ perceptions about science and technology.

Method

Phenomenological research approach from the qualitative research methods has been adopted as the research method to reveal science and technology teachers’ perceptions about science and technology. Daymon and Holloway (2002, 153) stated that at the core of phenomenology is the study of people’s worlds along with their subjective experience of their personal, everyday lives.

Working group

Research population consisted of 93 sophomores who registered Science - Technology Program and Planning course in College of Education. When defining research participant, 135 teacher candidates were informed about the study and after that 93 volunteer participated to study.

Measuring Tool

To obtain research data, a form, which contains open-ended questions, were developed by researchers. And the form was given to 4 field experts. Field expert's reviewed form and commented about the form. In the light of field expert's view form enhanced. Form contains questions about the explanation of idea's about science, technology and relation between science and technology.

Data Collection and Analysis

Research data collected by administering this form. Content analysis was applied to obtained data. Data were analyzed separately by two researchers and coded separately. Then, codes were compared, the code which coder have consensus were taken into consider and the codes which coder had no consensus discussed and consensus were made. After coding and discussing about the codes and theme were revealed. In the findings section themes were presented by supporting by direct quotations.

Findings

The themes obtained as a result of coding the data obtained from the views of the teacher candidates are provided below. The numbers given in parentheses with the themes indicate the number of views enabling the theme to be formed.

In questionnaire participants were asked to define **science**, themes derived from the definitions of participants and direct quotations are above:

Science includes physics, chemistry and biology (55)

> *"science class includes and gathers physics, chemistry and biology subjects" S1*
> *"science is a knowledge domain… and consists of physics, chemistry and biology." S12*
> *"Science includes physics, chemistry and biology and its working area is these areas." S85*

Science is try to understand and identify earth, nature and creature in the world (22)

> *"is a discipline tries to explain and express that nature, lives of creature which live in nature, and the changes occur in nature." S31*
> *"examine the natural phenomena." S42*
> *"…is a discipline which explains natural and scientific phenomena. …..describe the world." S5*

Science is a discipline tries to examine everyday phenomena and cause effect relationship between them (18)

> *"…science explains the everyday phenomena and stands on concrete and physical phenomena." S51*
> *"… science help us to understand the phenomena which occur in our everyday lives. It formulize and explain the phenomena which we see but we do not realize or which we realize but we do not understand how happen…" S32*
> *"…science sheds light to our everyday lives. And helps to understand everyday phenomena which we could not realize in our lives…" S44*

Science is receptive about invention and progress with invention (3)

> *"…science is a class which we invent something."S64*
> *"science progress with developing technologies and inventions, and science is a discipline which was improved towards defined purposes." S79*

Science is everything related with science and technology (5)

> *"…everything in our lives related science and technology …"(S10)*

In questionnaire as second question participants were asked to define **technology**, themes derived from the definitions of participants and direct quotations are above:

Technology is the tools, applications, innovations, improvements and developments which facilitate our lives and improve our lives, and it is made with the help of scientific knowledge (82)

> *"things facilitates human's lives. For example computer, cell phone and washing machine" S81*
> *"systems developed to facilitate human lives" S36*
> *"technology is improvement which are made with help of already knew. These improvements facilitate human lives and cause development. S38*
> *"technology is improving tools and appliances which facilitates human lives." S42*

The tools necessary to live, development and learning (10)

> *"…composed material like microscope. S67*
> *"…the tools which facilitate teaching and learning processes." S4*

All the things which fulfill human needs (12)

"emerged to fulfill human needs also." S39
"…emerged construction to fulfill human needs and satisfy human." S60
"technology…… the tools which increase living statue." S29

Innovations which are not limited with electronically devices (2)

"Technology; is not just only electronically devices. For example shoelace is a technology." S86
"technology is the improvements which occur many area not only electronically devices" S61

Improvements contain harm besides benefits (5)

"Generally technology contain the things which facilitate lives but besides that it contains harm things"S33
"sometimes is shifted from their purpose. For example weapon technology…" S21

In questionnaire; last question was concerned that **the relationship between science and technology,** themes derived from the definitions of participants and direct quotations are above:

All of the participants stated there is a relationship between science and technology. Their views themed and the themes are above;

Technology provide development in scientific knowledge and fulfill needs and also support science education (65)

"while we are teaching science classes, technology gives many opportunities. To teach science well, technology is important." S20
"…without technology, science education should be deficient. And without technology students can not learn good." S37
"…using technology in science classes abstract concepts can come concrete and technology can be used in this way." S46
"...with the help of technology we can study/examine atom and related issues or we can see creatures which we cannot see by our eyes and we can diagnose issues easily..."S84

Science and technology affect each other (18)

"…as technology develops, science develops. And as science develops, technology develops." S38
"…as science develops, produce knowledge and this knowledge help to improve technology." S78

Technology is application of science (5)

"Technology is applied form of science." S24
"science discover what is what and technology carries out to reality." S51

Science affects technology (7)

"…The works are done in scientific discipline, and advancements affect technology." S1
"…innovations, which are done in a scientific domain, can help to develop technology." S30

8. Discussion, Conclusion and Suggestions

According to science definitions of teacher candidates; it seems that most of teacher candidates define science as which consist of physic, chemistry and biology. Of course science is different from and more than the constitution of physics, chemistry and biology. As stated by Ziman (1968) science cannot explain with one sentence and can explain with some component. At the same time science teacher candidates explain science as is a discipline tries to understand and describe nature and creature and examine everyday phenomena. Similar with the definitions Cobern and Loving (2001) describe science as; is a discipline, which tries to describe and explain pattern of natural phenomena

According to another result, teacher candidates define technology as tools, applications, inventions and/or improvements facilitate life. A few participants stated technology is not limited with tools and contains some disadvantages. Majority of society perceive technology high-end technology tools (for example TV, computer, internet). However as stated by a few participants, technology is not only high-end technology tools but also actions, which thought to facilitate human lives, and carried out to reality can be named as technology. Almost all of the participants define technology from the view of advantages.

According to the results, all of the participant teacher candidates stated that there is a relationship between science and technology. When participants' views are examined, they mostly underline instructional use of technology. They stated that utilizing the technological development and tools, efficient science teaching can be realized and new scientific knowledge can be discovered. The reason why most of the participants stated in that way, most of the participants think high-end technology tools as technology and most of these tools are used in their classes. At the same time, they stated that there is a relationship between science and technology and this result is similar with the literature. Bybee (2000) state there is a continuous and endless relationship between science and technology and this study's result is similar with the Bybee. Science produce knowledge for itself and technology develops human made solutions to solve real world problem. Of course science uses technology to produce knowledge and technology uses scientific knowledge to produce solution.

To be understood science concepts better by science teacher candidates, science classes should be related with everyday life. And while teaching technology, technology concept should not be thought with one dimension, all dimensions should taken account. As result, ship made with the help of force of buoyancy, pressure cooker made with pressure, and many technology developments made with the help of scientific knowledge and there is a two way relationship between science and technology should be thought.

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STUDENTS’ EXPECTATIONS TOWARDS ONLINE COLLABORATIVE LEARNING ENVIRONMENT

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Abstract

This research investigated the factors that would encourage students’ participation in online asynchronous discussion and their expectations towards the lecturers’ role in facilitating the discussion. A quantitative research design was used in the present research where data was gathered using a set of five-points Likert scale questionnaires. 230 undergraduate students were randomly selected to participate in the research. Overall findings showed that students now have high expectations towards the online collaborative learning environment and therefore the lecturers have to be aware of the students’ expectations particularly while facilitating students’ online asynchronous discussion.

Keywords: Online collaborative Learning; Online Learning; Online Forum; Online Asynchronous Discussion

Introduction

Online learning has captured the attention of many higher learning institutions and at present the implementation is greater enhanced. Traditional learning approaches such as collaborative learning can now be implemented online due to the advancement of technologies for Web 2.0 tools. The nature of online collaborative learning environment is where the students interact with each other in an online learning course for the purpose of sharing knowledge or working together in an unstructured environment. The unstructured nature of collaborative learning demands facilitation from the lecturers where lecturers play the role to trigger and manage interactions.

Based on the needs of online collaborative skills among the students and the needs of facilitation support from the lecturers, this research was carried out. It was divided into three parts which is first; the students were asked about the skills that they had obtained with respect to their previous online learning experiences in asynchronous discussion, secondly what were the expected conditions that would encourage them to participate in collaborative online discussions and finally, what were their expectation towards lecturers’ role in facilitating discussion in online collaborative learning. Therefore the following research objectives were addressed:

To investigate factors that would encourage students’ participation in online asynchronous discussion.
To investigate students’ expectations on the lecturers’ roles in facilitating online asynchronous discussion in online collaborative learning environment.

Literature Review

Students’ learning is often associated with issues such as having difficulties to understand certain concepts and facts. Discussions have played significant role in enhancing students’ understanding where the students seek for verification, shared knowledge, compare and contrast their opinions with the experts, peers or the lecturers (Corden, 2001). Through Internet applications such as online discussion, the power of discussion is greater enhanced where other people’s opinions in solving learning problems can be accessible through online discussion (Tiene, 2000; Clark, 2003). Liaw (1999) stated that there are several potential benefits of online communication and typically, it is possible through group communication via collaborative learning. When students interact with their peers, they are able to build their own knowledge and negotiate meaning thus

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building up the interactions (Waltonen-Moore *et al*., 2006). However, simply placing the students in groups and settings that allow communication do not necessarily triggers changed of opinions for learning (Chung et al., 2008). Thus, the internet applications for learning (online learning) should integrate a collaborative learning environment to ensure students' learning within the context.

Collaborative learning emerged from the perception that learning takes place through socialization (Jeon, 2000). Learning is conceive as a property of the group (social and cultural), not the individual participant (Tu & Yen, 2007). Upon interaction with others, students can acquire new knowledge and accommodating the knowledge with the existing cognitive framework (Nyikos & Hashimoto, 1997). The purpose of collaborative learning is to get the students to learn by working together to solve learning tasks (Kumar, 1996; Gros, 2001) where students are found to possess knowledge sharing behaviour in a CSCL environment through the implemented peer-assisted learning (Auttawutikul & Natakuatoong, 2008). An individual does not own the knowledge and intellectuality, but it is shared among the community of practice. One of the underlying principles to engage students in learning and knowledge construction is collaboration (Jonassen et al., 1995).

Teachers or lecturers in collaborative learning are as the facilitators and consultants (Panitz, 1996). They are one of the members of the community for constructing knowledge who help to resolve conflicts and facilitate the learning process (Barkley, Cross & Major, 2005; Alavi & Dufner, 2005). They are not the ultimate source of information and that collaborative learning is not the practice of 'one-way knowledge transmission' as in traditional classroom (Harasim, 1990). However, the roles of facilitators in online collaborative learning are really important and what are students' expectations towards their roles should be explored.

Online collaborative learning is possible with the availability of online learning tools such as the online discussion forum. The asynchronous online discussion have gained educators' interest due to several advantages that they serve to learning (Valcke et al., 2009; Smet, Keer & Valcke, 2008; Solimeno et al., 2008). Asynchronous online discussion gives students retention time to reflect upon their learning (Sahu, 2008; Solimeno et al., 2008) as they can have enough time for 'thoughtful communication' (Goldsmith, 2002) and they have no urgency to respond to questions in online learning compared to question-answer in traditional settings (Sahu, 2008).

Many researchers investigated on the uses of this tool in collaborative learning settings, however, it is important to note students' readiness and the skills that they have before such implementation is made possible. Investigating students' available skills and perceptions will provide the information on whether pre-support should be provided or, were there any existing learning barriers that might inhibit successful learning (Vonderwell & Savery, 2004). Shraim and Khlaif (2010) indicated that students might show positive perception towards online learning but their level of readiness might show the dissimilarity. Corden (2001) also added that students' learning in his collaborative learning research settings tend to associate their previous experiences in traditional classroom, and making the students' collaborative learning to be inconsistent. That is, when they were given a task, they can work collaboratively but at times, they also preferred to work individually and independently (Corden, 2001).

The current situation draws our attention to be prepared beforehand upon implementation of online collaborative learning environment. Pre preparation should be carried out by investigating students' perceptions on online collaborative skills and what were their expectations on the lecturers' role before efforts were given for implementation.

Methods

The samples of this research are all final year students of Faculty of Education from one of the Malaysia's universities. There are approximately 350 students as the population of the research. A total of 230 samples were randomly selected from the population. The sample size is determined using the Table for Determining Sample Size from a Given Population by Krejcie and Morgan (1970). According to Krejcie and Morgan (1970), the minimum number of sample should be selected from a population of 360 students is 186. Since the number of population of this research is less that 360, the selected 230 samples should be enough to represent the population.

A pilot study was conducted to establish validity and reliability of the instrument. According to De Vos et al. (2002), the purpose of the pilot study is "to improve the success and effectiveness of the investigation". Cronbach alpha reliability coefficient of the questionnaire was conducted using the reliability analysis with SPSS software and the overall alpha for the questionnaire is 0.857.

The research instrument of this research is a set of questionnaires that consists of several parts as the followings:
Part A: Demographic Data
Part B: Perceptions on factors that would encourage students' participation in online asynchronous discussion
Part C: Students' expectations on the lecturers' roles in facilitating online asynchronous discussion in online collaborative learning environment

Part B and C use five-point Likert Scale, which range from Strongly Disagree, Disagree, Somewhat Disagree, Agree, and Strongly Agree. The data from questionnaire was analyzed using Statistical Packages for Social Science (SPSS) version 13. The data obtained was interpreted for frequency, percentage, mean, and standard deviation.

Results

4.1 Demographic Data

Majority of the students (77.8%) were females which reflected the demographic of the entire cohort of final-year pre-services teachers in Malaysia. Most of them (97.4%) had experienced using the existing university's e-learning system for 4 semesters and more (Please refer to Table 1).

Table 1. Experiences in using university's e-learning system

Experience	**N**	**Percentage (%)**
1 semester	0	0.0
2 - 3 semesters	5	2.2
4 - 5 semesters	12	5.2
6 - 7 semesters	78	33.9
More than 7 semesters	134	58.3
Total	**230**	**100.0**

Since most of students in this study had been using UTM's E-learning system for duration of 4 semesters and more, therefore this study also identified types of learning activities that they had experienced through the online asynchronous discussion in the e-learning. Table 2 shows the learning activities that they had with E-learning; group projects, case study discussions, and sharing of solutions for homework problems. All of these learning activities were related to collaborative-based learning activities.

Table 2. Students' learning activities through online asynchronous discussion

No.	**Learning activities**	**N**	**%**
1.	debates	60	26.1
2.	**group projects**	**186**	**80.9**
3.	**case study discussions**	**127**	**55.2**
4.	simulations	29	12.6
5.	role-playing exercises	40	17.4
6.	**sharing of solutions for homework problems**	**145**	**63.0**
7.	collaborative composition of essays, stories, and research plans	59	25.7
8.	a dialogue with their peers about the weekly readings	65	28.2
9.	reading and responding to pertinent texts such as books or journal articles	97	42.2
10.	active questioning of important issues	103	44.8

This study is also interested to find out the types soft skills that they think would help them to survive or might encourage them to participate in online discussion. Table 3 displays the skills and majority agreed that critical thinking, openness, and willingness to share of ideas were the soft skills that they should have. From the data, most of the students still did not agree that assertiveness and selflessness were the soft skills that they should have to participate in online asynchronous discussion. This might common among students in Asian countries compared to students from Western countries where shyness was not an issue among students in Western countries.

Table 3. Types of students' soft skills in online discussion

No.	Types of soft skills	N	%
1.	**Critical thinking**	**187**	**81.3**
2.	**Willingness to exchange of ideas**	**139**	**60.4**
3.	Critical reflection	127	55.2
4.	**Openness**	**154**	**67.0**
5.	Sincerity	121	52.6
6.	Selflessness	69	30.0
7.	Assertiveness	44	19.1

Despite having difficulties with online asynchronous discussion, the research would like to know whether the respondents were actually familiar with these online communication tools such as chat, online discussion forum, email, online quiz, Blog, Facebook etc. It was found that most of the respondents were familiar with several online social networking tools such as Facebook and Email (see Table 4). Other online communication tools such as Slideshare, Twitter, Skype, and Flickr were not the tools frequently used by the respondents.

Table 4. Frequency of usage of online communication tools

No.	Online Communication Tools	No Experience at all		Frequent usage	Mean	SD
		N	%	(%)		
1.	Chat	14	6.1	68.7	3.79	1.43
2.	Online Discussion Forum	18	7.8	55.2	3.42	1.42
3.	Sending personal message	24	10.4	60.9	3.43	1.57
4.	**Email**	**22**	**9.6**	**70.9**	**3.72**	**1.55**
5.	Online Quiz	42	18.3	47.4	2.87	1.70
6.	Online Journal	55	23.9	44.7	2.77	1.87
7.	Blog	92	40.0	34.5	2.14	1.99
8.	**Facebook**	**12**	**5.2**	**82.2**	**4.19**	**1.30**
9.	Slideshare	108	47.0	33.1	1.98	2.05
10	Twitter	173	75.2	9.1	0.73	1.44
11.	Skype	133	57.8	18.7	1.31	1.74
12.	Flickr	182	79.1	4.4	0.47	1.07

4.2 Students' perceptions on factors that would encourage students' participation in online asynchronous discussion

Students' perceptions on factors that would encourage students' participation in online asynchronous discussion will actually reflect students' knowledge and readiness towards required online collaborative learning skills. These perceptions will be discussed based on its dimensions.

The first dimension of the perceptions is support and it has been defined as students' perceptions towards supporting factors that will increase students' participation in online discussion forum where students need to collaborate with their friends and lecturers. There are three items that focus on this dimension and the finding of the data analysis is displayed in Table5.

Table 5. Supporting factors to encourage participations in online discussion - Support

No	Items	Mean	SD
4.	Motivation from peers is an important factor to encourage discussions through online discussion forum.	4.27	0.63
7.	In order to response peer comments through online discussion toward related topics that have been learned in a class, I need to read more.	3.99	0.68
11.	Collaboration among peers will shallow due to the lack of affective peer support.	3.90	0.75
	Overall	**4.05**	**0.47**

*N = 230

Based on the findings in Table 5, it can be concluded that respondents agreed that motivation and affective support from peers and knowledge in the discussion topics are supporting factors that will encourage students' participations in online discussion.

The next dimension of the perceptions is outcome and it focuses on the outcomes that the students will get from active participation in online discussion forum. There are eight items that focus on this dimension and the finding of the data analysis is displayed in Table 6.

Table 6. Supporting factors to encourage participations in online discussion - Outcome

No	Items	Mean	SD
21.	Sharing ideas and communicating personally through online collaborative learning will stimulate new ideas and reinforce current views.	4.21	0.66
13.	Through online discussion forum, I am able to understand of the constructive use of online communication tools.	4.07	0.66
12.	Through online discussion forum, I am able to recognize the value of a supportive learning community.	4.03	0.68
14.	Discussions and Collaboration through online discussion forum could develop my “metacognitive knowledge” (knowledge about one’s own cognition and the ability to monitor the assumptions and implications of one’s activities).	3.97	0.75
20.	Online collaborative learning provides opportunities to enhance personal construction of knowledge.	3.97	0.69
19.	Online discussion forum will engage me with peers to argue and negotiate certain issues for the construction of knowledge.	3.92	0.81
16.	I discovered that online communication had provided psychological support such as reducing the feeling of isolation.	3.91	0.73
17.	Discussions through online discussion forum make me always interdependence towards my classmates.	3.81	0.83
	Overall	**3.99**	**0.48**

*N = 230

Based on the overall mean of this dimension, respondents agreed with all the outcomes that they will get from participation in online discussion (Refer Table 6).

The third dimension of the perceptions is personality and it covers students’ personality regarding their belief and behaviors when participating in online discussion forum. There are 5 items that focus on this dimension and the finding of the data analysis is displayed in Table 7.

Table 7. Supporting factors to encourage participations in online discussion - Personality

No	Items	Mean	SD
10.	By trusting my classmates, I will feel a sense of belonging when responses towards their comments.	4.07	0.68
9.	I will willingly share my tentative ideas or critically challenge others’ opinions when I trust my peers.	4.03	0.70
18.	I responsible and accountable towards my responses through the e-learning forum.	4.02	0.66
6.	I am an active user of e-learning forum where I will post/response as many comments as I can.	3.70	0.92
5.	I am an observer person where I only like to read other peer comments in the e-learning forum rather than responses toward the comments.	3.69	0.91
	Overall	**3.90**	**0.49**

*N = 230

The fourth dimension of the perceptions is technique and it covers techniques or styles on how students participating in online discussion forum. The data analysis is displayed in Table 8.

Table 8. Supporting factors to encourage participations in online discussion - Technique

No	Items	Mean	SD
3.	The use of emoticon such as smiley face icon (☺) can represent peer feeling towards the posted response.	4.34	0.66
2.	We should respect and never look down at any response by peers in the e-learning forum.	4.30	0.64
15.	Students should actively questioning and responding towards comments posted by peers.	4.10	0.68
1.	Responses by peers in the e-learning forum should be responded by team members immediately.	4.00	0.74
8.	Posting a negative comment towards peer responses will kill the enthusiasm of the peer to contribute ideas in the future.	3.75	1.02
	Overall	**4.10**	**0.49**

*N = 230

4.3 Students' expectations on lecturer roles in facilitation

The success of online discussion between students and lecturer is also depending on students' expectations on the roles of lecturers in facilitation. Table 9 displays the related analysis of data.

Table 9. Students' expectations on Lecturer Roles in Facilitation

No	Items	Mean	SD
11.	A lecturer should appreciate both students' positive and negative responses in e-learning forum.	4.38	0.57
10.	A lecturer should be open-minded when reading the comments from students in e-learning forum.	4.35	0.63
6.	A lecturer should actively questioning and responding towards comments posted by students.	4.30	0.64
7.	Motivation from lecturer is an important factor to encourage discussions through e-learning forum.	4.27	0.70
12.	A lecturer should encourage and maintain informal way of communication through the online forum.	4.23	0.69
1.	The role of lecturers in e-learning forum is as a facilitator.	4.19	0.67
5.	To encourage students' discussion through e-learning forum, a lecturer should pro-actively plan structured online collaborative activities.	4.17	0.67
8.	Ongoing and comprehensive monitoring of student behaviour and interaction in the e-learning forum should be done by a lecturer.	4.14	0.65
2.	Lecturers need to manage the discussions through the e-learning forum.	4.11	0.72
3.	A lecturer is required to be responsive and resilient in managing the discussion	4.10	0.72
4.	A lecturer is required to manage group dynamics among students.	4.07	0.69
9.	Sufficient guidance from a lecturer throughout the discussion of each issue through the e-learning forum must be provided by a lecturer.	4.07	0.69
	Overall	**4.20**	**0.46**

*N = 230

Discussion

Based on the research findings, students had experienced some of active learning activities through online discussion forum such as group projects, sharing solutions of learning problems, case study discussions, and active questioning of important issues. These types of learning activities are relevant nowadays where university's students are encouraged to collaborate and share information, ask questions, and critique ideas from peers whenever possible. To make sure students are able to participate in those activities, certain soft skills are required such as critical thinking, willingness to exchange ideas, openness, critical reflection, sincerity, and selflessness. Findings of this study show that most of the students agreed on most of the required soft skills. Those soft skills also are required for collaborative learning.

This study also found that most of the students frequently used Facebook, email, and chat to communicate with other people. With the available experiences, it is predicted that most of them should be comfortable enough to communicate through online communication tools. Students' favour towards using Facebook is not surprising as it is aligned with a statistic reported by McDowell and Morda (2010) where there are 500 million of users registered Facebook and data from Office of Communication (OFCOM, 2008) reported that half of the users who registered themselves in social media including Facebook are teenagers. Students' perceptions on factors that would encourage students' participation in online asynchronous discussion and their expectations on the lecturers' roles in facilitation were also explored. Overall, the findings show that students agreed on all the factors where most of them agreed that motivation and affective supports from peers are required to increase peer participation in online forum.

They also agreed that participations in online discussion will be able to develop their understanding of the constructive use of online communication tools and metacognitive knowledge. Besides that through online discussion, they will be able to recognize the value of a supportive learning community and able to construct personal construction of knowledge. Most of the students also agreed that online discussion will make them engage with peers for knowledge construction, provide psychological support such as reducing the feeling of isolation, and stimulate new ideas and reinforce current views in learning. For the interdependence towards classmates, they only somewhat agreed on this factor.

Kim and friends (2005) reported that although seventy percent of the students describe positive experiences with online learning, sixty percent of the students perceived online learning as being more challenging than face-to-face course due to difficulty in communicating with peers as there are absence of emotional connection. Therefore, the use of emoticon is the best way to represent user's emotion through online. Findings of this research also show that students agreed that peers should respect and never look down at any response by others peers in the e-learning forum. This is important because posting a negative comment towards peer responses will kill the enthusiasm of the peer to contribute ideas in the future. Students' expectations towards roles of lecturers in facilitation in online discussion forum were at high level. This shows that students put a high expectation towards lecturers' roles as a facilitator. A study conducted by Tasir et al. (2005) found that lecturer should use online forum actively before students did so. The findings of the current study are consistent with those of Mazzolini & Madison (2007) who found that facilitators play an important role in engaging students towards an active discussion.

Conclusion

In conclusion, this study revealed that students agreed on all the factors that would encourage students' participation in online asynchronous discussion. They agreed that supports from peers and techniques to participate in online discussion forum were the important factors in online collaborative learning environment. Besides that, students' personality and their beliefs on the outcome of the online discussion forum also played an important role. Students also put a high expectation on the lecturers' roles in facilitation in online discussion forum where they believed lecturers should appreciate students' responses and be open-minded when reading the comments, and also actively questioning and responding towards the comments. Based on the findings, it can be concluded that both facilitator and students plays important roles to produce an effective online collaborative learning environment.

Acknowledgement

The authors would like to thank the Universiti Teknologi Malaysia (UTM) for its support in making this project possible. This work was supported by the UTM's Short Term Grant [77251] initiated by UTM.

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STUDENT PERCEPTIONS OF AN EDUCATIONAL TECHNOLOGY TOOL: VIDEO RECORDINGS OF PROJECT PRESENTATIONS

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Abstract

The primary goal of this study was to investigate students' perceptions of how incorporating a technological tool into the classroom education, the use of video camera for recording as well as discussing in-class group project presentations, influences their oral presentation, communication and career-related skills, learning motivations, and overall course evaluations. The research was conducted with 82 students enrolled in an undergraduate marketing course at a private university in Turkey. The findings illustrated that students evaluated the video-recorded presentations integrated into learning environment as highly effective at enhancing the learning outcomes and enriching the classroom education.

Keywords: Educational technology; video; skills; learning outcomes; affect

Introduction

Contemporary marketing strategies require technological knowledge and skills for conducting successful goal-directed business activities. Therefore, business school educations should provide technological competence and application of technology to improve students' abilities to perform more efficiently and effectively in their future careers (Chonko, 1993). In recent years, marketing educators in particular have been trying to satisfy these current needs of business and industry by incorporating the latest technologies into their courses. Previous research has shown that educational technology tools enhance student learning and develop career skills (Clarke, Flaherty, & Mottner, 2001; Hunt, Eagle, & Kitchen, 2004; Kırkgöz, 2011; McCabe & Meuter, 2011; Young, Klemz, & Murphy, 2003). However, further research with clearly defined multiple learning outcomes and supported with empirical evidence is needed to understand the role of educational technology on learning (Clarke, Flaherty, & Mottner, 2001; Hunt, Eagle, & Kitchen, 2004; McCabe & Meuter, 2011; Young, Klemz, & Murphy, 2003). Thus, this study aims to broaden the existing body of knowledge by examining the impacts of incorporating an educational technology tool into the classroom education, the use of video camera for recording and then discussing in-class group project presentations, on five student-perceived outcomes: oral presentation skill, communication skill, career skill, learning motivation, and overall course evaluation. It also investigates students' evaluations of this educational technology, and how these evaluations are related with the learning outcomes perceptions.

An Educational Technology Tool: Video Recordings

Educational technology tools, which include online media-rich e-books, syllabus, cases and other course materials, chat rooms, electronic bulletin boards, CD-ROMs, laptop computers, PowerPoint slides, videos, and many other instructional technologies, are expected to increase student engagement, motivation and learning (Clarke, Flaherty, & Mottner, 2001; McCabe & Meuter, 2011; Odhabi & Nicks-McCaleb, 2011; Young, Klemz, & Murphy, 2003).

With regard to video recordings, earlier studies showed that students may benefit from the use of video cameras in classroom and other learning environments in several ways including viewing recordings of missed lectures, and reviewing particular lectures as exam and assignment preparation at home (Odhabi & Nicks-McCaleb, 2011). Kırkgöz (2011) posit that integrating video-recording of student speaking in language learning enables students to watch and evaluate their performances, and make the necessary improvements. The contributions of this instructional technology to learning are still being examined in different fields, such as teacher preparation and life oral history collection (Christel & Frisch, 2008; Dymond & Bentz, 2008). Educators are also exploring ways to record and distribute lecture videos with minimum effort and cost (Chandra, 2007). However, additional research is needed to encourage educators to incorporate video recording techniques into the classrooms education, and to provide clear guidelines (Chandra, 2007; Kırkgöz, 2011). In this regard, the discussions of group project presentations by students based on video recordings are likely to enhance learning outcomes.

Anticipated Learning Outcomes

Since business schools may have a range of institution-specific objectives, there is no universal list of learning outcomes (Duke, 2002). However, many researchers suggest developing multiple learning outcomes specific to an education program, teaching method or instructional technology, and evaluating these outcomes on several different aspects by gathering the perceptions of students, employers and faculty (Clarke, Flaherty, & Mottner, 2001; Duke, 2002; Marks, 2000). Thus, this research examines the impacts of both the process of video recording in-class group project presentations and the discussions that arise from viewing these recordings on students' perceptions of five learning outcomes: (1) oral presentation skill, (2) communication skill, (3) career-related skill, (4) learning motivation, and (5) overall course evaluation. These dimensions were determined based on the aim of meeting the needs of business world.

Oral presentation skill

After graduation, students quickly discover the importance of the appropriate presentation of self in job interviews, and later, in professional presentations that may impact their future careers. In addition, students may learn from each other by actively participating in learning process, namely during presentations (Chonko, 1993). Oral presentation skills can be defined as ability to manage speaking tone, pace and body movements, to hold the attention of the audiences, to maintain adequate eye-contact and to handle the questions well (Magin & Helmore, 2001). With regard to technology, Özad and Kutoğlu, (2004) argued that students may prefer to use visual aids like VCD or power points in their presentations to make easier to present their ideas, to get the attention of the audience or to feel more confident and relaxed during their presentations. Therefore, the integration of video-recording of project presentations in learning environment has the potential to improve students' oral presentation skills.

Communication skill

Duke (2002) showed that students perceived communication skills as highly important for their future careers. Ability to speak effectively to groups, to communicate at the correct level of detail and to communicate orally are some of the crucial skills that students need in order to meet the expectations of the businesses. Unfortunately, business schools have been criticized for failing to provide graduates with oral and written communications of a sufficiently high standard (cf. Chonko, 1993). Projects, role-playings and presentations are recommended as examples of activities which are able to integrate communication skills into core marketing courses, and thus play a role in the redesigning of marketing education to meet the needs of the external business environment (Young & Murphy, 2003). Technology provides the ability of managing information and developing communication skills for marketing graduates (Hunt, Eagle, & Kitchen, 2004). Thus, group project presentations blended with video-recording can enhance learning outcomes in the communication skill context.

Career-related skill

The fundamental goal of business school and marketing education is to develop the skills required in today's complex, competitive, and changing work atmosphere (Hunt, Eagle, & Kitchen, 2004; Marks, 2000). Such skills that are needed by graduates include those that are needed for career preparation such as a good surrogate for real world experiences; those that are needed at the beginning of their careers such as job application skills; and those that are needed later, relating to job performance, such as conducting business meetings and giving presentations (Barnett, Greenberg, & Nicholls, 2007; Clarke, Flaherty, & Mottner, 2001; Duke, 2002). Clarke and his colleagues (2001) showed that educational technology tools play an effective role in preparing marketing students for employment, and real-world problems and tasks. Hence, the video recording of in-class group project presentations for subsequent discussions can be beneficial for students' career-related skills.

Learning motivation

In general, marketing educators can motivate their students to spend more time on course tasks by creating an effective technological learning environment (McCabe & Meuter, 2011). In particular, students' motivations to attend to educational activities may be closely related with the degree to which technological tools used in these activities help them to achieve their employment goals (Clarke, Flaherty, & Mottner, 2001). Thus, in examining the impact of technology on learning, Leidner and Jarvenpaa (1995) recommended to use self-efficacy, affect and motivation as learning outcome variables. Motivation variable can be defined as the degree to which a student is motivated by a particular method (cf. Leidner & Jarvenpaa, 1995) or the extent to which a method of instruction motivates a student to work hard in the course (Young & Murphy, 2003). As a result, incorporating video recording of in-class group project presentations into the classroom education has the potential to motivate students to work hard for their presentations.

Overall course evaluation

A positive relationship between the preferences of certain instructional methods and overall attitude toward the marketing major has been found in prior research (Davis, Misra & van Auken, 2000). Notably, Young and his colleagues (2003) suggested using group project-based instructional methods to improve student learning performance and pedagogical affect. Moreover, when the technology is integrated into teaching and learning, such as using laptop computers in class, students are likely to have more favorable evaluations toward the pedagogical method, and in turn to have higher levels of knowledge gained, effort expended, and skills developed (Young, 2001). Consequently, the educational technology tool deployed in this study can improve students' overall course evaluations.

Methodology

This study was conducted with 82 students enrolled in an undergraduate marketing course at a private university in Turkey. The research process consisted of two stages: in the first stage, the lecture recorded students' in-class group project presentations on a weekly basis, and in the second stage, on the following day, students viewed the video-recordings, discussed their performance with the lecturer, and finally evaluated the use of video-recorded presentations integrated into learning environment by completing a survey.

Sample characteristics

Although 90 students participated in group project presentations, due to the absenteeism during survey administration, the response rate was 91%, yielding an effective sample of 82. Most of the students were in the second (50%) and third (34%) year of their undergraduate education, and studying public relations and advertising (59%). 72% of the respondents were female and 28% male. The average respondent age was 22.

Variables

Oral presentation skill was operationalized using by five items (ability to manage speaking tone, manage body movements, hold the attention of the audiences, maintain adequate eye-contact, and respond effectively to questions). Communication skill was measured by three items (ability to speak effectively to groups, communicate an appropriate level of detail, and communicate orally) adapted from Duke (2002). Career skill was assessed by a mixture of five items adapted from previous research (ability to get a job, expected performance on job, ability to conduct business meetings, ability to make professional presentations, and serving as a good surrogate for real world experiences) (Barnett, Greenberg, & Nicholls, 2007; Clarke, Flaherty, & Mottner, 2001; Duke, 2002). Learning motivation was measured by using two items (work hard for the presentation and study more to better learn the presentation topic) adapted from Leidner and Jarvenpaa (1995), and Young and Murphy (2003).These measurements were scored on a 7-point Likert-type scale, with the high end of the scale denoting a completely agree response ("In my opinion, the use of video camera for recording and discussing group project presentations provided me high level of ability…/ motivated me to…").

The four-item scale (effective/ineffective, useful/useless, satisfactory/unsatisfactory, good/bad) which was developed by Mitchell and Olsen (1981) and then adopted by Davis, Misra, and Van Auken (2000) was employed to measure the positive thoughts and feelings of students toward the educational technology tool used in this course. The same scale with four additional items (valueless versus valuable, good use of my time versus waste of my time, not enjoyable and desirable versus undesirable), which was modified from Davis, Misra, and Van Auken (2000), was used to measure overall course evaluations of students. The statements "Overall, in this class, the use of camera for recording and discussing group project presentations to assist learning…/overall, this course was…" were measured on a 7-point semantic differential scale.

Results

As shown in Table 1, average rating of oral presentation skill indicated that students evaluated the use of video camera for recording and discussing in-class group project presentations as having positive impact on their ability to make presentations (*M* = 5.73, *SD* = 1.16, cronbach alpha = .93). Similarly, the mean score of the communication skill demonstrated favorable students evaluations regarding the integration of video-recorded project presentations into learning environment to improve communication skills (*M* = 5.70, *SD* = 1.04, cronbach alpha = .88). As expected, results illustrated that students perceived blending classroom learning with video-recorded presentations as highly effective in developing their career-related skills (*M* = 6.14, *SD* = .83, cronbach alpha = .81). With regard to learning motivations, students responded favorably to the use of video camera to increase their motivations to work hard (*M* = 5.89, *SD* = 1.08, cronbach alpha = .78). The findings also revealed that students ' thoughts and feelings toward incorporating video recording of group project presentations into the classroom education were highly positive (*M* = 6.27, *SD* = .95, cronbach alpha = .92). Likewise, their perceptions of the overall value of the course were highly favorable (*M* = 6.44, *SD* = .67, cronbach alpha = .93). In conclusion, these findings showed that all the anticipated learning outcomes were achieved through the educational technology tool deployed in this course.

Table. Student Evaluations of Anticipated Learning Outcomes (N = 82)

	Mean[a]	Standard Deviation	Cronbach Alpha
Oral presentation skill	5.73	1.16	.93
Communication skill	5.70	1.04	.88
Career-related skill	6.14	.83	.81
Learning motivation	5.89	1.08	.78
Pedagogical Affect	6.27	.95	.92
Overall course evaluation	6.44	.67	.93

The results of one-sample t-tests showed that the means of all of the items are significantly greater than 4 ($p < .01$).

To further investigate the impacts of student evaluations of this educational tool on the learning outcomes, the correlations between these variables were measured. The results are presented in Table 2. As can be seen, there was a strong, positive correlation between pedagogical affect and oral presentation skill (*r* = .55), communication skill (*r* = .58), career skills (*r* = .55), and overall course evaluations (*r* = .57, *n* = 82, *p* < .01). Only learning motivation and pedagogical affect was moderately correlated (*r* = .40, *n* = 82, *p* < .01). The reason for this may be student claims that they were unaware that presentations were to be recorded, and therefore were not motivated to make a greater effort in preparing their presentations.

Table. Correlation Matrix of Learning Outcomes (N = 82)

	Pedagogical affect	Presentation skill	Communication skill	Career skill	Learning motivation	Course evaluation
Pedagogical affect	1	,547**	,584**	,555**	,406**	,568**
Presentation skill	,547**	1	,848**	,430**	,471**	,334**
Communication skill	,584**	,848**	1	,534**	,493**	,446**
Career-related skill	,555**	,430**	,534**	1	,554**	,678**

Learning motivation	,406**	,471**	,493**	,554**	1	,361**
Course evaluation	,568**	,334**	,446**	,678**	,361**	1

**p < .01

Conclusion

This study implies that recording group project presentations on video and using these videos to evaluate student performances were perceived as an effective, useful, satisfactory and good instructional technology in promoting learning. Findings also revealed that this educational technology experience enriched classroom education by contributing positively to students' overall course evaluations.

Consistent with the literature, results demonstrated the positive influence of an educational technology tool on student learning. In particular, the video-recorded presentations integrated into the learning environment enhance skills which students may significantly benefit in their future careers. The perceived impacts of this educational experience indicated that the use of technology ensures students be able to make engaging presentations, to communicate successfully and to develop career-related skills. Moreover, the deployment of the instructional technology tool motivated students to study more for the course and the specific activity the educational technology targets.

In general, this study contributes significantly to the literature by providing a way of incorporating technology into classroom education to enhance student learning, and by examining its impacts on multiple learning outcomes specific to marketing major and business education. It can be said that by applying this method the needs of both students and business world that employs business school graduates can be met partially.

The current investigation has several limitations. Because the data was collected from a small sample drawn from a private university where students may have relatively high experience with different kinds of instructional technology methods in various courses, the findings may have limited generalizability. Thus, further research with larger samples that are exposed to different levels of technological tools in classroom education should be conducted. Another limitation is that this work did not investigate the impacts of demographic characteristic and educational background on students' perceptions toward this technological tool. Future studies should consider these factors while examining the effectiveness of video recording of student presentations incorporated into learning environment.

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TANGIBLE MULTIMEDIA: A CASE STUDY FOR BRINGING TANGIBILITY INTO MULTIMEDIA LEARNING

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Abstract

Multimedia augmented with tangible objects is an area that has not been explored. Current multimedia systems lack the natural elements that allow young children to learn tangibly and intuitively. In view of this, we propose a research to merge tangible objects with multimedia for preschoolers, and propose to term it as "tangible multimedia". To evaluate the feasibility of such multimedia prior to actual research, a prototype named *TangiLearn* has been developed for a case study. This paper is the report of what we discovered during the study. The study concluded that *TangiLearn* enhanced the preschoolers' enjoyment and learning performance.

multimedia; tangible multimedia; tangibility; tangible object.

Introduction

Tangible systems have been in existence across many computing domains nowadays, such as tangible user interface (TUI), augmented reality, and mixed reality, but there has not been any research on tangibility in multimedia learning for preschoolers. Even though some TUI researches have been observed to explore the coupling of tangible objects and multimedia objects, multimedia objects are not their main emphasis. The multimedia objects merely serve as testing elements for evaluating the usability of their physical user interfaces. The whole TUI research is on issues pertaining to tangible interaction, with the target to replace mouse, keyboard and computer screen (Marco, Cerezo, Baldassarri, Mazzone, & Read, 2009). In response to this, a "new genre" of multimedia learning system for preschoolers called "Tangible Multimedia Learning System" (or in short, tangible multimedia) that greatly capitalizes on "tangibility" of multimedia expression via tangible objects is conceived. We adopt the use of the term "tangible" from Ullmer and Ishii's researches (Ullmer & Ishii, 2001; Ishii & Ullmer, 1997) because the term carries the meaning that physical form is given to digital information. Unlike TUI system, tangible multimedia is designed based on real multimedia perspective. From its inception until prototyping, it was scratched up based on multimedia development model and the rule of multimedia design guidelines. A relevant comparative experimental research for the system has been planned in future. For formative evaluation purposes, we developed a low-fidelity prototype of tangible multimedia named *TangiLearn* for case study and this paper serves as a report for what we have found during the study.

Problem statement

A problem faced in current multimedia learning systems for preschoolers is the lack of natural elements and sense of tangibility that is truly adapted to their characteristics, learning capacities, and underlying cognitive developmental thinking abilities. For preschoolers whose learning abilities are highly dependent on the effective use of external stimuli, using the systems means chances to explore real-life objects and play educative toys does not exist (Jones, 2003). Logical reasoning and abstract thinking are beyond their level of thinking (preoperational stage) (Piaget, 1952, 1972). They need to grip something tangible in order to allow their cognition process to make sense of the concepts, especially ideas outside of their immediate context. In this respect, we observe a

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large learning gap between the preschoolers and multimedia environment, a phenomenon which could impair their overall motivation and learning performance.

Fig. 1 A gap between the multimedia and preschoolers

Tangible objects as a means of tangibility in multimedia learning system

Tangible objects surrounding the preschoolers serve as the best means to bridge the learning gap. This is because they can be designed to realize the sense of tangibility in multimedia by providing simultaneous sensorial stimulation of visual, auditory and tactile of the children (Chau, Toh, & Zarina, 2012a). Tangible objects are physical objects that have been augmented with computational power (Manches, 2010) so that tangible objects can be bound to digital multimedia objects. With digital multimedia objects physically embodied in “tangible” form, preschoolers can hold, grasp, feel, move, and manipulate them from the physical environment.

The aim of the case study

The main purpose of the case study is threefold. First is to examine the feasibility and usability of the prototyped *TangiLearn* system, a manifestation of tangible multimedia, prior to actual experimental research (Chau, Toh, & Zarina, 2011). We look for preliminary evidence to support the assumption that tangible multimedia can enhance children’s learning performance. Second is to gather information required to fine-tune the design of the treatment in full-scale experiment. We seek to identify any necessary refinements to the overall design towards the final *TangiLearn* deployment in the typical preschool classroom setting. Third is to establish an appropriate experimental protocol, such as overall experimental flow, setting, and procedure for full-scale experimental research.

Participants

Six preschoolers aged 6 were the participants in the case study. They were chosen because the age group is the primary user group for *TangiLearn* in the final experiment. As there were only a few participants in the case study, we administered the whole study ourselves.

Users’ information collection techniques

Quantitative and qualitative research methods, namely unstructured observation, unstructured interviewing, and questionnaires were employed in the case study.

Unstructured observation was conducted throughout the study. It is basically a method that is unplanned, informal, watching, and recording of behaviors in a natural environment (Cochen, Manion, & Morrison, 2002). Using observational notes, we recorded the children’s natural reaction to *TangiLearn*, the way the children collaborate, and whether the learning activities designed were appropriate. The technical performance of the system was also observed. In unstructured interview, 10 open questions were asked verbally to draw out ideas, impressions, and experiences pertaining to the prototype from the participants. They offered us key insights into issues not obvious in quantitative results obtained from questionnaires.

Quiz and *Smileyometer* (Read, MacFarlane, & Casey, 2002) were used to identify the participants’ learning performance and their level of enjoyment respectively. For measuring the level of enjoyment, we adopted the idea of Zaman and Abeele (2004), and referred the enjoyment to “joy-of-use” or “likeability” of using *TangiLearn*. *Smileyometer* was chosen because it has been proven easy to gauge the response from the children in many different situations (Xie, 2008). The self-report instrument was made child-friendly by the use of smiley, a pictorial representation of different kinds of happy faces to represent the different levels of enjoyment. We modified the *Smileyometer* to suit to the level of the participants.

Setting and implementation

TangiLearn, a manifestation of tangible multimedia, was developed for case study. This case study was an on-site evaluation took place in one of the kindergarten in Kuala Lumpur. It was conducted in a quiet classroom separated physically and acoustically from other classrooms to limit distractions. The case study was completed in one day. During the study, a laptop equipped with a camera, a set of tangible objects, and a normal display table suited to the participants’ anthropometric characteristics was set up. The table was used as a space for participants to place and move the tangible objects (Figure 2). The tangible and multimedia objects binding were implemented through the adaptation of Quick Response (QR) code marker and Flash library. Implementation using open source library entails minimal monetary investments and times for development. QR code markers were attached on the tangible objects for binding purposes, and the children simply need to hold the tangible object and align to the camera mounted on the computer monitor.

Fig. 2 *TangiLearn* set up

Learning Contents

National Preschool Curriculum (NPC) of Malaysia emphasizes the mastery of language skills for preschoolers (Challenger Concept, 2009). In line with NPC, the learning content of *TangiLearn* focuses on real-life objects and general knowledge in English. General knowledge in English is chosen because first, embedding literacy learning within knowledge-building activities is engaging for young children (Albert Shanker Institute, 2009). English language curriculum set by the Ministry of Education of Malaysia (2001) stipulated that an enjoyment of the language learning should be developed through the use of interesting means. Second, general knowledge nicely suits the use of tangible objects in *TangiLearn*. For this case study, topics of general knowledge covered are animals, fruits and household items. Abstract concepts were not introduced, consistent with the level of cognitive ability of young children (Piaget, 1952).

Procedure

At the beginning of the case study, specific instructions on activities and features of the *TangiLearn* system were described to each participant in accordance with the experimental protocol. Subsequently, participants were arbitrarily grouped into pair because children prefer to work in groups (Africano et al., 2004), and would demonstrate a high level of engagement when learning alongside each other (Inkpen, Ho-Ching, Kuederle, Scott, & Shoemaker, 1999).

Each pair of participants was given 10 minutes for practice. After the practice, two consecutive experimental sessions began. The first session used *TangiLearn*, while the second session used conventional multimedia learning system. To avoid achievability differences, the two systems were made comparable in which both of them contained similar contents, breadth, and depth of the topics. With this, the issue of difference in extraneous cognitive load due to the differences in the contents would not arise. The only difference was that *TangiLearn* was augmented with tangible objects, whereas conventional multimedia learning system was not.

When the first session started, each pair was requested to explore *TangiLearn* freely for 30 minutes. *TangiLearn* consisted of two sections, the Learning section, and Quiz section. The Learning section was the section where the learning contents were delivered to the participants. Participants who entered Learning section in *TangiLearn* would find themselves entering a world consisted of many randomly-placed learning objects (both virtual and tangible), such as animals and household items (Figure 3). Learning object refers to the knowledge unit or concept that the system intended to deliver.

Fig. 3 Tangible and virtual learning objects in *TangiLearn*

To proceed, the participants were required to grip a tangible object on the display table in front of them, and point it to the computer camera to trigger the corresponding learning object in *TangiLearn*. If the participants grabbed a tangible lion and showed, the lion learning object would display corresponding animations and videos about the lion on the computer screen, and so the learning process started. Upon completion of learning session, the participants would need to answer the quiz by identifying and picking up the correct tangible object. There were 16 learning objects in total. Understanding these learning objects was the core objective of the prototyped *TangiLearn* system. Therefore, after the learning session, participants were expected to master the name, relevant key terms, and the description of the objects. The learner was free to explore any learning object, or to exit *TangiLearn*.

Right after the first session, the second session followed. Similarly, the pairs of children were asked to explore the conventional multimedia learning system for the same allocated time. After the two learning sessions were completed, pairs were asked to complete the quiz and *Smileyometer* questionnaire. The whole study was concluded with an unstructured interview.

Results from case study

Four participants rated their level of enjoyment of using the *TangiLearn* with the highest score (enjoyed very much) in *Smileyometer*. In our opinion, the use of some of the fascinating tangible objects contributed to this outcome. From their facial and emotional expression, *TangiLearn* seemed to be novel for them as they have not seen any computer system coupled with tangible objects before. They understood the tasks in *TangiLearn* without much problem. They were tinkering with the tangible objects and attempted different positions and alignments to the computer. They discussed most about how tangible objects could be bound to the computer. Discussion on the learning activities and concepts the *TangiLearn* aimed to deliver was relatively lesser, as such, the children were curious about the system more than the learning activities and concepts in *TangiLearn*. Even though towards the end of the learning session, two participants seemed to slightly lose patience in exploring many learning objects, overall, they still maintained a high level of alertness and engagement throughout the learning process. This was not easy as children normally have very short attention span, poor concentration and ease of distractibility (Blanchard & Moore, 2010; Alliance for Childhood, 2000). None of the children indicated that they wanted to stop prior to completion of the allocated amount of time. Based on this situation, we suggest that *TangiLearn* is an engaging multimedia learning system for preschoolers.

We discovered that the most attractive feature in *TangiLearn* to the children was not animations or videos, but the tangible objects. When we asked them whether they liked the animation, they shook their head, implying that animations were nothing for them. They said that the animated series in television were much better than what they saw in *TangiLearn*. Indeed, in today's world, animations and videos are no longer fun in the mind of the "new age" children. They are surrounded by opportunities to the exposure of the realm of digital media (Blanchard & Moore, 2010; Rideout, Vandewater & Wartella, 2003), such as high-end computer games and realistic animations. Therefore, some new paradigm shift in conventional multimedia learning has to be sorted out for the children in this technological age. Based on the result obtained from the case study, *TangiLearn* is able to attract the "new age" children with the tangible objects.

Besides, we observed that there was peer collaboration similar to "parallel play" aroused in *TangiLearn*. "Parallel play" is a classic study of Parten (1932) in social participation. Accordingly, "parallel play" describes activity where children play side by side on the same activity that provokes equal social involvement (Scarlett, 2004, as cited in Xie, 2008). *TangiLearn* was a low-fidelity tangible multimedia prototype, and the Game section in the prototype was not created for evaluation yet. As such, the term "parallel play" was not suitable. Instead, we suggested the term "parallel learning" to reflect the similar kind of collaboration. In this case study, it was obvious that "parallel learning" existed. With pairs of two children sitting side by side using similar tangible objects for similar tasks in *TangiLearn*, they had the opportunity to discuss together, interacted with each other, exchanged ideas, passed around the tangible objects, and worked cooperatively to answer the quiz. We did not observe "sequential turn taking," or other kinds of collaboration such as "directive learning," and "competitive learning" aroused.

Fig. 4 Parallel learning observed during the case study

Another important finding we observed was the successful use of direct representation level of tangible objects rather than the abstract or symbolic level. Since the inception of TUI researches in 1995, manipulative materials such as cubes and rods have been utilized in many researches, where many features are scrapped, made less realistic, and their simplified properties are always used to represent other domains, such as shapes for coins and different colours for numbers. They argued that this is the correct way of using manipulatives, otherwise, their effectiveness will be degraded (O'Malley & Fraser, 2004). There are also researches against this idea. They assert that children have problems in interpreting the symbolic representation of manipulatives (Uttal, Scudder, & DeLoache, 1997; Manches, 2010). In this case study, we did not make the tangible objects to represent other domain, instead, we directly map them into the virtual world. They represent themselves; for example, if tangible apple was used, it was apple in the virtual world in *TangiLearn*. The result evidenced that the use of direct mapping of tangible objects to the digital multimedia objects was as good as symbolic mapping in enhancing learning.

Quantitative results had helped support the qualitative results that *TangiLearn* was an educationally valuable system. The quiz results indicated that participants were successful in gaining knowledge from the system. In the *Smileyometer*, 3 participants reported that the quiz was easy, 2 moderate, and 1 difficult. We believed that the participants performed well in quiz due to the iterative hands-on experiences, which reinforced their understanding.

A number of technical problems arose during the case study. The most notable problem was related to difficulties in QR code execution. The QR code recognition engine in *TangiLearn* sometimes failed to response due to the low capacity computers used in the kindergarten. We also observed that the visual marker technology lacked of mobility due to the fact that the participants could not move the tangible objects too far from the camera. This problem must be addressed in the full-scale experimental research; otherwise, interest to use the full-scale *TangiLearn* among the children will be affected. Apart from that, some participants seemed to have difficulties in aligning the visual markers to the camera. However, the issue of physical alignment of visual markers was not totally a bad thing. According to Antle (2007a), orientating the visual marker to camera can also serve as a beneficial training to the preschoolers. It enhances their spatial experience as well as drilling their motor skills.

Considerations and refinements for the development of full-scale *TangiLearn*

After detailed analysis, we realized that there should be design considerations for tangible objects. If tangible objects are arbitrarily used, they may be disadvantaged by multimedia objects, or vice versa. The whole display could be cluttered in *TangiLearn*.

The choice of tangible objects for use in *TangiLearn* highly affected the children's rating of enjoyment level. The children tended to rate high level of enjoyment for toys. Level of enjoyment went lower for common objects such as books, plates, and erasers. Among all the common objects, animal objects captured more attention from the participants than those household utilities such as spoons and scissors. This may be because the children were more emotionally tied to animals. Famous branded commercial characters such as "Barbie doll," "Ben 10," and "Transformers" should not be used as these objects tended to attract children more than any other objects. They might divert their attention from actual learning, and ended up playing around with the toys.

The size of tangible objects chosen should be suitable to preschoolers. If tangible objects are too huge, they will not only block the view of the children to the computer screen, but will also take up a large portion of the space of the display table, and thus giving a very heavy "packed" feeling to the children. Besides, huge tangible objects will tend to be the frequent choice of the children. However, if tangible objects are too small, the sense of holding the tangible objects becomes weaker. From our observation, the best size of tangible objects are the size of slightly bigger than the hand palms of the preschoolers, and all tangible objects should be set around this size for consistency. Similarly, the size of the table for displaying tangible objects should not be too large to ensure reachability of points of contact amongst preschoolers. If not, visual search for the desired tangible objects will be affected.

Tangible objects used should be gender-free. In the case study, we intentionally placed a robotic model, "Transformer" as one of the tangible objects in *TangiLearn*. It ended up that the boys competed to play with it. Girls in turn argued why there was no "Barbie" doll available for them. A good multimedia learning system should be able to meet the learning preferences of both male and female learners. Apart from that, the participants were also found tended to choose tangible objects that have more striking color. The colour should be balanced among the tangible objects so that every object has equal chance to be chosen by the preschoolers for learning.

After the case study, we do agree with the guidelines suggested by Pederson, Sokoler, and Nelson (2000) and

Antle (2007a, 2007b). According to Pederson and associates, the physical objects chosen for representing digital objects should be the “right” objects in a sense that human is able to grasp, to reason about, essence to the user’s tasks, and meaningful in the use situation. According to Antle, three areas of cognition, namely symbolic reasoning, embodied and spatial cognition should be the criteria for choosing objects as physical instantiation to digital objects. To develop a truly usable tangible multimedia, we plan to apply these guidelines in the final version of *TangiLearn* system.

We were also informed of the change required for the research procedures and setting. We confirmed several alterations on the experimental protocol decisions. The first alteration is to limit the total number of learning objects (both virtual and tangible) to 7 objects in each learning scene, in compliance with Miller’s (1956) idea that they are the limits that a person can remember at one time (Chau, Toh, & Zarina, 2012b). The second alteration is the number of topics covered. While reducing the number of learning objects in each scene, there should be more topics for learning. Such alteration could relieve their load in each learning session while maintaining the amount of learning contents. The third alteration is the elimination of the treatment using conventional multimedia system for participants using *TangiLearn*. As a controlled system, it should be conducted on different group of participants. This was because the result revealed a very large difference in the participants’ level of enjoyment on *TangiLearn* and conventional multimedia learning systems. After lengthy duration of time for exploring *TangiLearn*, the participants seemed to feel bored navigating the conventional multimedia learning system due to similarity of learning contents.

On the technical side, due to the problem of execution of QR code flash library in *TangiLearn*, we plan to replace the QR code with other alternative technology. Among the technologies shortlisted for choice is RFID technology.

Conclusion

This case study sought to uncover the possible role that tangible objects in multimedia learning played in impacting preschoolers’ learning performance and level of enjoyment. Despite the technical problems, the overall results of the study were highly positive in terms of the enjoyment, the feasibility and usability of *TangiLearn* system. On the whole, we have successfully elicited ideas from the preschoolers, and the results provided us insightful information about the areas that require refinements in the final full-scale research on tangible multimedia.

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TEACHERS' PERCEPTIONS REGARDING THE BENEFITS OF USING THE INTERACTIVE WHITEBOARD (IWB): THE CASE OF A SAUDI INTERMEDIATE SCHOOL

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Abstract

The aim of this study is to examine the views of teachers of intermediate school on the use of the Interactive White Board (IWB) as an instructional tool in the classrooms. A questionnaire was distributed to fifty teachers, and three teachers were interviewed at Prince Sultan Intermediate School in order to determine their views on the use of the IWB. Findings revealed that most teachers believe that IWB constitutes an effective and convenient way to deliver the learning content and that it increases the level of classroom interaction which in turn increases the learning experience. However, the result of study also revealed that the majority of teachers use the IWB as an overhead projector and for internet research but do not make use of the many other advantageous features of the IWB. Based on the fact that the teachers' reluctance to utilize all of the available IWB features stems from their limited knowledge of all that IWB technology has to offer, it is recommended that teachers using the IWB in class undergo more training so that they can become fully aware of how to optimize its use. It is also suggested that the number of students in the classroom is reduced to allow for more interactive learning.

Keywords: Teachers' Perceptions; Instructional Tool; Interactive Whiteboard (IWB); Intermediate Schools

1. Introduction

The Interactive Whiteboard has become an increasingly familiar instructional tool in modern day classrooms where new information and communications technologies are exploited in numerous ways to enhance teaching and learning. The Interactive Whiteboard constitutes a digital and interactive tool and is defined by BECTA (2003) as a touch-sensitive board that can be connected to a computer and a projector displaying images from the computer screen onto the board. The computer can be directed by touching the board directly or via a particular pen.

The Interactive Whiteboard or IWB possesses a number of built-in applications and capabilities designed to improve the quality of teaching and learning in the classroom. For example, it allows the teacher to run video clips and animations to enhance the learners' understanding of concepts, incorporate web-based resources, demonstrate a piece of software, display the learners' projects during class presentation, edit textual sources, monitor penmanship exercises, and save notes written on the board for future use.

Since its creation by SMART Technologies Inc. in 1991, it has become a valuable yet cost intensive instructional tool that many learning institutions dream of having. The multiple features of the IWB allow for engaging and thus meaningful learning of curriculum contents. For instance, in Science it can be used to explain abstract scientific phenomena such as solar system, eclipse and static electricity, and in Mathematics the area of shapes (Latham, 2002) .With the help of the Interactive White Board learners are able to imagine, describe, and model solutions to a problem. English Language instruction can be enhanced by presenting English vocabulary and linguistic fundamentals. In this respect Gerard and Widener (1999) suggested that the instructor can use the IWB to project a website and overwrite it to emphasize specific details.

The IWB also possesses multiple presentation tools such as spotlight, snapshot, reveal, and sharing that allow a class to engage more successfully in all forms of collaborative work which can be captured and shared. It also has the capability to record learning sessions which teachers can later share with other learners and colleagues for reviewing and discussion purposes. Its built-in special software enables teachers to write, draw and annotate on its surface directly unto the board. Electronic files of lesson contents can be saved and used later for repeated

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sessions, and the files can be mailed as attachments to absent students. The software designed for the IWB has a built-in library of images on different subjects which teachers can use in their lessons. In summary, the IWB increases the level of interactivity taking place in the class by enabling students to draw and write on its surface or drag objects and icons.

Many studies done over the past decade document the social and academic benefits of using IWBs in the classroom. In a recent study, Blue and Tirotta (2011) (do not find) reported that the whiteboard creates an interactive class and motivates learners to remain engaged in the lesson. It also helps increase the learners' motivational level, particularly those with learning disabilities. By allowing learners to learn in different ways from their peers, the IWB also helps learners more responsive to different learning style to learn more effectively (Bell, 2002). This as a result will increase their motivation. Visual learners can view their work projected and receive an immediate feedback on it. Auditory learners can use different software to interact with the board. Tactile learners can use diverse coloured pens to write on the board and highlight significant ideas and concepts.

The Prince Sultan Intermediate School in Jeddah is one of the more advantaged schools in Saudi Arabia which could afford equipping its classrooms with IWBs. The school introduced IWB-assisted teaching in 2007 to enhance the quality of teaching and learning experiences. It has replaced the traditional blackboards and is used by the teachers to explain contents, record their instruction and post learning materials the learners can review at a later time. The Prince Sultan Intermediate School was chosen for this study because it possesses a record of high academic achievement and educational standards whose students leave as well rounded and accomplished individuals. It's also one of the few schools in Jeddah which utilize the smart board. It's School of Technology proud itself of up-to-date labs utilizing the most current software applications and equipment suited for industrial instruction. The school's facilities are designed to provide students with the opportunity to experience state-of-the-art technology with the purpose of preparing them for technical and management careers, including more than 25 interactive smart boards installed in most of the classrooms. However, the successful implementation of technologies as instructional tools strongly depends on the perceptions of educators towards these innovations (Coulter, 2004; Teo, 2008; Zhao, Pugh, Sheldon & Byers, 2002). This paper examines the perceptions of teachers at Prince Sultan Intermediate School in Saudi Arabia on the use of the Interactive White Board (IWB) as an instructional tool in their classrooms.

2. The Study

To achieve the objective of this study, it is employed a mixed methodological design which applied both quantitative and qualitative methods to collect data.

2.1 Part I: Survey

The quantitative part of the study was based on a questionnaire that explored the perceptions the teachers of the Prince Sultan Intermediate School entertained in respect to the benefits of using the IWB in their classrooms. A ten-item questionnaire was developed to identify the teachers' perceptions about the benefits of using the IWB in instruction. These ten items were developed based on a comprehensive review of the existing literature. A five-point Likert scale that indicated degrees of agreement (from strongly disagree to strongly agree) was used.

2.1.1 Respondents

The study was conducted at the Prince Sultan Intermediate School with a population of 50 teachers. The whole population was taken for this study. Since the school is a boys' school, only male teachers are employed and thus all respondents were male (100%; n = 50). Most respondents (40%) were between 30 to 39 years of age. On average, the sample was relatively young as 70% of the teachers were below 50 years of age.

2.1.2 *Analysis of Survey Data*

The data obtained from the questionnaire were coded into SPSS Version 11.0 for analysis. Descriptive statistics in the form of frequencies and percentages were used to describe the respondents' perceptions of the benefits of using the IWB in the classroom.

2.2. Part II: The Interviews

The qualitative part of the study was based on interviews with three selected teachers. These interviews were conducted to examine in detail how the teachers used the IWB in the classroom and in order to explore ways by which to improve the teachers' utilization level of the tool.

2.2.1 The Interview guide

A set of interview questions were prepared to guide the interview process and to probe deeper into the participants' views. Each interview lasted for about 30 minutes. Before the interviews were conducted, participants gave their asked to give their consent to participate in the study, either by in written form or verbally. All the interviews were conducted in Arabic and later translated into English. The interviewees' responses were recorded.

2.2.2 Interview Protocol

A 6-item semi-structured interview guide was used to structure the interview. The interview guide was divided into two broad categories: demographic information of the respondents (five items) and the teachers' observations on the IWB as an instructional tool (six items). In addition to responses to the structured questions, the participants were encouraged to give additional comments or share additional experiences. Table 2.1 presents the open-ended questions used in the semi structured interview protocol.

Table 2.1 Interview Protocol

No	Questions
What do you think of the IWB as an instructional tool for your course(s)?	
In your opinion, how effective is the IWB in delivering your course contents?	
In your opinion, do students achieve the desired learning outcomes when you use the IWB?	
What are the advantages of using the IWB in teaching your course(s)?	
Would you support continuing the current practice of using the IWB in teaching and learning?	
What are your suggestions to improve the current use of IWB?	

2.2.3 Interview Participants

The interviewees consisted of three teachers from the school looking back at between six to twenty five years of teaching experience. The three participants were chosen because of their experience in using the IWB and because they were known to be very enthusiastic about using modern technology in their teaching.

2.2.4 Analysis of Interview Data

A written version of the full scripts was produced by way of "transcribing" the qualitative data. Thematic content analysis was used to categorize the generated data. The study used Glaser and Strauss's (1967) method of constant comparison for coding qualitative data. The analysis identified and categorized all points that the participants respondent to using several iterations to complete the process. After reading the transcripts to obtain an overall idea of the interviewees' responses, each line was assessed in order to generate levels that reflected the research's initial coding. This enabled the researcher to develop a general category scheme of the participants' responses.

After developing the general category schemes, the researcher identified individual themes by sorting the initial schemes into concrete categories which reflected similar responses regarding the participants' perception on the usage of IWB in instruction and arranged them according to separate categories.

3. Results

Prince Sultan Intermediate School Teachers' Perception of the Benefits of the IWB

Based on the overall evaluation of the teachers' responses contained in the survey, the majority were very positive about the IWB as an instructional tool. The teachers' responses to all the items on the IWB's benefits are presented in Figure 4.1.

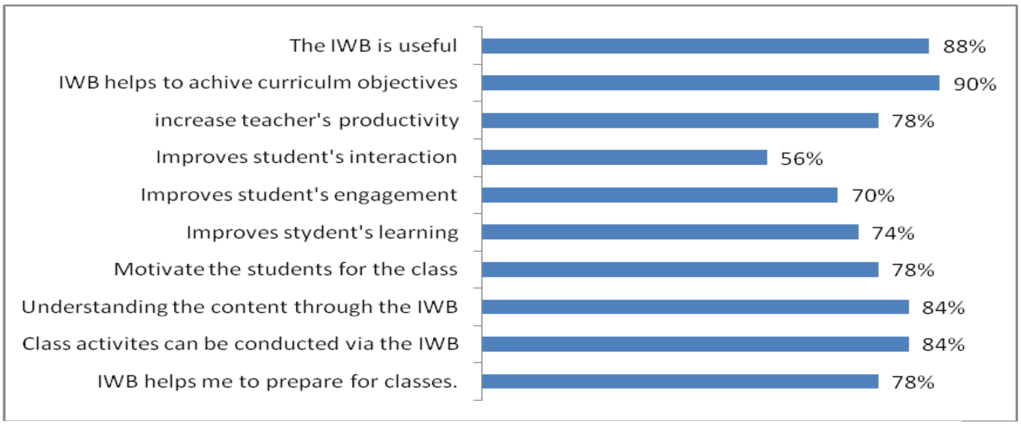

Figure 4.1: The teachers' perceptions toward the IWB's benefits

The percentages of the recorded positive responses are listed in Table 4.2. The item receiving the highest percentage of agreement was "The IWB helps me to deliver curriculum contents," where 90% of the teachers agreed with the statement. Approximately 88% of the teachers agreed that they found the IWB was a useful tool. 84% of them agreed that class activities could be conducted well via the IWB and 78% agreed that the IWB helped them to prepare for classes, and 78% agreed that the IWB helped motivate the students. However, only 56% of the teachers agreed with the statement that the use of IWB helped improve student behaviour during class.

Overall, the majority of the respondents viewed the IWB as a good instructional tool. Hence, most of them were in support of teaching and learning with the IWB. More detailed information on the teachers' perceptions of the IWB as a mode of course delivery is presented in Table 4.2.

Table 4.2 Teachers' Perceptions of the Use of IWB in Teaching and Learning

Statements on the advantages of the IWB	**Responses in %**				
	SD	**D**	**N**	**A**	**SA**
The IWB helps me prepare for classes.	-	2.0	20.0	52.0	26.0
In-Class activities can be conducted well via the IWB.	-	2.0	14.0	60.0	24.0
The Students can understand the content well through the IWB.	-	2.0	14.0	54.0	30.0
The IWB helps motivate the students in class.	-	6.0	16.0	42.0	36.0
Using the IWB improves the students' learning progress during class.	-	2.0	24.0	44.0	30.0
Using the IWB improves the students' engagement during class.	2.0	2.0	26.0	46.0	24.0
Using the IWB improves the students' behaviour during class.	4.0	14.0	26.0	28.0	28.0
Using the IWB increases the productivity of the class.	-	2.0	20.0	46.0	32.0
The IWB helps me deliver curriculum objectives.	-	0.0	10.0	50.0	40.0
I found the IWB to be useful.	0.0	4.0	8.0	44.0	44.0

SD=Strongly Disagree; DA= Disagree; NS= Not Sure; A=Agree; SA=Strongly Agree

Specific Usage of the IWB at the Prince Sultan Intermediate School

All three interviewed participants used the IWB in the classroom. However, it was noted that despite the numerous applications of the IWB, the three teachers limited their use of the IWB to only three main purposes. They used the IWB to serve as an overhead projector to present the learning content in the form of power point presentations, in simple learning activities such as filling in the blanks, and to retrieve information from the internet

Effectiveness and Advantages of the IWB as an Instructional Tool

The three interviewed teachers agreed that the IWB helped them reduce the time needed in the preparation of their lessons and eventually helped in cost containment. They also supported the overall usage of IWB for learning and teaching purposes and indicated that this innovative tool ensured a more effective mode of teaching compared to the conventional blackboard.

The respondents agreed that the introduction of the IWB had not completely changed their teaching but admitted that it had considerably improved it. Furthermore, the teachers noted that overall class participation had definitely increased and that class time was being spent more productively. The above facts supported Smith's (2000) findings that the effectiveness of the IWB in the learning process depends on the educator's creativity to ensure that learners are motivated and engaged.

4. Discussion and Conclusion

It can be asserted that the IWB constitutes an effective instructional tool that has the power to engage and motivate students in the learning process. Because engagement in the lesson is an essential component for student achievement, the IWB can help improve the academic performance of learners and their behaviour in class. It can be used to elicit more productive responses to classroom instruction and to stimulate active participation in class. The IWB also encourages the involvement of those students who are normally reticent and reluctant to actively participate in the group's learning process (Painter, D. & Whiting, B).

Overall, the results showed that the teachers of the Prince Sultan Intermediate School entertained a positive attitude towards using the IWB indicating that it was enjoyable as an instructional tool and technological adjunct to classroom lessons.

It is suggested at this point that a complete study should be conducted to look into the technical difficulties encountered by both learners and teachers. In addition, future studies may focus on comparing the cost-effectiveness of IWB and the traditional method of delivery via the whiteboard by evaluating the students' learning gains. Additional studies may also examine the adoption rate and the variables affecting a successful implementation of IWB such as students' capability and readiness to learn, and the teachers' ability to make optimal use of the IWB.

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TEACHERS' READINESS IN UTILIZING EDUCATIONAL PORTAL RESOURCES IN TEACHING AND LEARNING

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Abstract

The purpose of this study was to identify teachers' readiness in utilizing the educational resources from the Eduwebtv online portal. Teachers' readiness was measured in terms of knowledge, skills and attitude. Research samples consisted of 387 secondary school teachers from five different states selected using the cluster simple random sampling technique. The design of the study was quantitative in nature employing the survey method. Data were gathered through the use of the Eduwebtv ReadinessQuestionnaire developed by the researchers. The questionnaire was divided into four sections a) background information, b) knowledge of Eduwebtv, c) skills in using Eduwebtv, and d) attitude towards using Eduwebtv. Data were analyzed using descriptive statistics of mean, frequency, percentage and standard deviation. Findings revealed that majority of the teachers had moderate (n=201, 51.9%) to high (n=186, 48.1%) levels of knowledge of Eduwebtv as an educational resource portal. Also found majority of the teachers had moderate skills in using Eduwebtv portal. Apart from this, majority of the teachers were found to foster positive attitudes towards the use of Eduwebtv online resources for teaching and learning. In terms of readiness in utilizing the Eduwebtv portal, these findings suggest that although teachers have knowledge of Eduwebtv and its benefits to both teachers and students, they seem lacking in the skills to fully capitalize on the advantages afforded by this online technology

Keywords: online educational portal, Eduwebtv, students' achievement, effectiveness

1. Research Background

The trend of today is that knowledge isno longer delivered to students in the forms of memorization and drills. Thanks to the rapid advancement in information and communication technology (ICT), the teaching and learning environment of today is more dynamic and interactive than ever before. With the birth of the Internet and the Web educational resources and materials can be accessed online and readily available for use. Realizing the importance of providing both learners and teachers with quality educational content and resources, the Ministry of Education, Malaysia, developed its own educational online portal formally known as Educational Web Television (Eduwebtv) in 2009. The portal serves as a platform to deliver educational content in digital format in line with the Educational Development Master Plan *(Pelan Induk Pembangunan Pendidikan)*2006 to 2010 – turning the national education system into world-class.

The Eduwebtv online portal can be readily accessed from www.eduwebtv.com.At its conception, it has eight main video-based channels including news, academic and documentary. The news channel consists of videos that are related to the MOE and important events and daily activities. The academic channel presents knowledge sharing hosted by the officers, teachers and MOE personalities related to the best practices in teaching and learning. The documentary channel contains significant and interesting documentaries to be shared online.The interview channel presents various interviews with important officers and personalitiesrelated to the education field and educational programs and initiatives. Many of the content for the curriculum channel consist of video-based materials that were formerly produced by the Educational Technology Division for the once-aired Educational Television program.

The Eduwebtv educational online portal is developed to ensure all citizens particularly school students have equal opportunity to access quality education presented through the digital medium. On the part of the teachers, the online portal provides video-based resources and materials that can be integrated into instruction. In accordance with this, the MOE provides training in the use of Eduwebtv portal to teachers in stages. In-house training is conducted in various schools by teachers who went for the training in using the portal.

2. Research Problem

Many technology initiatives have been introduced into the schools with the noble aim of improving the quality and effectiveness of teaching and learning. Unfortunately, in terms of integration of technology in the classroom teachers are still not fully capitalizing on the resources provided to them (Rosnaini, 2006). Barriers may exist in the implementation and utilization of the Eduwebtv online portal particularly on the part of the teachers(Rosnaini&MohdArif, 2009).

The teacher factor is critical in the success of the implementation of the Eduwebtv online portal for teaching and learning purposes. It is important for the teachers to understand the role of the online portal in assisting them to teach using technology-based content. Mohd.IzhamandNoraini, (2007)pointed out that teachers' readiness in using technology is the benchmark to look at teachers' understanding of a new technology, and the acquired skills needed. A study by Norizan (2002) noted that language teachers were ready in terms of knowledge about computers for teaching and learning, but they lacked the skills in doing so. According to Yeoh (2007), teachers need sufficient time to prepare them to use technology for teaching purposes. Teachers also face problems in determining how technology can be used effectively in the classroom (Brush, Glazewski, Rutowski, Berg, Stromfors& Van-Nest, 2003).

In other words, teachers must be ready to use the new technology introduced to them. Teacher readiness can be measured in terms of knowledge, skills and attitude (Rosnaini, 2006; Wong, 2002). Although the Eduwebtv portal has been in the educational scene for almost three years, there is a lack in research in terms of utilization and readiness of the teachers to teach using the resources and materials from the portal.

3. Research Objectives

The research attempted to examine the teachers':

Knowledge of the Eduwebtv educational online portal.
Skills in using the Eduwebtv educational online portal for teaching and learning.
Attitudes towards Eduwebtv educational online portal as an instructional resource.

4. Research Methodology

4.1 Design

The study was exploratoryin nature and employed the survey method. In the context of this study, a survey was considered most appropriate since it could be used to gather data related to teachers' readiness in utilizing the Eduwebtv online portal for instructional purposes. As suggested by Johnson and Christensen (2008) a survey will allow researchers to gather information which can assist in understanding the characteristics of a given population.

4.2 Samples

The target population consisted of all school teachers who were teaching in secondary national schools in Malaysia (N = 176,377). The accessible population were secondary school teachers from five states – representing the north, south, west coast, east coast of Peninsular Malaysia, and East Malaysia (N= 44, 530). Based on Krejcie and Morgan's table (1970) for a population of 50,000, the minimum sample size should be 381. In this study, the samples were selected using cluster simple random sampling technique.

4.3 Instrument

The research instrument used was in the form of a questionnaire developed by the researchers based on review of related literature and previous studies.It comprised of four sections – (A) demography, (B) knowledge of Eduwebtv, (C) skills in using Eduwebtv and (D) attitudes towards Eduwebtv (34 items). In section A there were 10 items related to teachers profile including age, gender, teaching experience and training in using Eduwebtv online portal. Section B consisted of 20 items related to the teachers' knowledge of Eduwebtv using true or false scale. Section C comprised of 15 items related to the teachers' skills in integrating Eduwebtv resources and materials for instruction. The four-point Likert scale was used to determine the teachers' skills ranging from 1 (not competent) to 4 (very competent). Section D had 33 items related to the teachers' attitudes towards Eduwebtv based on four aspects – anxiety, confidence, preference and perception. In this section the four-point Likert scale was used to determine teachers agreement ranging from 1 (strongly disagree) to 4 (strongly agree).

4.4 Validity and Reliability

The instrument was validated by two experts in the field of Educational Technology. Reliability of the instrument was obtained through a pilot study involving 30 teachers who were not involved in the actual study. The Cronbach alpha values ranges from .78 for the knowledge of Eduwebtv scale, .9 for the skills in integrating Eduwebtv scale, and .97 for the attitudes towards Eduwebtv scale.

4.5 Data Analysis

A total of 420 questionnaires were distributed to teachers from the five states, and 387 were completed and returned (return rate 92%). Data gathered were analysed using SPSS version 15. Descriptive statistics in the form of frequency, percentage, mean and standard deviation were employed.

5. Findings and Discussion

Respondents' Profile

Table 1 presents the data of the respondents' background. Majority of them were female teachers (n = 289, 74.4%), while there were only 98 male teachers (25.3%). Majority (n = 255, 65.9%) of the teachers were less than 40 years of age. In terms of teaching experience, majority of the teachers (n = 234, 60.5%) had more than five years of experience in schools. Most of the teachers (n = 307, 79.3%) had experience in using computers for more than five years. Majority of the teachers too (n = 323, 83.5%) had their own computers. A total of 236 teachers (61%) had browsed through the Eduwebtv online portal, while 151 teachers (39%) had not done so. At the time of data collection (2010/2011) only 164 teachers (42.4%) stated that they had attended a course in using Eduwebtv portal, on the other hand, majority (n = 223, 57%) had not.

Table 1: Respondents Profile

Demographic Info	Category	No. Sample N=387	Percentage %
Gender	Male	98	25.3
	Female	289	74.7
Age	20-29 years	143	37.0
	30-39 years	112	28.9
	40-49 years	111	28.7
	50 years & above	21	5.4
Teaching Experience	0-5 years	153	39.5
	6-10 years	79	20.4
	11-15 years	44	11.4
	16-20 years	67	17.3
	21 years & above	44	11.4
Experience using Computer	0-5 years	80	20.7
	6-10 years	153	39.5
	11-15 years	86	22.2
	16 years & above	68	17.6
Own laptop/desktop	Yes	323	83.5
	No	64	16.5

Internet access at school	Yes	360	93.0
	No	27	7.0
Browse EDUWEBTV Portal	Yes	236	61.0
	No	151	39.0
Attend EDUWEBTV Portal Course	Yes	164	42.4
	No	223	57.6

Knowledge of Eduwebtv Educational Online Portal

Table 2 presents the finding related to knowledge of Eduwebtv portal. Scores obtained from the knowledge of Eduwebtv scale ranged from 0 to 20. The scores were then categorized into three levels (low, moderate and high). Scores less than 6 was considered as having low knowledge of Eduwebtv, whereas scores between 7 and 13 was interpreted as having moderate knowledge. Teachers with scores between 14 and 20 were considered as knowledgeable about the educational portal. Table 2 shows the teachers' knowledge of the Eduwebtv online portal. A total of 201 teachers (51.9%) demonstrated moderate knowledge of Eduwebtv, while 186 teachers (48.1%) were found to be knowledgeable about the Eduwebtv educational portal. The mean score obtained was 13.48 (SD = 2.11) which means that in general the teachers in the study had moderate knowledge of the portal.

Table 2: Knowledge of Eduwebtv Educational Online Portal

N	**Frequency**	**&**	**Percentage**	**Mean**	**S.D**	**Level**
	Scores 0-6 (Low)	*Scores 7-13 (Moderate)*	*Scores 14-20 (High)*			
387	0 (0%)	201 (51.9%)	186 (48.1%)	13.48	2.11	Moderate

Skills in Using Eduwebtv Educational Online Portal

Table 3 presents the finding related to the teachers' skills in using the Eduwebtv online portal for teaching and learning. Scores obtained from the skills in using Eduwebtv scale ranged from 15 to60. The scores were then categorized into three levels (not competent, moderately competent and competent). Teachers with scores ranging from 15 to 30 were considered as teachers who were not competent in using Eduwebtv portal, while teachers with scores ranging from 31 to 45 were perceived as teachers were moderately competent in using the portal. Teachers with scores from 46 to 60 were perceived as teachers who were highly competent in using the portal to access resources and materials for instructional purposes. Majority of the teachers (n = 256, 66.1%) considered themselves not competent in using the portal. Another 110 teachers (28.4%) considered themselves moderately competent, while only 21 teachers (5.4%) regarded themselves as competent in using the portal. The mean score obtained was 36.11 (SD = 9.13) which means that in general the teachers in the study were moderately competent in using the Eduwebtv online portal.

Table 3: Skills in Using Eduwebtv Educational Online Portal

N	Frequency	&	Percentage	Mean	S.D	Level
	Scores 15-30 (Not Competent)	*Scores 31-45 (Moderately Competent)*	*Scores 46-60 (Competent)*			
387	110 (28.4%)	256 (66.1%)	21 (5.4%)	36.11	9.13	Moderately Competent

Attitude Towards Eduwebtv Educational Online Portal

Table 4 shows teachers' attitude towards Eduwebtv online portal. Scores obtained ranged from 33 to 132. Attitude scores were categorized into two: negative (scores 33 – 82) and positive (scores 83 – 82). Majority of the teachers (n = 294, 76%) demonstrated positive attitudes towards the use of the online portal, but another 23 teachers (24%) were found to have negative attitude.The mean score obtained was 91.20 (SD = 12.53), meaning that as a whole the teachers fostered positive attitude towards the Eduwebtv educational online portal.

Table 4: Attitude TowardsEduwebtv Educational Online Portal

N	Frequency	& Percentage	Mean	S.D	Level
	Scores 33-82 (Negative)	Scores 83-132 (Positive)			
387	93 (24.0%)	294 (76.0%)	91.20	12.53	Positive

In many instances the success of implementing new technology relies heavily on the readiness of its users. According to Wong (2002) in determining teachers' readiness in terms of knowldge, skills and attitude should be examined together so as to provide a more comprehensive information. Therefore, in the context of this study, the teachers' readiness of utilizing the Eduwebtv educational online portal were explored in terms their knowledge, skills and attitude. The findings of this study concur with the study by Rosnaini Mahmud (2006) who found that majority of the secondary school teachers who took part in the study (n = 303) had moderate knowledge of and in using ICT, and had positive attitude towards ICT. However, having moderate knowledge and skills may not be sufficient for the teachers to be able to harness the full potential provided by the Eduwebtv online portal specifically, and educational portals in general. Since there is plentiful of educational resources online, teachers need to familiarize themselves with the educational content and academic resources found on the web (Lever-Duffy and McDonald, 2009) and integrate these in their instructional practices. Mohd.Izham and Norainin (2007) highlight the critical role of teachers in delivery of knowledge in the teaching and learning process. Since many of the teachers in the study did not attend any training in using and integrating the video-based resources and materials from the Eduwebtv online portal, it is suggested that steps taken by the relevant authorities to promote the use of the portal and held specially-designed training programs to increase teachers' competency and knowledge of the resources available to them 24 hours.

Conclusion

In terms of expenditure, the Ministry has allocated a huge budget in developing the Eduwebtv online portal. Its aims are noble – bridging the digital gap and barriers in accessing quality educational content and resources for teachers and students, and the public in general. Other than relying on top-down directives, the teachers themselves need to take the initiative to explore the various options that they have in getting instructional resources and materials, and the Eduwebtv online include in their repertoire of instructional strategies and materials.

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TECHNOLOGY ANXIETY AND IMPLICIT LEARNING ABILITY AFFECT TECHNOLOGY LEADERSHIP TO PROMOTE THE USE OF INFORMATION TECHNOLOGY AT ELEMENTARY SCHOOLS

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Abstract

“Oversold & underused” is a criticism by Cuban (2001) of the investment of information technology (IT) in the classroom. Recently, Taiwan’s educational administration has provided considerable financial support to IT in elementary schools, but few reports have provided evidence of its successful use. The present study aims to identify the personal factors that affect principals’ beliefs about the promotion of IT in their schools. 331 data were collected and analyzed with AMOS 19.0. The results of this study indicated that greater technology anxiety was negatively associated with perceived ease of using (PEU) IT, whereas implicit learning ability was positively correlated with perceived usefulness of IT. Technology leadership increased significantly with PEU and perceived usefulness (PU), it is also associated with the intention to overcome difficulties in promoting information technology in schools. The implications of this study may contribute to the reduction of principals’ technology anxiety, increasing their implicit learning ability and therefore fostering the future implementation of IT in schools, changing the myth of technology as “oversold & underused”.

Keywords: technology anxiety; information technology; implicit learning ability

Introduction

According to Hodas (1993), ‘Technology is never neutral: the values and practices must always either support or subvert those of the organization into which it is placed’ (p. 1). Robertson, Grady, Fluck and Webb (2006) state that when promoting change produced by technology, school leaders would do well by obtaining the engagement of school staff. These authors encouraged leaders to use real data to gauge the social climate, the organizational culture and the nature of the relationships between teachers, students and the community. The role of the leader, according to Cuban (2001), suggests that the manner in which technology is implemented is more important than the technology’s intrinsic value. However, principals’ behavioral beliefs are more effective when they encourage teachers to incorporate technology in their classrooms. Technology leadership shows resemblances to the research on leadership in general. This study examines leaders’ technology anxiety and implicit learning skills that contribute to technology leadership and the intention to promote technological implementation.

Research Content and Hypotheses

Reasoned action

According to Ajzen and Fishbein (1980), attitude formation involves a combination of elements of beliefs and affectively laden evaluations about a particular object or its situation. The theory of reasoned action (TRA) seeks to address the link between this concept of attitudes and actions and considers actions a particular subset of behavior: thoughtful, intentional behaviors that can be consciously controlled (Fraser, 2001, p. 246). Ajzen and Fishbein (1980) considered intention, as the immediate determinant of action. The first consideration of the theory of reasoned action suggests that a person‘s attitude influences their intention which then leads to a particular action. There are variables affecting attitude and intentions of IT use derived from Bandura’s (1977) Social Cognitive Theory (SCT), where behavioral intention emphasizes beliefs about the use of technology and the perceived outcomes of adopting it. SCT considers personal beliefs, such as learning efficacy and anxiety, which affect behavior. Therefore, this research used TRA to predict principals’ intentions in promoting new IT products to school matters more precisely. In this context, the reasoned action model of technology leadership was proposed by decomposing Ajzen’s (1985) theory of planned behavior. This model replaces the attitude toward use with technology leadership and replaces behavioral intention with the intention to promote technology use at schools.

Technology leadership

Bozeman and Spuck (1994) suggested that educational technology leaders should be able to use technology to solve real problems in their schools. Before beginning full technology implementation, principals should be aware of the challenges and barriers inherent in most technology programs. These challenges can easily undermine the confidence of even the most seasoned leaders (Lashway, 2003). Piper and Hardesty (2005) suggested that leadership is needed to influence educators' use of technology. Thus, technology leadership is therefore more important than the technical infrastructure or expenditures. According to Valdez (2004), leadership for technology includes a combination of many leadership qualities and the ability to implement change, resources, professional development, emerging techniques, equipment and software. As such, the present study examines how technology leaderships, learning abilities as well as other individual characteristics and perceptions could affect school leaders' behavioral intentions.

Technology anxiety (TA)

Technology anxiety is an attitude that is applicable to technology in various forms. Psychologists have classified general anxiety into two areas: trait anxiety and state anxiety (Biggs & Moore, 1993). Trait anxiety can be described as "a general readiness to react with anxiety in many situations", whereas state anxiety refers to "anxiety actually experienced in a particular situation" (Biggs & Moore, 1993, p. 243). Computer or information technology anxiety as state anxiety includes "the fear or apprehension felt by individuals when they use computers or new technology, or when they consider the possibility of utilization" (Simonson, Maurer, Montag-Toradi, & Whitaker, 1987, p. 238). Technology anxiety is a negative emotional state or a negative cognition experienced by an individual when he/she uses technology or technology equipment (Bozionelos, 2001). Technology anxiety is a negative emotional response, such as fear or discomfort that people experienced when they think about using or actually using technology (Hasan & Ahmed, 2010). As such, technology anxiety is expected to directly influence the use of new technological products and to moderate the relationship between technology leadership and the intention to promote the use of information technologies in schools.

Implicit learning ability (ILA)

Implicit learning is characterized as a set of automatic, associative, unconscious, and unintentional learning processes that are distinguished from the conscious, deliberate, and reflective learning processes that are associated with executive functioning and working memory (Kaufman et al., 2010). Kaufman et al. (2010) concluded that implicit learning ability (ILA) is suggestive of the structure of human information processing, an independent cognitive system by which individuals analyze and understand the regularity of their experiences. Moreover, Kaufman et al. (2010) explained implicit learning tasks under specific conditions in which participants did not receive an instruction, thereby making learning 'incidental' to task requirements. Anderson and Dexter (2000) suggest that rapid changes in technology and a highly uneven distribution of expertise make technological leadership particularly demanding of implicit learning. Amongst many principals encountering rapid change, some leaders were eager to implement technology and to learn implicitly simple to complex aspects of information technology independently. Technology leadership is found in implicit learning abilities that guide the intention to promote the use of information technology.

Research Hypotheses

The research hypotheses are proposed as follows:

H1: Technology anxiety (TA) is positively correlated to PU.

H2: Technology anxiety (TA) is positively correlated to PEOU.

H3: Implicit learning ability (ILA) is significantly correlated to PU.

H4: ILA is significantly correlated to PEOU.

H5: PU is significantly correlated to technology leadership (TL).

H6: PEOU is significantly correlated to PU.

H7: PEOU is significantly correlated to TL.

H8: TL is significantly correlated to intention to promote (IP).

Research design

Research procedure and participants

The survey participants consisted of 190 principals of elementary schools in Taiwan who participated in an in-service professional development workshop in Taipei city in January 2012 and 243 principals in the elementary school principals' professional workshop conducted by the National Teaching Institute in March 2012. In total, 339 surveys were collected (with 76.5 % returns). After invalid data were removed, there were 331 usable surveys (with 97.6% validated). In terms of gender, the proportion of female respondents was 30.5%, and the proportion of male respondents was 69.5%. Regarding age, 45% of the respondents were between 41 and 45 years old, 29.6 % were between 46 and 50 years old, and 15.4 % were older than 51.

Research Instruments

To measure technology anxiety, Sinkovics, Stottinger, Schlegelmilch, and Ram's (2002) technophobia instrument was used in this study. To measure technology leadership, this study adapted Bozeman and Spuck's (1994) suggestion that educational technology leaders can use technology to solve real problems in their schools. This study used the scale of implicit learning ability with definitions by Kaufman et al. (2010) and Huang-Pollock, Maddox, and Karalunas (2011). All of these questionnaire items used a 5-point Likert scale format and the respondents marked their level of agreement with a statement on a 5-point scale that included 'strongly disagree-strongly agree'.

Research results

SPSS 19 was employed as an analytical tool to conduct descriptive statistics, reliability analysis and correlation analysis. This study also used the statistical software Amos 19 to conduct path analysis to understand the variables of the study.

Item analysis with reliability and validity

Internal consistency was determined by examination of the composite reliability (CR) of the constructs (Fornell & Larcker, 1981). All composite reliability values in the present study ranged from 0.808 to 0.946, surpassing the suggested threshold value of 0.7 (Nunnally, 1978; Hair et al., 1998). Model validation was discussed extensively in the literature, but most authors merely offered terminology instead of methodology (Refsgaard & Henriksen, 2004). Convergent validity refers to the degree to which multiple items measure one construct. Convergent validity in the present study was evaluated by determining whether (1) the average variance extracted (AVE) values were larger than 0.5 (Fornell & Larcker, 1981) and (2) the factor loadings of all items were significant and higher than 0.5 (Nunnally, 1978). Under the condition that all of these criteria were met, convergent validity was accepted. Furthermore, all t-values in this study were significant, indicating that all items were discriminative, and all items were able to identify different degrees of response (see Table 1).

Table 1. Factor Loadings, AVE, CR

Item	Mean	S.D.	Loading	t-value
TANX: CR=0.829; AVE=0.620				
1.When using new IT devices, I worry that I might break them	2.32	0.99	0.682	42.306
2. When using new IT devices, I worry that the use of the wrong buttons will cause the machine to freeze or accidentally delete important files and data	2.43	1.05	0.837	41.971
3.Operating new IT devices makes me anxious or uncomfortable	2.24	0.94	0.834	43.287
TACIT: CR=0.946; AVE=0.854				
1.I can confidently explore the operations of new IT devices	3.48	0.90	0.936	69.721
2.I can confidently operate the functions of new IT devices and operate them easily	3.41	0.92	0.943	67.316
3. I can set the settings of new IT devices to my personal preferences	3.34	0.97	0.892	62.453
PU: CR=0.894; AVE=0.738				
1.Promoting IT education in schools can facilitate the convenience of supervision work	4.07	0.67	0.841	111.023
2. Promoting IT education can facilitate class leadership and design	4.10	0.67	0.877	112.024
3. Promoting IT education can increase the convenience of teaching evaluations	4.15	0.68	0.859	110.943
PEOU: CR=0.934; AVE=0.823				
1.IT functions are easy to operate	3.84	0.65	0.936	106.720
2. IT manuals are easy to understand	3.83	0.67	0.913	103.887
3. IT maintenance is easy to understand	3.82	0.69	0.874	100.404
TL: CR=0.836; AVE=0.630				
1. I can use IT to resolve problems in class management	4.05	0.75	0.820	97.426
2. I can use IT to resolve problems r in personnel management	4.18	0.66	0.808	114.096
3. I can use IT to resolve problems with student issues	3.98	0.70	0.751	103.180
IP: CR=0.808; AVE=0.513				
1. Even lacking funding, I can continue to promote IT use	3.73	0.97	0.781	69.917

at school				
2. Even lacking professional personnel, I will continue to promote IT use	3.83	0.98	0.693	70.940
3. Even lacking teachers' engagement, I will continue to promote IT use at school	3.25	1.01	0.659	58.607
4. Even lacking support from the top administrative units, I will continue to promote IT use at school	3.18	1.04	0.727	55.637

Factor and construct reliability analyses

To evaluate the consistency of the variables, a reliability analysis of the questionnaire was conducted using Cronbach's α. According to Nunnally (1978), a Cronbach's α value above 0.5 indicates an acceptable measurement of reliability. The Cronbach's α values are shown in Table 2. All values are above 0.5, and the reliability coefficient for the entire questionnaire is 0.777, suggesting that the variables are reliable. The construct validity of the research instruments was established by means of confirmatory factor analysis (Byrne, 2001). All factor loadings were statistically significant according to Kaiser (1970; 1974). If the value of the Kaiser-Meyer-Olkin (KMO) measurement of sampling adequacy is above 0.5, the construct validity is acceptable. The KMO values are displayed in Table 3. All values are above 0.5 and range from 0.683 to 0.766, and the validity of the entire questionnaire is 0.883, indicating that the variables exhibited good validity. As shown in Table 3, the means of each dimension were between 2.33 and 4.11, and the standard deviations were small, indicating that the degree of dispersion was low.

Table 2 Factor and construct reliability analysis

Dimension	Mean	SD	Cronbach's α	KMO
Overall	3.54	0.38	.777	.883
TA	2.33	0.86	.829	.708
ILA	3.41	0.89	.945	.766
PU	4.11	0.61	.895	.751
PEOU	3.83	0.63	.932	.760
TL	4.07	0.62	.837	.723
IP	3.50	0.71	.681	.683

Correlation Analysis

Table 3 shows that TACUT, PU, PEOU and IP showed significant positive correlation, all with 'moderate correlations'. There were significant negative correlations between TA and ILA, TA and PU, TA and PEOU, and TA and TL, all with 'low correlations'; and there were significant positive correlations between IP and TA, IP and PU, and IP and TL, all with 'low correlations'. There was a certain degree of correlation among these six dimensions and among these continuous variables. Furthermore, there were significant correlations between the ordinal variable 'frequency of using information technology (FUIT)', TA, ILA, PU and TL, meaning that FUIT influences TA, ILA, PU, and TL. This finding indicates that based on the frequency of using new technology and the high level of FUIT, these respondents had a low level of technology anxiety but a higher level of implicit learning ability and mediated positive technology leadership by perceived usefulness of information technology. In contrast, FUIT showed no correlation with the intention to promote new technology use at schools.

Table 3 The correlation matrix

	TA	ILA	PU	PEOU	TL	IP	FUIT
TA	1						
ILA	-.427**	1					
PU	-.119*	.400**	1				
PEOU	-.337**	.561**	.429*	1	1		
TL	-.387**	.640**	.520*	.630**	.166*	1	
IP	.198**	.074	.125*	.022	.108*	-.016	1
FUIT	-.136*	128*	.124*	.081			

Model Goodness of Fit Test

This study used structural equation modeling (SEM) with AMOS 19 software to test the goodness of fit of this model. To avoid problems that may arise from using the Chi-square test in a large sample, this study adopted Hair's recommendations to set χ^2/df< 5 as an acceptable level together with multiple indicators to obtain a more objective conclusion. The model was hypothesized as χ^2 =218.826, df=136; χ^2 / df=1.61, RMR=0.037, RMSEA=0.043, GFI=0.934, AGFI=0.907, in which RMR and RMSEA were lower than 0.05, GFI and AGFI were higher than 0.9, indicating that this model best fit the data.

Hair et al. (1998) proposed that researchers should not only pay attention to the Chi-square values but should also consider other fitness measures. The fitness values obtained in this study were all larger than 0.9: NFI = 0.949, RFI = 0.935, IFI = 0.980, TLI =0.975, and CFI = 0.980. Overall, judging from the comprehensive indicators, the theoretical model fit the overall pattern of the data.

Path analysis

The results of the path relations among the hypotheses are shown in Figure 2. We can see that Hypotheses 1, 2, 3, 4, 5, 6, 7 and 8 were supported. Figure 2 indicates that the test of the influence of TA on the participants' PU and PEOU was supported, with standardized regression coefficients (SRC) of 0.133 and -0.148. The test of the influence of ILA on PU and PEOU was supported, with SRC of 0.348 and 0.504. The test of the influence of PU on TL was supported, with SRC of 0.453. The test of the influence of PEOU on PU and TL was supported, with SRC of 0.304 and 0.224. The test of the influence of TL on IP was supported, with SRC of 0.248.

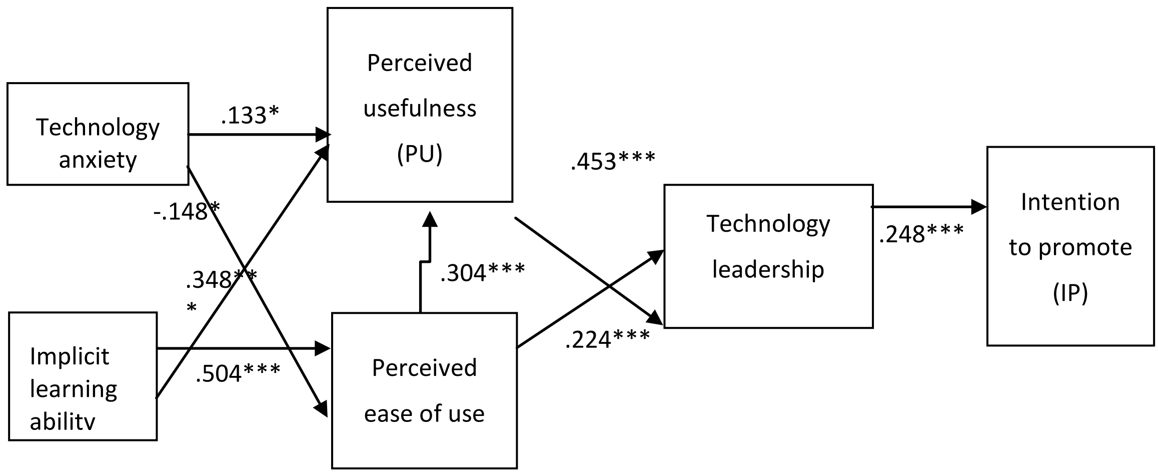

Figure 1: Results of the research model

Discussion

As expected, greater technology anxiety was negatively associated with perceived ease of using information technology when participants reported their concerns in both constructs. Furthermore, technology anxiety and implicit learning ability showed positive correlation with perceived usefulness of information technology at schools. Technology leadership changed as a function of the difficulty of using information technology in educational tasks, and it increased significantly, when perceived ease of use and usefulness were affected. These changes were apparently associated with the intention to overcome difficulties in promoting the practice of information technology in schools.

The finding of new technology anxiety is negatively associated to PEU is supported by the studies of Parayitam, Desai, Desai, and Eason (2010), Vician and Davis (2003)Vician and Davis, 2003**43** Kim and Forsythe (2008) which indicated a negative relationship between technology anxiety and performance. Another finding indicates implicit learning ability is positively associated to PEU and PU is consistent to the study of Howard, Japikse, and Eden (2006). They point out that school principals with low implicit learning ability were likely to perceive difficulty in implementing information technology, then indirectly affects their frequency of using information technology and their attitude toward low technology leadership. Thus, school principals can refine their metacognitive abilities in support of implementing new technology in schools.

Conclusion and implication

The present study proposes a technology leadership and intention model that does not attempt to capture every dimension of behavioral belief and attitude but rather provides empirical support for specific dimensions related to schools' effectiveness in implementing new information technology. The study acknowledges that high levels of implicit learning ability are related to applications of good technology leadership. Therefore, the results of this study suggest the in-service trainings for school principals can focus on sharing the experience of technology leadership to delimitate the technology anxiety, and sharing expertise of implicit learning strategies to anchor the confidence in self-development to use new technological devices.

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The Acceptance Of The Trainee Counselors Towards Smart Counseling Management System (Scms)

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Abstract

Awareness that the progress of information technology can improve productivity. Along with the need for increased counseling services from time to time have led to the development of the counseling management system know as the Smart Counseling Management System (SCMS). This study was carried out to see how far the level of consumer acceptance of this system using the Technology Acceptance Model (TAM). The respondents are trainee counselor. A set of questionnaire was used to measure the acceptance towards SCMS. The data was analyzed by using descriptive method to describe the respondents' level of acceptance of SCMS. The results showed that the acceptance of respondents are positive and are at high levels. Overall, this study has clarified that the system was able to achieve its development objectives.

Keywords : Technology Acceptance Model, Smart Counseling Management System

Introduction

Counselor in Malaysia today have reached a lot of requirements to fulfill the high demanding for counseling service. Significant changes in socialization, politics and economy, and urbanization of the countryside to the city make the profession as a counselor rapidly rising and get well response from the society. Research done by National Health and Morbidity Survey in the past 10 years reveals that 11.2 percent of Malaysians aged 16 years and above tend to suffer mental disorders (Nina, 2011). News from on of Malaysian local TV broadcast on 29 October 2011 reported that only about 13 percent of students in Malaysia can handle the stress they had experienced, while the rest were facing the problems in managing their stress. Increasing the percentage of people with mental disorders has shown that this problem is not a new thing, yet should be taken seriously by the authorities. Hence, the development counseling services particularly in Malaysia should be enhance to follow with current requirements. Technology development should be manipulated to ensure that counseling management can be more effective. Jacob (2009) found that the department with good information management can build customer satisfaction. In fact, cost savings and effectiveness of the working process also greatly varies among the departments that have good and weak information management.

Realizing the importance of information technology is seen can help increase efficiency in the management of storage systems, then a software system called Smart Management Counseling Management System (SCMS) was constructed. This system not only aims to make the management of client records become easier, but the record can also be effectively stored and organized. SCMS is the stand-alone systems and that is not part of any network. In other words, it can only be used on a computer without a network with other computers. User can search for clients' information based on personal information such as clients' name or identity card numbers that need to be enter in 'search' column. Counselors can also print the whole information if they have to do so. For data security factors, each owner must have a unique and distinctive SCMS identification (id) and password so that the confidential data can only be achieved by the system owner.

SCMS Software Design Process

Software design process that has been through in this system development refers to the measures to determine the material that will be used, system development objectives and final goals to be achieved. These development and implementation process is based on ADDIE model. This model is a basic model that is useful in any program design because it is simple and easy to understand. According to this model, the process repeated

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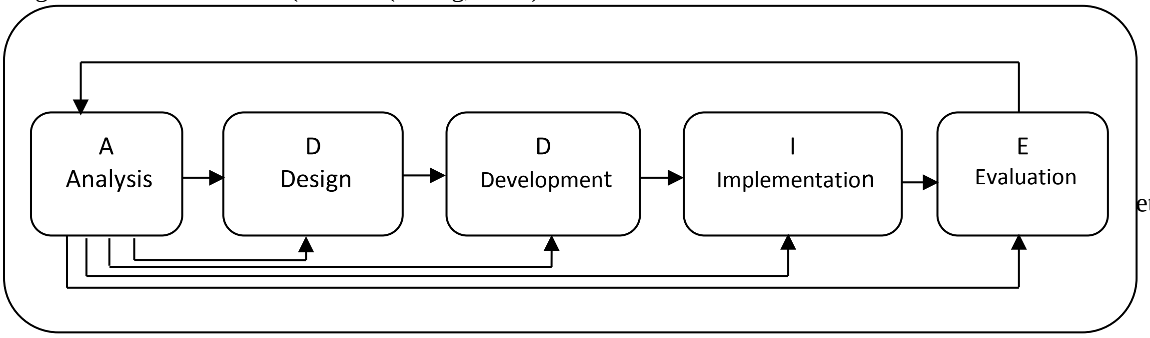
at each phase and consists of five phases, namely a sequence of spelling the name of this model. Description and explanation of the ADDIE model as shown in Figure 1.

Figure 1: ADDIE Model (Source: (Cheng, 2009)



ethod

The Design phase is the process of determining the objectives, structure, and approach and design interfaces that will be used.

The development phase

There are questions to be considered in this phase including the budget, the production of materials to be used or referred to, appropriate forms of interaction, and how information will be displayed to the user.

The implementation phase

This phase is identified as a testing process towards the actual use among consumers. Further, the preparation may be made to face the technical problems that may occur by looking at the alternative plans.

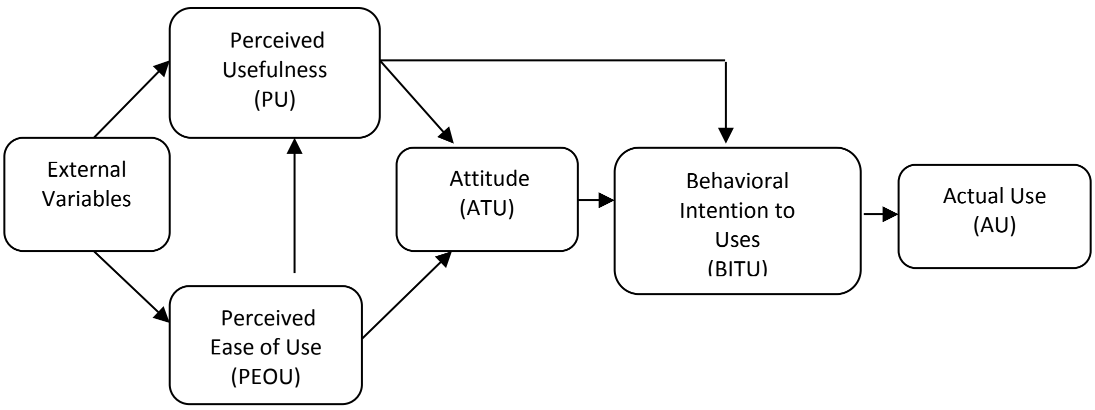
The evaluation phase

This final phase is to assess the consumer comment on the software to determine whether development objectives can be achieved or otherwise.

Although this system is capable to increase the quality of counseling management, but consumer acceptance of this system should be studied because the user is the main determinant to the successful of the system development. The study of counselor trainee acceptance towards SCMS is using the approach of Technology Acceptance Model (TAM). Developed by Fred Davis in 1986, the idea of TAM model is to explain consumer acceptance of computer-based technology (Masrom & Hussein, 2008).

Conceptual Framework

Figure 2: Technology Acceptance Model (TAM) by Davis (1989)



External Variables

External variables are an element that can influence consumers to use technology. Various aspects can be identified as external variables. There are studies that stated that the characteristics of a technology or characteristics of the target respondent as external variables, as well as many other factors that may be considered as external variables.

Perceived Usefulness (PU)

PU determines as a level where the user believes that using a particular system or technology can provide facilities or benefits that could improve their work performance.

Perceived Ease of Use (PEOU)

PEOU is a measure or the extent to which users believe the technology or system is easy to operate and can be controlled according to user requirements and free of effort.

Attitude towards Using (ATU)

Attitude means the act or views that are based on an idea in mind (Kamus Dewan, 4th Edition). While Davis (1989) in Tangke (2004) also defines ATU as an assessment of the effects experienced by a person using a particular system or technology in his work. Attitude also is an aspect that can influence consumer behavior.

Behavioral Intention to Uses (BITU)

Soviani et al. (2011) explained BITU as the tendency to use a system or technology. Level of use could be predicted through users attitude and attention to the system or technology.

Actual Use (AU)

Wibowo (2008) stated AU as the actual usage that conceptualized in the measurements of the frequency and duration of the use of a technology. Satisfaction and the belief that technology is useful are the perceptions considered as factors that can increase the actual use of a system.

There are four determining elements in the Technology Acceptance Model (TAM) approach are use in this research which are perceived usefulness, perceived ease of use, attitude towards using, and behavioral intention to use. TAM has been referred for much research on the acceptance of information technology from different countries and become one of the most popular model acceptance among researchers as more simple and easily to understood. The other strengths of this theory is able to explain the relationship between the determining constructs and the acceptance of information technology. Besides, explaining users' behavior or attitude towards information technology in different situations.

Venkatesh (2000) and Zakour (2004) emphasized that TAM is the best model and is often used by researchers. Park (2009) and Rustiana (2006) also agreed that TAM is useful to explain the levels of consumer acceptance of information technology. TAM is a good model because of simplicity and the good predictions have facilitated many researchers to understand and apply (Rustiana, 2006).

Objectives of the Study

Purpose to be achieved including:
to assess the perceived usefulness towards SCMS
to assess perceived ease of use of SCMS
to see the level of attitude towards using SCMS
to see the level of behavioral intention to use SCMS

Purpose of the study

The main purpose of this study is to see the acceptance of Smart Counseling Management System (SCMS) among trainee counselors in Malaysia.

Methodology

Participants

The respondents consisted of 96 of bachelor students in Education (Guidance and Counseling) in one of the local university in Malaysia.

Instruments

The questionnaire containing two parts. Part A consists of five items related to the background of the respondents. While part B consists of 20 items taken from TAM approach to evaluate the acceptance towards this system and divided into four parts consists of systems usefulness, ease of use the system, attitudes and intention to use the system. Reliability of this instrument is α .95.

Besides, a compact disk containing the SCMS system software and user manual are also provided to each respondent during the test.

Result

Analyse : Part A

Gender

Table 1 shows the distribution of respondents by gender. Majority of the respondents are female which is 82 people or (85.4%). While male consisted of 14 persons (14.6%) only.

Table 1: Distribution of the Respondent According to Gender

Gender	Frequencies	Percentage (%)
Male	14	14.6 %
Female	82	85.4 %
Total	**96**	**100.00%**

Year of Study

All bachelor students from each year of study were involved. For the first year students, about 25 people or (26%) are participated while 18 people or (18.8%) were second year students. Third year students were 32 people or (33.3%) and the rest of 21 people or (21.9%) were from the fourth year students. Table 3 shows the distribution of respondents according to year of study.

Table 3: Distribution of the Respondent According to Year of Study

Year of Study	Frequencies	Percentages (%)
Year 1	26	26.0 %
Year 2	18	18.8 %
Year 3	32	33.3 %
Year 4	21	21.9 %
Total	**96**	**100 %**

Analysis: Part B

In part B, scale of 7 scores of options was used, where is 1 is for 'strongly disagree', 2 for 'disagree', 3 for 'somewhat disagree', 4 for 'not for both/neutral', 5 for 'somewhat agree', 6 for 'agree' and 7 for ‘strongly agree '. So, to analyze the data, all the question in this section were measured in three levels of classification based on interpretation of the mean score. The range of 1 to 3 determine as ‘low’, 3.1 to 5 as ‘medium’ and 5.1 to 7 as ‘high’.

Perceived Usefulness

Table 5 shows the mean scores are between 5.86 to 6.06 and are at high level. Although on the whole result shows most of the respondents agreed that the SCMS is useful in their work, but there are low levels of acceptance of the second and third items, which described that SCMS can improve performance and productivity of their work. The overall mean is 5.95 and the standard deviation is .903.

Table 5: Perceived Usefulness

Item	L	M	H	Mean	Level
Using SCMS in my job would enable me to accomplish tasks more quickly.	2 (2.1%)	27 (28.1%)	67 (69.8%)	5.90	High
Using SCMS would improve my job performance	2 (2.1%)	31 (32.3%)	63 (65.6%)	5.86	High

Using SCMS in my job would increase my productivity.	1 (1.0%)	30 (31.3%)	65 (67.7%)	5.86	High
Using SCMS would enhance my effectiveness on the job.	1 (1.0%)	23 (24.0%)	72 (75.0%)	5.98	High
Using SCMS would make it easier to do my job.	1 (1.0%)	25 (26.0%)	70 (72.9%)	6.02	High
I would find SCMS useful in my job.	2 (2.1%)	18 (18.8%)	76 (79.2%)	6.06	High

Notes: L– Low, M– Moderate, H–High, %– Percentage

Perceived Ease to Use SCMS

Refer to table 6, the position of the mean score of 5.98 found in the first item explained that the respondents agreed that learning to operate SCMS would be easy for them. Although still at a high level of acceptance, but the lowest mean score of the second and fourth items indicated that SCMS less flexible and cannot be used in accordance with their needs. The overall mean is 5.80 and the standard deviation is .885.

Table 6: Perceived Ease to Use

Item	L	M	H	Mean	Level
Learning to operate SCMS would be easy for me	1 (1.0%)	25 (26.0%)	70 (72.9%)	5.98	High
I would find it easy to get SCMS to do what I want it to do	4 (4.2%)	29 (30.2%)	63 (65.6%)	5.70	High
My interaction with SCMS would be clear and understandable.	2 (2.1%)	29 (30.2%)	65 (67.7%)	5.79	High
I would find SCMS to be flexible to interact with.	2 (2.1%)	31 (32.3%)	63 (65.6%)	5.72	High
It would be easy for me to become skillful at using SCMS.	3 (3.1%)	25 (26.0%)	68 (70.8%)	5.81	High
I would find SCMS easy to use.	3 (3.1%)	25 (26.0%)	68 (70.8%)	5.86	High

Notes: L– Low, M– Moderate, H–High, %– Percentage

Attitude Towards SCMS

Based on table 7, the mean score was between 5.82 to 6.11 and at a high level. The first item is 'I like to use the SCMS' showed the lowest mean score. However, majority of the respondents agreed that they were positive about this SCMS software in which the item shows the value of the highest mean score. The overall mean was 5.98 and the standard deviation is .818.

Table 7: Attitude Towards SCMS

Item	L	M	H	Mean	Level
I like to use SCMS.	2 (2.1%)	30 (31.3%)	64 (66.7%)	5.82	High
Using SCMS is a good idea.	1 (1.0%)	22 (22.9%)	73 (76.0%)	6.04	High
Using SCMS will be interesting.	3 (3.1%)	25 (26.0%)	68 (70.8%)	5.83	High
I will be positive about using SCMS.	1 (1.0%)	24 (25.0%)	71 (74.0%)	6.11	High
Using SCMS will bring profit for me	1	24	71	6.07	High

	(1.0%)	(25.0%)	(74.0%)
Notes: L– Low, M– Moderate, H–High, %– Percentage			

Behavioral Intention to Use SCMS

There are only 3 items in this section in which the mean value does not differ greatly from each other which is between 6:15 to 6:27. Table 8 shows the results of studies towards assessing the interest in using the SCMS. The item 'I intend to use the SCMS' shows the lowest scores rather than the other items. However, the majority of respondents were interested in using the SCMS in the future based on the highest mean scores of the result. The overall mean is 6.20 and the standard deviation is .811.

Table 8: Behavioral Intention to Use SCMS

Item	L	M	H	Mean	Level
I intend to use SCMS frequently in my job.	1 (1.0%)	18 (18.8%)	77 (80.2%)	6.15	High
I intend to use SCMS frequently in the future.	-	15 (15.6%)	1 (84.4%)	6.27	High
I will strongly recommend others to use internet banking.	-	19 (19.8%)	77 (80.2%)	6.19	High

Notes: L– Low, M– Moderate, H–High, %– Percentage

SCMS Prototype

SCMS prototype development includes five major parts which is refer to the actual counseling report form that commonly used to write reports counseling. Most of the space or columns available to fill in the basic information of the session and are usually required to be reported by counselors in counseling forms such as client information, the problems faced and further treatments.

This system is only in English version and the main menu displays five main sections including Clients Profile, Individual, Group, Reports and Logout. Figure 3 shows the main menu interface of Smart Counseling Management System.

Figure 3: The main menu interface

Discussion and conclusion

The overall findings indicated positive and a high acceptance among the respondents. Clearly, SCMS has been successfully makes respondents interested and excited about the features and functions available on this system. The results showed that the assessment of behavioral intention to use the SCMS get the best feedback from the other parts. Although there are only three items in this section, however, the findings showed that the respondents were very interested in using this software. On the other hand, some items in the lowest mean score need to be emphasized. This includes the second item in the perception of ease of use SCMS, in which respondents agreed that the SCMS less easy to use as they pleased. In addition, the third and fourth items stated that 'interacting with the SCMS is a flexible and clear and easy to understand' are also among the lowest mean sum total. This must be taken a step further by making improvements to make the system become more user-friendly.

Researcher described the actual level of acceptance towards this SCMS as a picture that explained the willingness of respondents to take advantage of all technological facilities provided. In fact, not an exaggeration to say that the findings of this research also clearly shows that the respondents were also eager for an innovation that can improve their work performance and productivity in line with the demand for effective services from time to time. Overall, this system has achieved the objective to attract users to continue using this system in the future.

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THE BARRIERS OF USING EDUCATION TECHNOLOGY FOR OPTIMIZING THE EDUCATIONAL EXPERIENCE OF LEARNERS

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Abstract

The paper will discuss the impact that education technology has on the teacher-student experience and does learning really takes place or has the educator been removed from the learning environment. Technology can enhance the teacher-student experience; the study will conclude that the educator-student learning experience can't be replaced by technology due to human and social elements which technology lacks. Education technology does not have interpersonal interaction and an increase in technology can lead to less interaction within teacher-student interactions. Communication constitutes of 80 through language, while 20% is nonverbal such as writing. Education technology falls into the 20 precent category concluding that it is not the best tool.

Keywords: barriers, technology, teaching and learning, technology integration, change; teacher-learner education

Technological challenges in education technology continue to prevail and will only become effective when the impact and focus remains on the learner and ensures a positive learner experience-then the barriers will be omitted

Mudar

Introduction

The communication and information age has progressed in ways never used before in society, work environments, institutions and people's lives through the use of laptops, iPhones and iPods. This has led to an awakening for learners to become more competitive in the global marketplace, increasing the demand of technology. Globalisation has led to an increase in the use of technology within education; this does not necessarily mean that it has impacted on learners in a huge way. Cradler (2003) (Schrum and Glassett, 2006) said that there is not enough evidence on the impact of education based technology on learners. Bretag (2011) said that education technology has led to a "rebuild" and not "remodel" as teachers are now teaching through the use of power-point slides as opposed to chalk boards. Education institutions use technology as a means to build onto existing methods, as opposed to optimally utilising the technology in more meaningful ways this is demonstrated when learners use laptops but limit their use of functionality on the laptop. Technology when used for educational purposes should create a meaningful learning experience for learners and teachers.

The use of education technology and information and communication technology all promote for learning by using technology. Catherall (2005) identifies e-learning; learning technology; online learning; blended learning;

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ubiquitous learning and mobile learning as the different types of learning technology each with their own features. The mediums of learning identified are computer-based; video conferencing; satellite, webcast and CD-ROM. These types of learning are on the increase as education institutions want to produce high calibre students who are compatible with the international globalised order (The Economist, 2008). Jaffer, Ng'ambi and Czerniewicz (2007) said that education technology can enhance teaching and learning if the focus is on education objectives and technology can be used as a possibility. The study will give an understanding of term education technology and how it impacts on teaching and learning by highlighting its strengths and the challenges which hamper a meaningful education experience for both teacher and learner. The study will therefore examine how technology shapes the future of education.

The UCLA Report (2007) noted that education technology can lead to active learners who master their learning content and increases learner modes of critical thought ensuring students' progress at their own level, use multimedia applications, have greater communication and collaboration skills and writing and research skills. This becomes critical factors when they become professionals in their respective fields. Catherall (2005) identifies dimensions of self-regulated learning which demonstrates that this type of learning create greater enquiry from a personal perspective leading to problem solving from one's own experience and enquiry. Koller, Harvey & Magnotta (2001) said that technology based learning works just as well as traditional teacher learning and costs even less, although other scholars argue that technology can be costly due to upgrading costs and new technology which become available (The Economist, 2008). This means that new technology can be used to enhance traditional teaching and learning, in order to embitter the education experience. There is however a gap in learning objectives and online deliver, both has become important in ensuring that bigger learning goals are met. Traditional teaching fills the gap as the teacher oversees that learning gaols are met, although the need for global competitiveness and communication, insight and thought , and research have not be filled. Even though technology is on the increase, financial constraints due to the ever-changing needs of technology; leadership challenges, infrastructural demands and support continue to hamper the effectiveness of technology, particularly in Third World countries.

Koller, Harvey & Magnotta (2001) question how credible education technology is in comparison to teacher-student traditional teaching and learning. This paper shares the views of Kirkup and Kirkwood (2005) and Wagner (2001) (Jaffer, Ng'ambi and Czerniewicz, 2007) that education should be driven by context and content objectives and not by technology. They further posit that technology can impact on teaching and learning positively, although it is not the only means and the successes of the technology education experiences must be identified and the areas where there is not significant impact must be omitted.

Main problem and research objective

Education remains important and because of our globalised world and the technology age, the compatibility of learner to be technologically savvy is pivotal. Technology will continue to dominate many aspects of human existence and if integrated optimally can only further ensure better teaching and learning takes place in the education experience of learners. There is a need to investigate whether education technology impacts on the teaching and learning experience in a positive way in comparison to traditional learning. The study focussed on how education technology, through teaching and learning can ensure that the students have an optimal education experience. The study discusses education technology and teaching and learning, in order to explore and make a significant contribution to the existing literature. The study seemed to answer the following key research questions: Has education technology been successful in creating an optimal educational experience for learners? What is the result of education institutions using technology as a means of learning and its effects on the education experience of learners?

2.1 Primary objective

The primary objective of this study was to investigate the use of technology within learning environments and its impact on teaching and learning.

Secondary objectives

The following secondary objectives were identified in order to achieve the primary objective:

* To conduct a literature review which will assist in identifying what education technology entails and its learning methods?
* To review current empirical research on the topic
* To summarise, draw conclusions and provide recommendations based on the empirical results.

3. Literature review

Education technology is a study and practice which facilitates learning in order to create, manage and use technology to improve teaching and learning (AECT, 2004). Education technology (e-technology) and learning technology has become an important aspect in skills development globally. In such, education based technology has a number of barriers for all stakeholders involved, once overcome technology will be have greater impact in the curriculum as opposed to only being a subject on its own, without clear education objectives and with student having access to it all the time.

Su (2009) said that technology can be used for integration and transformation purposes. The integration of technology ensures that technology enhances current learning, whereas transformation allows for technology to teach learners things which were not taught until new technology was found. The paper agrees with Su's view that technology should be used to transform education in addition to maintaining the teacher-learner experience this will beneficial for all. The concept learning has evolved and does not hold the same meaning it held in the past. Perkins (1992) defines technology as the retention of knowledge. The AECT (2004) said that learning entails understanding and retention of knowledge, it is a study which uses different types of technology in education, in order to focus on learning and its facilitation of appropriate technology , to improve performance (AECT, 2004).

Traditional teaching and learning takes place when the teacher instructs learners and student ask questions based on the teachers instructions, it can however be interactive and engaged. The content given to students is for the group and not for an individual, this can impact of individual learner progress because the teacher has to attend to a class of students; learners are placed in classes according to their age, the content and context is age specific as well. The content is presented in a personal manner and students can have access to the educator immediately, there are not stumbling blocks for the knowledge transfer process to take place.

Constructivist learning entails greater engagement and interaction for students, the teacher is only a guide and enquiry is based with the learner. The content and progress is based on individual needs. Learners interact across age groups either via peer learning or individual learning and due to technology student have greater interactivity and engagement (Su, 2009).

The types of technology based learning can occur at any time and place; or can be self-paced where it happens at any time or can be content-centric with a little teachers-student interaction or learner-learner interaction or learner- focussed where the learner navigates learning. This type of learning is when technology replaces traditional face-to-face learning it is not text-based learning and the instructor does not have to be in the same room as the learner and is therefore technology delivered learning. This type of learning can be computer based learning which includes mediums such as E-learning (Koller, Harvey & Magnotta, 2001).

Based on the traditional and constructivist learning models it is clear that both methods have strengths, however traditional teaching is interactive and engaged with content and peer learning. It is also applicable to all field of study and the content might be age specific but the educator challenges the students to work harder, motivates the student and can address any problems immediately, therefore creating an added advantage which technology alone cant.

Table I: The benefits of education based technology

Technology can be used anywhere, anytime, in large or small groups, is cost effective and can be updated as new technology emerges.
Has a greater geographic reach, is self-paced training to match the learner, scalability, effective learning delivery, a variety of education methods available, and greater tracking of progress (Koller, Harvey & Magnotta, 2001).
Catheral (2005) said that some education technology can be flexible, improves IT skills of learners, creates greater learner-learner interaction, is easily accessible to a wide knowledge base; ensures greater teacher-teacher interaction, with progress being tracked.
Technology learning promotes for social learning (online chats); self-regulated study; imitation by peers within groups; is interactive(The Economist, 2008) ;
Technology ensures learning goals; creates meaningful feedback; identifies needs; modelling strategies; providing guided and independent practice; task engagement and performance; providing students with control of their learning and elicit student work to create understanding of language and concepts (Digital Learning Imperative, 2012).
Technology creates personalised learning, professional development, data and assessment, digital content or software, blended and hybrid learning, online courses, tools and devises; learning management platforms and personalised learning (Digital Learning Imperative, 2012).

The barriers of education technology

The barriers of education technology can be split into categories. The *student barriers* include more self-discipline needed by students, reduced contact with educator and peers; special needs by students and printing costs (Catherall, 2005). The *educator barriers* associated with learning include how responsive the system is towards academic input, learning support availability, cultural implications impact on the attendance of learners, an information overload due to the internet, plagiarism and security threats are on the increase and not all subjects can be taught via learning such as Humanities and Arts. Park, Lee, Blackman and Belland (2005) said that teachers would like to have more time to plan their classes, have technology support and ensure better leading and guiding with the use of technology, as well as have feedback based on their work. They highlight the use of incentives for their professional growth and rewards.

Table II: The barriers of education technology

Cost implications; technology is disruptive; entrenched organisational culture focussing on traditional learning; technology can disrupt classes when opened in class; availability and access to information can lead to increased cheating and plagiarism (The Economist, 2008).
Dawes (Bingimlas, 2009) holds the view that change, might not be easily accepted-there will be some degree of resistance
Challenges around the those who have access to this technology an those who don't (digital divide) ; differing levels of computer literacy levels; less involved due to decreased teacher-learner and learner-learner interaction in the learning experience continue to persist (Koller, Harvey & Magnotta, unknown).
Barriers of technology include lack of motivation due to poor social skills, poor computer skills and a lack of availability of access; a lack of time and class time and a lack of motivation and social awareness and school culture (Catherall, 2005).
Bingimlas (2009, 1) said that the major barriers of education technology include a lack of confidence, competence and a lack of access to resources.
Misalignment between teachers and administrators creates difficulty for teachers (Park, Lee, Blackman and Belland (2005))

Challenges of education technology

Table III: The challenges of education technology

The digital divide still exists (The Economist, 2008).
Educator challenges on training remain (The Economist, 2008).
Educator challenges on support and infrastructure of technology used are eminent
Higher wearing a way of technology exists (Koller, Harvey & Magnotta, unknown).
Problems on accommodating individuals with disabilities (The Economist, 2008).
High start-up costs and a lack of proven result or credibility (Koller, Harvey & Magnotta, unknown).
Catheral (2005) identifies challenges around infrastructure problems, upgrades are needed; integration and technical support problems.
Then there are the teacher challenges around technology support and infrastructures (Koller, Harvey & Magnotta, 2001).

Both teachers and learners need to revisit what can work optimally for their teaching and learning experience to take place progressively and they need to determine their future collectively. There is also a need for public participation in identifying the needs of educators and learners in the education experience (Jaffer, Ng'ambi and Czerniewicz, 2007). The barriers of technology can only be eradicated when there is a common understanding and agreement by all stakeholders on each of the aspect. It will take time and research to validate why technology is important.

Research design and methodology

Firstly, the study conducted a quantitative study on the nature of technology based learning and how this practice contributes to teaching and learning. There is not enough large-scale concrete research which has been done on the topic and this calls for a strong and sustained case which will contribute to ensuring that technology enhances the education experience of learners in a meaningful manner. Secondly, both teacher and learner technology integration barriers have been identified in an effort to increase the effectiveness of this practice. A desk research study was used. This aim of this study was to investigate how technology based learning contributes to teaching and learning, have education institutions that practice this been successful in their education goals. Primary and secondary sources were used to conduct desk research; library sources; internet sources; documents reports; websites, and papers.

Findings and conclusion

The study examined how technology based education in schools has contributed to learning outcomes. There unfortunately is no going back as we live in a technological age and technology has become acceptable and the norm. Brandsford, Brown and Cocking (2000) (Kozma, 2003) said that educators play an important role in ensuring the effectiveness of technology within education and it is for this reason that Park, Lee, Blackman and Belland (2005) recommend that teachers become the driving force in ensuring technology enhances teaching by including all relevant stakeholders provide feedback to teachers; ensuring greater collaboration and knowledge sharing among teachers , increase rewards and incentives for teachers and for change to occur at the individual and organisational level within education institutions. The paper agrees with the UCLA (2007) recommendations that there is a need to investigate student engagement, information literacy and student learning and course design in the education technology future plans as not enough research has been done. Laurillar (2001) and O'Hagan (1999) (Katsifili, 2010) illustrate that education technology can impact on certain teachings and learning objectives, if it is aligned to the aims of the education experience. It will therefore contribute to the teaching and learning needs and not merely on using technology for the sake of it (Jaffer, Ng'ambi and Czerniewicz, 2007).

5.1 Findings

Table IV: The outcomes on education institutions using technology

The digital learning imperative concluded that 45 percent of student who used technology to solve problems, 42 percent used technology to for experiments or be creative 17 percent developed demonstrations and 13 percent designed and developed products.
Kozma (2003) conducted in a study for 174 case studies, of innovative pedagogical practices of technology over 28 countries. The outcome concluded that when technology was used in collaboration to traditional teaching and learning there was professional development for the teacher and student ,they became more problem solving orientated; designed new things; examined their own work and managed information better and had stronger communication and collaboration skills
In 1985 Apple computer launched a project called Apple Classroom of Tomorrow (ASCOT). The research was conducted using seven classrooms where each teacher and student received a two computers one for home and one for school the results where (www.nsba.org): -Teacher used computers more to do to their work -students became more stimulated and interactive with peers as opposed to becoming socially isolated. -The youngest children also adapted to using technology (age) -software support didn't become a problem for children - student performance was good -teachers and student had positive behavioral changes
ASCOT findings after 10 years (www.nsba.org) -technology acts as a catalyst for student learning and teacher teaching -Student became interactive and engaged -Technology remodeled education -absenteeism reduced and drop-out rates declined at the high school level -Change occurs over time and not immediately
Honey (2005) (Earle, 2002) in her study refers to 15 instances where technology within schooling has impacted positively on: reading; language and writing skills, better learning; better learning attitude and self-esteem; achievement in subjects, interaction and engagement.

Schacter (1999) researched five big studies on education technology as well as two small scale studies which used newer technology. The findings concluded: **Kulik's Meta-Analysis Study**: 1st study: meta-analysis was used over 500 individual studies

Outcomes: higher percentile scores, faster learning and positive attitude changes

Challenges: Positive effects were not achieved in all field

Sivin-Kachala's Review of the Research: 2nd study: reviewed studies with consistent patterns

Outcomes: better achievement throughout school, improved attitudes

Challenges: student population; software design access to technology and educator's role

The Apple Classrooms of Tomorrow (ACOT); 3rd study: reviewed a partnership between Apple and five schools

Outcomes: Better problem solving and reasoning (not conclusive), better attitudes for teacher in teaching and students.

Challenges: Apple participant scored the same as non-apple participants in reading comprehension; math's and work study

West Virginia's Basic Skills/ Computer Education (BS/CE) Statewide Initiative; 4th study: Assessed West Virginia's 10 year education technology project

Outcomes: better performance; positive attitudes by teacher and learner; departmental goals were met; cost effective , increased instructional time and tutoring was across ages

Harold Wenglinsky's National Study of Technology's Impact on Mathematics Achievement; 5th study: assessed fourth and eighth grade students nationally using new advanced technology

Outcomes: more stimulation and performance increased; professional development of teachers impacted on student performance; improvement in math's results.

Challenges: Student who used education technology did not have immediate positive changes, only 5 weeks after inception in the program in comparison to non-users

Student performed worse on drill and practice technology

Scardamalia & Bereiter's Computer Supported Intentional Learning Environment (CSILE) Studies 6th and The Learning and Epistemology Group at MIT 7th study: analyzed two smaller merging studies using new advanced technology which seemed promising

Outcomes for 6th study: measured understanding, reading and language, promotes reflection focusing on multiple perspective and greater thinking.

Outcomes for 7th study: better math's results; better learning.

Based on the findings technology was used in collaboration with traditional teaching it impacted positively on the education experience of the learner. The use of technology ensured that learners could work independently, solve problems, increased communication and collaboration and have greater access to information. The findings also concluded that more research is needed on the topic, when curricular content and teacher motivation is considered with technology it can impact meaningfully on education.

6. Recommendations and Implications

Based on the results, education institutions using technology as a means of educating learners, experienced positive and meaningful teaching and learning outcomes. Stone- Wisker (Schacter, 1999) said that education should be placed first before technology and the education gaols should drive the process, if not technology use becomes ineffective. Based on the above technology will remain well into the future and has positively left its mark in certain fields, surely if used in collaboration with traditional teaching can change and shape the face of the future of teaching and learning forever.

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THE DESIGN OF WEB-BASED LEARNING ENVIRONMENT TO ACTIVELY CONNECT HUMAN BRAIN AND GOBLE BRAIN

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Abstract

The main goal of this study is to identify factors that might influence learners to learn online actively based on the theories of human brain, constructivism, rational behavior, innovation diffusion. There are 2,083 interviewers data collected from high schools in Taipei and Hualien. The "Active Online Learning" Model has been constructed based on survey results by using structural equation modeling. The results of the analysis indicate that the perceive usefulness is the critical factor to promote satisfaction to the web-based learning environment. A content-rich online learning environment can connect each individual's prior academic experiences and encourage active online learning.

Keywords: Structural equation model; Theory of planning behaviors; Theory of reasoned action, Technology acceptance model; Brain theory; Cognitivism; Constructivism; Perceived ease of use; Perceived usefulness; Multiple adaptation;

Introduction

For the purpose of surviving in the highly competitive globalization environment, it is critical to apply advance computer and Internet technology to provide flexible, multiple, dynamic multimedia teaching environment to grasp the rapid changes of knowledge and accumulate intellectual capital in the era of knowledge-based economy. The virtual classroom is very different from the traditional physical classroom in terms of disciplines. The role of self-regulated learners is relatively more important under the much less regulated web-based learning environment. A learner without reasonable motivation is quite difficult to learn online actively. To attract learners continuing to learn online, in addition to learner's motivation, the design of the web-based learning environment is critical to enhance users' intention. In this study, a set of key concepts including perceived ease of use, perceived usefulness and multiple adaptations have been adopted to integrate with the theories of innovation diffusion, technology acceptance, cognition, construction and human brain to explore factors that might influence learners' satisfactions and intentions to participate in the web-based learning environment.

Theoretical Background

This study focuses on the integration of human brain theory with educational theories and the influences on the development of the learning environment. Also, the concepts of planning behaviors, reasoned action and technology acceptance model have been used to evaluate and estimate the effectiveness of the online learning web site. The related theories and concepts are specified as follows:

2.1 Cognitivism

Cognitivism had been developed since early 1960s, and it is viewed as mental constructions in the minds of individuals. Learning was regarded as information processing of input, storage and retrieval. Cognitivism emphasized on the internal mental processing on the part of the learners. It was based on the thought process behind the behaviors. However, knowledge was still viewed as given and as absolute, as in behaviorism (Skinner, 1938, 1953).

2.2 Constructivism

Constructivism started to be developed in the late 1980s. The concept was derived from collaborativism and cognitive information processing. Constructivism went beyond the ideas of cognitivism to understand the way in which the brain store and retrieve information. This theory also examined the way in which learners made meaning from experiences. The key concept of constructivism was that people learned best by actively constructing their own understanding. Knowledge could not be transmitted from one person to the other; it needed to be constructed by each individual. Jacqueline and Martin Brooks (1993) suggested that students constructed understanding that was meaningful to them. In other words, knowledge was constructed in the mind of the learners. Generally speaking, there are two different views of constructivism:

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2.2.1 Cognitive Constructivism

Cognitive Constructivism was based on the work of Swiss developmental psychologist Jean Piaget (1977). There were two key principles for teaching and learning from Piaget's point of view. The first principle was that learning was an active process. The second was that learning should be whole, authentic and real. In a Piagetian classroom, students must be given opportunities to construct knowledge through their own experiences. Teachers provided a rich learning environment that assisted in expanding the conceptual and experiential background of the learners. Technology supplied a variety of tools to accomplish the goals of a constructivist classroom. In short, cognitive constructivism approached learning and thinking from the perspective of the individual.

2.2.2 Social Constructivism

Social constructivism was pioneered by Vygotsky (1978). Social constructivism defined learning as a social construct that was mediated by language via social discourse. From the viewpoint of social constructivism, learning does not occur in isolation. Learners interact with the knowledge, the learning environment and other learners (Dershem, 1996). Knowledge cannot be independent from the historical and cultural background of students (O'Loughlin, 1992). Meaningful learning is rooted in the historical and cultural background of each individual. Learning is not only based on an individual's past academic experiences, but also on the collective experiences of the persons in the learning environment. People learn and work collaboratively, not individually, throughout most of their lives (Resnick, 1988, cited by Brown et al., 1989). The offspring of social constructivism was cooperative and collaborative learning. The major goal of cooperative learning was the construction of shared understanding through interaction with other students. The more the knowledge was shared, the more was learned (Leidner & Jarvenpaa, 1995). Basically, cognitive constructivism described the mind in terms of the individual and confined it to the individual's head, while social constructivism described the mind as a distributed entity beyond the boundary of the individual's body.

2.3 The Human Brain

Thinking takes place through the aggregate action of billions of neurons. Learning in a biological system involves adjustments to the synaptic connections that exist between the neurons. Neuron interconnections are not fixed, they change all the time, mostly in response to learning. The nervous system transmits, stores and processes information instantaneously. The perceived information needs to be compared with the information that is stored in the nervous system. An interpretation is mostly related to our past academic experiences. The brain is designed to seek meaning in the content. Meaning is complex and involves the need for relevance, emotional connections, transfer and pattern making (Nelson, 2001; Jensen, 1998, 2000):

2.3.1 Relevance

Relevance is a function of the brain's making connections between existing neural sites (Greenough & Juraska, 1986). Our brains grow in a social environment because we forge meaning through socializing. Group discussions and the sharing of personal academic experiences among students can help them to associate and connect their learning with meaning. Social cognition theory believes that culture is a determinant of individual development. Culture teaches children both what to think and how to think (Vygotshy, 1978).

2.3.2 Emotion

Emotion and meaning are linked. Emotions engage meaning and predict future learning because they involve our goals, beliefs, biases, and expectations. Research in brain theory suggests that emotional health is fundamental to effective learning. The key ingredients of Emotional Intelligence are confidence, curiosity, and capacity to communicate. Emotional Intelligence has proven to be a better predicator of future success than have traditional methods like standardized test scores (Goleman, 1997).

2.3.3 Pattern Making

"Patterns are the key to intelligence. Patterning information means really organizing and associating new information with previously developed mental hooks." (Mehler & Dupoux, 1994, p49) To improve learning, it is important for a school to provide an online learning environment based on brain theory that encourages students to make their own meaning out of things. Brain theory fits well with the practice of contextual learning and constructivism (Parnell, 1996). Learning and memory are interlocked. It is important to realize that without memory we are unable to learn from prior knowledge and experience. Our memory works by association. It is difficult to remember information if there is no obvious association between things. In other words, the success of the retrieval is highly dependent on state, time and context. Associations, similarities or contrasts trigger recalls. Students can better recall their learning by using the right system in the right way.

2.4. Behavior Theories

There are three popular models of users' behavior theory including reasoned action theory, technology acceptance model and Innovation Diffusion Theory, which are used to predict students' participations in the web-based learning environment actively.

2.4.1. Theory of Reasoned Action

The theory of reasoned action (TRA) was developed by Martin Fishbein and Icek Ajzen (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). TRA is often used to predict and explain individual's behavior in the process of decision-making. TRA suggests that a person's behavior is determined by one's intention, and intention is influenced by his/her attitude and subjective norm directly or indirectly. Attitude toward the behavior is refers to the individual's positive or negative feelings about performing a behavior. Subjective norm refers to the individual's subjective judgment regarding others' preference and support for a behavior (Werner 2004).

2.4.2 Technology Acceptance Model

Technology Acceptance Model (TAM) was first introduced in 1989 (Davis, Bagozzi, Warshaw). TAM is an adaptation of the TRA to the field of Information Systems. TAM stresses on two critical factors to impact the intention of individual that are perceived usefulness and perceived ease of use. (Davis, 1989; Mathieson, 1991; Szajna, 1996; Taylor and Todd, 1995a Chau, 1996) Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free from effort" (Davis, 1989). Perceived ease of use influences an individual's attitude significantly through self-efficacy and instrumentality. In other words, when a person's self-efficacy of using of the computer technology is different, it will enhance or weaken individual's intention of using a specific computer technology (Davis, 1989; Mathieson, 1991; Szajna, 1996; Taylor and Todd, 1995a; Chau, 1996). In short, the more familiar with the system, the less anxiety the user will experience (Brown, 2004). Also, if users can obtain resources of information system in time to complete their academic assignments as a result their academic performance can be improved. This will trigger their positive attitude toward the system, the intention of using the system can be enhanced. Moreover, the decision to adopt the system will be speeded up. (Alavi, 2002; Oliver and Herrington, 2003)

In addition to extrinsic motivations which are perceived usefulness and perceived ease of use, some of the researchers in TAM proposed perceived enjoyment as an intrinsic motivation to promote the intention and willingness of individual to accept information system (AgarwaI et al, 1998). Van der Heijden's theory uses TAM as foundation to evaluate the system by using enjoyment instead of efficiency of the system as a major consideration. In addition to usefulness and ease of use of system, Heijden suggests design a web site should also consider the aesthetics of the interface and the interesting of the content to inspire the positive feeling of the users. Positive emotions can promote the ability to store and retrieval information from brain. The study of Atkinson and Kydd (1997) indicates the perceived enjoyment will impact users' behavior to access the Internet Moon and Kim (2001) use perceived enjoyment as a factor to explain the acceptance of the system.

2.4.3 Innovation Diffusion Theory (IDT)

IDT Theory is concerned with the manner in which a new technological idea, artifact or technique, or a new use of an old one, migrates from creation to use. According to IDT theory, technological innovation is communicated through particular channels, over time, among the members of a social system. In 1962, Rogers presented IDT, the theory migrate the technological innovative idea, artifact or technique to an individual and an organization in the social system. The Diffusion processes consist of four key elements: Innovation, communication channel, time and the social system (Rogers, 1962; 1995). Rogers proposed revised adoption model which is known as innovation decision processes based on the processes of an individual or an organization to accept innovative artifacts over a period of time. Innovation decision process can be divided into five stages: knowledge, persuasion, decision, implementation, confirmation. In recent years, many empirical studies' researchers integrated five stages of innovation diffusion theory into three stages: knowledge, attitude and practice, it also known as KAP (Hubbard, et al., 2003).

Roger (1983) presented the three key factors that affect individual to decide whether to accept a specific innovative object, which include: relative advantage, complexity and compatibility (Rogers, 1983). Relative advantage and complexity is similar to the perceived usefulness and perceived ease of use in TAM. Compatibility refers to the degree of compatible among individuals' past academic experiences and current needs. The higher compatibility, the better the possibility of the use of innovative artifacts is.

Proposed Model and Hypotheses

This study proposes Active Online Leaning (AOL) Model on the basis of the theories of behavior including TRA, TAM, IDT. AOL model adopts three stages (knowledge, attitude and practice) in IDT to predict whether an individual will participate in the web-based learning environment actively. The three stages are described as follows:

3.1 Knowledge

In the stage of knowledge, it adopts the perceived usefulness, ease of use and multiple adaptations to evaluate the usefulness, easiness and adaptation of the web-based learning environment.

3.1.1 Perceived ease of use (PEOU)

In addition to the computer skills is used to evaluate the ability of a user to operate the web-based learning environment, the accessibility of Internet-enabled computer devices is also used to evaluate the easiness getting online. Two facets of PEOU are provided as follows:

- Technique: Subscale of technique is calculated by 3 questions in the questionnaire that is used to evaluate users' computer skills. These questions include total years of accessing the Internet (Q6), taking any Internet or computer classes (Q87) and having any computer skills (Q87). The higher the score that a user get, the better the computer technique that a user possess.
- Accessibility: There are five questions used to evaluate the accessibility of Internet-enabled computer devices. These questions include having a computer or computers at home (Q1), having Internet connection from home (Q2), type of the Internet connection (Q3), using mobile phone to get online (Q5) and places of getting online (Q11). The higher the score that a user get, the better the accessibility to a computer and the Internet that a user have.

Three hypotheses derived from PEOU are provided as follows:

H1: The better skills that a user has, the easier of web-based learning environment can be operated.

H2: The easier a user can access the Internet-enabled computer devices, the faster a user can learn online.

H3: The easier a user can operate and access the web-based learning environment, the more chances a user can experience the advantages and effectiveness of the learning web site.

3.1.2 Multiple Adaptations (MA):

The online learning environment provides a variety of materials, functions and interface designs that can attract users to explore and experience the advantages of the web-based learning environment. This study stresses the concept of “relevance” in the theory of human brain and cognitive constructivism, “interactive” in the theory of social constructivism and positive emotion “enjoyment” in the theory of human brain. Relevance, interaction and enjoyment are three facets of multiple adaptations which are used to evaluate the adaptations between learner and learning environment. Three facets of MA are provided as follows:

- Relevance: There are four items in a question used to evaluate the relevance of the content of a learning web site to the course and connection between a leaner and a learning web site. The question is to identify the factors that influence the learning results online (Q73). The answer of each item has adopted 5-point Likert scales, in which 1 indicates extremely unimportant and 5 is extremely important. Four items include the information on the page current (Q73_1), the information relating to the course (Q73_2), the information meeting users' needs (Q73_4) and the page linking users to other relevant web sites (Q73_5). The score of four items are cumulative, the higher the score, the higher relevance of the online learning environment is.

Interaction: the web-based learning environment provides communication channels among teachers, students and learning environment that can promote learning and thinking through collaboration among users in the learning community. (Dershem,1996) There are five items in the question of the factors that influence the learning results online (Q73) related to the subscale of interaction. Five items include the interaction with teacher online (Q73_10), interaction with other classmate online (Q73_11), providing an objective academic evaluation online (Q73_13), equipping with a discuss panel or a message board online (Q73_14), giving quizzes and solutions of related materials to assist students better understanding the course subjects (Q73_15). Also, a question of whether a student allows sharing and constructing the teaching materials collaboratively online (Q68) are all cumulative. The higher the score, the higher interactions in the online learning environment is.

Enjoyment: learning in a multimedia web-based virtual classroom is much more effective than blackboard and chalk in the traditional physical classroom. Multimedia can improve students' motivation and enhance learning outcomes. An online virtual classroom applies advanced computer technologies, integrates multimedia of sounds, images, databases, graphics, slides and animation effects to promote learning both in lively and depth of teaching materials that can stimulate and initiate all related memory regions and inspire the positive emotion of learners. There are 2 questions with 5-point Likert scales used to evaluate enjoyment aroused by web-based learning environment. The question of the factors that influence the learning results according to past experiences on interaction with the Internet (Q73). It includes two items that are whether the web pages contain multimedia (Q73_3) and whether interface design of web-based learning environment attracts users (Q73_6). Another question is the reason for users to access the web-based learning environment (Q74), the item in the question is the vivid and lively multimedia interface design (Q74.2). The scales of each item are summed. The higher the score, the more enjoyment will be yielded.

Four hypotheses derived from MA are provided as follows:

H4: The more needs and requirements of the learners can be achieved by the web-based learning environment, the more adaptation between a learner and an environment can be fit.

H5: The more interaction among members and teachers in the online learning environment through the sharing and communication tools, the more learning paths and portfolio of learners will be retained in the online learning's environment. As a result, the online learning environment is able to provide teaching materials according to users’ needs. In other words, the adaptations between learners and learning environment are higher.

H6: The more interesting of teaching web site, the more positive emotions of learner will be inspired. The more learners are recognized the teaching web site and the more adaptation between a web site and learners will be made.

H7: The adaptation between a web site and learners is higher, the learners are more willing to explore teaching web site and thus web site will exert more achievements.

3.1.3 Perceived Usefulness (PU):

Task, convenience and knowledge are used to evaluate the effectiveness and usefulness of online learning environment.

Task: Four items in a question of the main purposes of going online (Q75) are assisting doing homework, searching curriculum materials, downloading curriculum materials and browsing entrance examination materials. There is one item “improve academic performance” in a question of the reason for users to access the web-based learning environment (Q74) and a question of using Internet to search information for writing an assignment, a report, or doing research for school (Q86) respectively. All the items in Q74 involved five-point Likert scales ranging from 1-‘extremely unimportant’ to 5-‘extremely important’’. The item in Q75 and Q86 are 2-‘yes’ and 1-‘no’. All the items for subscale “Task” are accumulate. The higher the score, the more the task has been accomplished.

Convenience: To experience conveniences of the online learning environment, there are six items in the questions of the reason for users to access the web-based learning environment (Q74). The items of removing the barriers of space and schedule (Q74_1), sharing faculties, resources and information among schools (Q74_4), eliminating the differences between urban and rural (Q74_6), arranging more flexible course schedule (Q74_7), fitting personal schedule (Q74_9) and saving traffic time (Q74_10) are used to evaluate the convenience of the web-based environment. The answer of each item is 5-point Likert scales, and 1 indicates ‘extremely unimportant’ and 5 is ‘extremely important’. All the items for subscale “Convenience” are accumulated. The higher the score, the more convenience the online web site can offer.

Knowledge: To participate in online learning environment, learner can increase his/her knowledge, link majority of knowledge base, access information better, and shorten the distance with the global knowledge. There are four items in the questions of the reason for users to access the web-based learning environment (Q74). The items of obtaining information easier and faster (Q74_8), connecting with information and knowledge base (Q74_5), bridging the distance to the globe and knowledge (Q74_3) and gaining information, knowledge, skill, ability (Q74_12) to evaluate the knowledge that web site can offer. The answer of each item is 5-point Likert scales, and 1 indicates 'extremely unimportant' and 5 is 'extremely important'. All the items for subscale "Knowledge" are accumulate. The higher the score, the more knowledge can be delivery.

There are four hypotheses about the usefulness of the web-based learning environment are provided as follows:

H8: The more short-term learning goals and tasks can be achieved, the more useful of an online learning site is.

H9: The more knowledge and ability of learner can be enhanced, the more useful of the online learning web site is.

H10: The more facilitates of the web site can bring to learners, the more useful of the teaching web site is.

H11: The more compatible of the teaching web site and users' needs, the easier of the teaching web site can be accessed and used, the higher satisfaction of the teaching web site will get

3.2 Attitude:

In the second stage of "attitude" reflects the satisfaction of the users to the online learning environment in term of ease, usefulness and flexibility. When users are more satisfied with the teaching web site, the higher the willingness is to participate in online learning. In this model, the observed variable of satisfied attitude (SAT) is a mediating variable to determine whether the leaner will continue to participate in an online learning web site actively. The hypotheses related to the variable of satisfied attitude are provided as follows:

H12: The more satisfaction of a learner to the web-based environment, the more likely a user will access the web-based environment actively.

3.3 Practice:

In the third stage, "practice" is emphasized on the intention of users to participate in web-based learning environment actively. The question of the willingness of future participation (Q91) is used to evaluate a user's intention to engage in online learning. This study attempts to construct a model that is based on the existing literature to evaluate the learners' preferences to the learning environment in terms of three dimensions (ease of use, adaptation, usefulness) and perceptions of their impact on the effectiveness of e-learning which are directly or indirectly influencing learners' satisfactions and intentions to learn online actively.

Methodology

4.1 Research Design

This study constructs "Active Online Learning" (AOL) model based on the theories of behavior (TAM, TRA and IDT), education and human brain. For the purpose of identify the factors that will impact learners to learn online actively. This study conducted a survey in Taipei and Hualien during March in 2011. Total of 2083 data were collected from both regular and vocational high schools. Among them, there are 1249 (61.1%) male and 796 (38.9%) female.

4.2 Data Analysis

In this study, structural equation mode (SEM) is adopted to explore the causal relationship of variables in AOL model by estimating multiple regressions simultaneously. There are 15 questions and 49 items used to compose three exogenous latent constructs (perceived ease of use, multiple adaptation and perceived usefulness), ten observed variables (technique, accessibility, relevant, interactive, enjoyment, task, knowledge convenience, satisfaction, and active online learning) in this study. This study uses a measurement model and a structural model two-step approach to SEM (Hair, et al. 1998). A measurement model is estimated followed by an estimation of structural model. The measurement model involves in conducting a confirmatory factor analysis (CFA) for assessing the contribution of each indicator variable and for measuring the adequacy of the measurement model.

The data collected for this study is normally distributed because the skew index ranges from -1.63 to .365 and kurtosis index ranges from -1.33 to 3.67 that are not exceed an absolute value of 3 and 10 respectively (Kline, 2005). The maximum likelihood estimation (MLE) was chosen to conduct SEM analysis. The use of MLE is to estimate the mean of a normally distributed random variable. In order to get reliable results in SEM, researchers recommend that a sample size of 100 to 400 cases is appropriate (e.g. Hair, Black, Babin, Anderson, & Tatham, 2006; Kline, 2005;Ding, Velicer, and, Harlow, 1995) because if the sample size is less than 100, the procedure may fail to converge on estimates of the coefficients. On the other hand, if the sample size greater than 400, MLE will become too sensitive. Even though the sample size of this study is 2083, MLE is still chosen because MLE is a better option over other estimation methods based on past several studies (Tabachnick & Fidell, 2007; Hair et al., 2006). This study uses CFA and MLE to conduct measurement model analysis and assessment.

4.2.1 Measurement Model Analysis

A meaningful latent variable should be composed by a set of observed variables that can accurately represent a construct (Hair et al., 1998). In other words, a set of observed variables in the latent variable should be reliable and valid in order to ensure the quality of the measurement (Bollen, 1989). To verify the reliability and validity of the latent variables in the model, individual item reliability measure, composite reliability measures and variance extracted measures were calculated.

- Individual Item Reliability

The individual items in measurement model are critical to ensure the stable and reliable of the latent variables (Hair, 2006). In general, the acceptable factor loadings is greater at 0.7 (Bagozzi & Yi, 1988; Hair, et al, 2006), However, in the social sciences, the scope of the study is wider, the constructs is more difficult to define, the impact of external interferences and measurement errors are greater, as a result the factor loadings are not high. An item is considered to be reliable if the standardized loading value is greater than 0.5 and above (Johnson, et al. 2001). In this study, the individual item' factor loading of the subscales is 0.64 for Technique, 0.54 for Accessibility, 0.95 for Relevance, 0.88 for Interaction, 0.89 for Enjoyment, 0.5 for Task, 0.75 for Knowledge, 0.74 for Convenience. The result showed that all the values of individual item reliability of each observed items are above 0.5, shows a good representation underlying latent variables (Anderson & Gerbing, 1988).

Composite reliability measures

Factor loadings can assess convergent validity that measures the extent to which the items truly represent the intended latent construct (Hair et al., 1998). In addition to factor loading, convergent validity can also be estimated by composite reliability (CR) measures (Hair et al, 1998). CR is computed for each latent variable included in the model, CR reflects the internal consistency of the observed variables measuring a particular latent variable. CR of latent variables PU, PEOU and in the model "AOL" are 0.65, 0.62 and 0.92 respectively. All three CR above the minimum acceptable level 0.6 (Fornell and Larcker, 1981), it shows that the measures are reliability (Fornell and Larcker 1981; Gerbing and Anderson 1988).

Average Variance Extracted (AVE)

Discriminant validity measures the extent to which the conceptually similar constructs are distinct. Discriminant validity is examined by comparing the correlation between the construct and the square root of AVE. In the model, three AVE are 0.36, 0.36 and 0.74 respectively. There are two AVE below suggested value, however, the standardized factor loadings for all observed variables are above 0.5 and significant ($p<0.05$). This indicated that all of the items have an acceptable convergent validity in explaining the theoretical constructs (Hair et al., 2006).

4.2.2 Structural Model Analysis

Structural model was evaluated using AMOS 5.0 using maximum likelihood estimates. The measures used in this study to assess the model's overall goodness of fit include the likelihood ration chi-square ($\chi 2$), the ratio of $\chi 2$ to degrees of freedom ($\chi 2$ /df), RMR(root mean square residual), the root mean square error of approximation (RMSEA), the goodness-of-fit index (GFI) and the adjusted GFI (AGFI). In practice, chi-square is not a very good fit index because it is affected by sample size. Larger samples like 2083 in this study might produce larger chi-squares that are more likely to be significant. However, both chi-square (4.627) and p value (0.099) are not significant in the study. In contrast to traditional significance testing, a nonsignificant chi-square is preferable that indicates the predicted model is congruent with the observed data. The ratio of $\chi 2$ to degrees of freedom is less than 3 (4.627/2=2,314) that indicates acceptable fit between the hypothetical model the sample data (Carmnines & McIver,1981). RMR is 0.028 at acceptable level (<0.05). RMSEA measures the mean discrepancy between the population estimates from the model and the observed sample values. RMSEA is 0.025 which is less than 0.1 indicates good model fit (Browne, et al. 1993; Hair, et al. 1998). The GFI is developed to overcome the limitations of the sample size (Joreskog, et al. 1993). Extension of the GFI is AGFI, adjusted by the ratio of degrees of freedom for the proposed model to the degrees of freedom for the null model. Both GFI and AGFI value are 1 and 0.988 which higher than 0.9 is recommended as a guideline for a good fit (Segars, et al. 1993). In this research model, there are 11 out of 12 factor loadings of items are greater than 0.5. And all the factor loadings for the indicators were greater than twice of their standard errors, the parameter estimates demonstrated convergent validity. Also, all t-values greater than 2.58 are significant. Accordingly, all factors in the measurement model are adequate reliability and convergent validity (Anderson & Gerbing, 1988). An examination of the unstandardized parameter estimates revealed all estimates to be both reasonable and statistically significant at the 0.05 level. That is, all of the parameter estimates were >1.96, indicating that all the parameters were important to the hypothesized model (Hair *et al*. 2006; Holmes-Smith 2000).

5. Implications of the research

AOL model adopts three stages of knowledge, attitudes and practice in the theory of innovation diffusion to assess whether an individual will continue to participate in web-based learning environment. In the first stage, the usefulness of learning web site PU is directly determined by PEOU (0.60) and MA (0.69), the MA has greater impact on PU. Latent variable of PU, PEOU and MU in the first stage are all used to evaluate the ease, usefulness, and flexibility of learning web site that influences the attitude of the users in the second stage. The attitude of SAT affects directly from PU (0.38), indirectly from both PEOU (0.23) and MA (0.26). The usefulness PU of the web site play greater role to enhance users' satisfaction SAT than MA and PEOU. The final stage, the intention of active learning online AOL is directly linked to users' attitude SAT (0.63), indirectly impacted by PU (0.24), MA (0.24) and PEOU (0.145). PU plays 0.38 direct effects, MA 0.26 and PEOU 0.23 indirect effects on SAT. The model explains (R^2) 84% of the variance in active online learning AOL. The path significance of each relationship and R^2 value by each path in the model are shown in Figure 1.

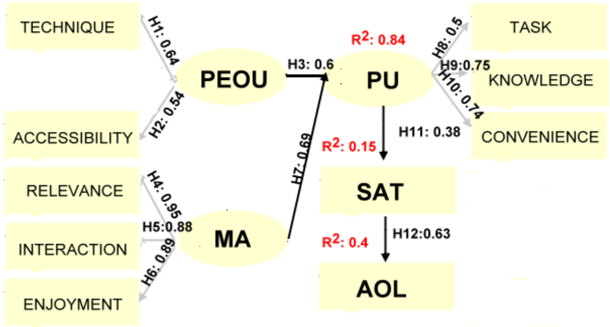

Figure 1.The path significance of each relationship and R^2 value in the model

6. Conclusions

According to the findings, both perceived ease of use (PEOU; 0.60) and multiple adaptations (MA; 0.69) play critical influences on perceived usefulness (PU). The ability to operate computer and the Internet as well as the accessibility of computer and the Internet are reflecting the easiness of using the web-based learning environment for learners. These two factors determine whether the learners have the extra energy and time to explore and experience the learning web site that can achieve better academic performance. A multiple adapter web-based learning environment integrates the theories of human brain and education (cognitive construction of social structures) which provide readily available communication tools to teachers and students to construct a shared cognitive map that allows learners to direct their own learning and improve their intention to learn online actively.

The multiple adaptations (MA) emphasize on providing a web-based learning environment that includes diverse learning goals and experiences compatible with learners' prior academic experiences. The web-based learning environment embedded learners' learning paths that can motivate students to initiate exploring and constructing their own knowledge. Also, multimedia learning environment can improve learners' motivations and stimulate learners' positive emotions. Consequently, human related memory regions will be initiated and triggered that greatly influences the brain's activities and learning processes.

It is difficult to learn actively without motivation. A content-rich online learning environment can meet the users' needs that allow user to associate with their prior learning experiences by interaction with learning environment. The study of Kinzie and Berdel（1990）indicates that interaction is leading the process of learning to improve academic achievement and promote learners' motivation. At same time, interaction can improve learning efficiency and develop learning strategies by controlling the learning content and preceding orders of the web-based environment. When learners actively participate in learning, they will pay attention to their own learning process, and can more easily perceived accomplishment and satisfaction. (Salomon, Perkins and Globerson, 1991)

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THE DEVELOPMENT AND EVALUATION OF AN AUGMENTED REALITY ASSISTED LEARNING SYSTEM OF AQUATIC ORGANISM UNIT

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Abstract

In this study, we proposed an assisted learning system based on instructional design theory and augmented reality. The content knowledge is focus on the aquatic organism of science and life technology course in primary school. The goal of the proposed system is to facilitating learners' motivation by providing realistic 3D-visual materials and specific operating experiences. As the advantage of augmented reality, our system employs the fish and plant markers which contain icons to trigger and show various amazing materials while learners use their finger to cover it. Through the observation records and attitude questionnaire, we collected all of the data of the learning processes from 114 students' operation and their attitudes toward the system. According to the evaluation results, we concluded that augmented reality assisted learning system not only could promote learners' motivation in science learning but also encourage them to become the active learner.

Keywords: aquatic organism; augmented reality; computer-assisted instruction; instructional design; learning attitudes;

Introduction

Augmented reality has been broadly applied in various fields, including simulation, teaching, and medical science. Multimedia computer-assisted instruction has been found to motivate learning, reduce the time required for learning, and improve learning efficiency (Ma & Wu, 1998). Regarding the features of multimedia computer-assisted instruction, Chang (1995) found that multimedia has the advantages of enabling learners to express themselves better, motivating the desire for self-learning, and increasing interaction between instructors and learners. Additionally, various experiments have shown that obtaining operating experience is vital; however, simulation software enables learners to practice repeatedly (Chang et al., 2008) and reduces the risk factors of conducting experiments. Lu and Yao (2002) also stated that presenting abstract material using multimedia enables learners to understand the material better, and audio and visual displays allow learners to interact with the material. Materials that employ augmented reality facilitate stronger motivation and result in better learning achievements (Chen, Wu, & Zhung, 2006).

This study takes advantage of augmented reality and uses virtual models to display animals and plants that are difficult to bring to the classroom or to present materials that are dangerous or problematic to explain. Chang et al. (2008) highlighted that visualizing abstract ideas facilitates learners' understanding by reinforcing the abstract ideas throughout the courses, enabling learners to observe and gain experience in a limited period of time. Billinghurst (2003) stated that employing augmented reality as an instruction tool enables learners, in both virtual and real environments, to interact with virtual objects smoothly, generating new teaching and learning strategies that can be implemented regardless of whether learners have experience of using computers. Lin (2009) suggested that augmented reality facilitates a stronger motivation compared to static images, enabling learners to capture the essence of the subjects without limitations or merely reading the image cards or text.

Therefore, the objective of this study is to develop an interactive learning system based on augmented reality and 3D materials to attract the learners' interest. Augmented reality is used to reinforce learners' understanding

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of the typology and features of aquatic organism. It is expected that it will increase learners' interest in the concept and make learners to find different things.

Literature Review

Computer-assisted instruction

Multimedia computer-assisted instruction is more beneficial for conversational ability. Learners can choose topics to learn or practice according to their individual preference to self-evaluate and receive immediate feedback. Additionally, learners have a higher likelihood of interacting with instructors when computer-assisted instruction is used. Multimedia visualizes abstract materials to facilitate learning achievements and interest. To ensure completeness, instructors can add relevant information to the materials currently available. The additional information is very beneficial to learners attempting to understand the material (Lu & Yao, 2002).

Because of the current prevalence of computers and the addition of information education, if computer-assisted instruction can supplement expository instruction and present abstract material using a computer, images, audio and visual effects, and gaming, enabling learners to store received information in their long-term memory and improve their learning efficiency, teaching efficiency can improve (Hung, 2008). The role played by computers is as the communicating media; course designers are the key factor responsible for the entire process of teaching (Hung, 2008). Therefore, this study develops materials that employ augmented reality to facilitate learning. The reasons for employing augmented reality when designing materials included the following: (1) motivating learners by employing multimedia; (2) designing virtual characters and environments; (3) understanding the materials presented through the courses; and (4) facilitating learning efficiency through interaction.

Augmented reality

The definition of augmented reality

Augmented reality is an extension of virtual reality. Generally, the factors that comprise the environment include scenes and existing objects. Scenes and existing objects are presented virtually in virtual reality applications, whereas in augmented reality applications, information or virtual objects are presented after computation in actual scenes.

Milgram et al. (1994) considered real and virtual situations to be two ends of a continuum; they explored the possibility of operating with computers, categorized the application environments to establish a theoretical foundation, and summarized the theory. The left side of Fig. 1 represents the real environment, and the right side represents the virtual environment. The area between is where both the real and the virtual environment exist, also known as the interface of augmented reality, where virtual objects and images are added to real environment. As shown in Fig. 1, augmented reality is the application between reality and virtualization.

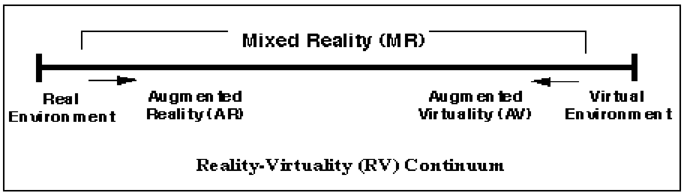


Fig. 1. Mixed Reality (Data source: Milgram et al., 1994)

Azuma (1997) highlights that augmented reality enables a real situation that cannot be presented by a virtual situation, instead of being a replacement of real situations. Augmented reality has three essential properties. First, virtual objects are combined with real situations. Second, immediate interaction is facilitated. Third, augmented reality must operate in a three-dimensional environment.

The presentation of augmented reality

Augmented reality has different requirements based on different environments or conditions. Milgram et al. (1994) defined three methods of display. First, monitor-based augmented reality, where all the scenes are output by a projector, monitor, or similar; this is the simplest means of display and has the lowest hardware requirements; thus, the implementation of augmented reality using this method of display is easier. Second, augmented reality implemented with a head-mounted see-through video, which requires a head-mounted display panel capable of capturing and localizing external images. Images are displayed on the head-mounted display panel after they are created by superimposing images generated by the computer. Third, augmented reality implemented with a head-mounted optical see-through device, where the effect of augmented reality is maximized with the application of an optical see-through, enabling users to see the real environment and the virtual objects projected on the display panel. This study adopts monitor-based augmented reality and employs the convenience of webcams; thus, the proposed method is easy to use under any circumstances. Equipment costs are minimal and the method is easy to set up, making it easy for augmented reality to become a part of learning environments. As shown in Fig. 2, applying augmented reality involves preparing a camera and pre-defined markers. The monitor outputs virtual objects or animations based on the pre-defined marker it detects. Additionally, the design of markers is not limited; users can design their own markers according to their preferences or needs.

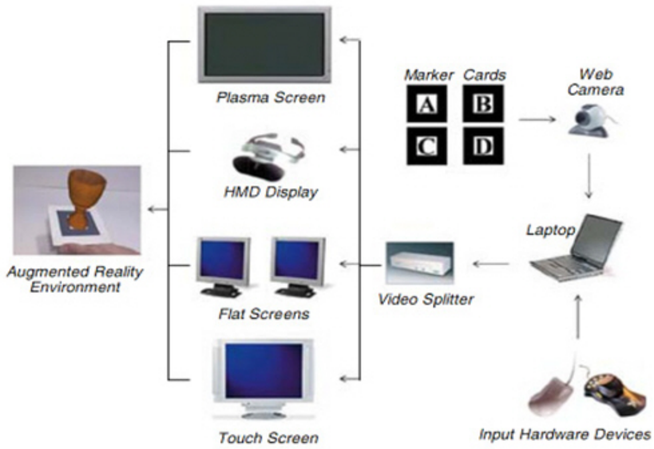


Fig. 2. Common operating environment for augmented reality systems (Data source: Liarokapis, 2007)

The advantages of applying augmented reality in education are listed below.
Interactive: Augmented reality is easy for the learners to use and discuss with each other, enhancing their motivation to learn through a new experience of learning.
Perceptual feedback: Learners can operate augmented reality at their own pace to obtain immediate feedback in virtual three-dimensional object modeling.
Spatial relations: Using these applications, learners can more easily understand the spatial relationship between virtual objects, real objects, and real environments.
Fresh experience of learning: Because the application of augmented reality provides simple and intuitive interaction, rendering the presentation of knowledge attractive, multimedia applications can also provide additional fun when learning, enhancing their motivation to learn by integrating the materials into teaching that employs augmented reality.

This study was conducted in two stages. During the first stage, the system of augmented reality and the teaching materials were developed; during the second step, a teaching experiment was conducted. Regarding the development of a system and materials, software such as 3Ds Max, Maya, Photoshop, and Total Immersion D'Fusion were used to implement the augmented reality system.

System Development

Teaching materials

To develop material employing augmented reality, animals and plants from different aquatic environments must be surveyed, the bodies of the aquatic animals must be examined, and finally, the characteristics of their bodies and movements must be depicted. This study is based on the competence indicator 2-2-2-2 of the Grade 1-9 Curriculum Guidelines that specifies the physical characteristics and movements of aquatic organism and focuses on how to improve their living environments and maintain their health (Department of Elementary Education, 2008). By employing augmented reality to present the movements of aquatic animals and plants, and including a zoom function, learners can observe the unique body parts of these animals and learn their functions and related information.

Planning and developing the system

Developing the three-dimension model of aquatic organism

The virtual objects of aquatic organism are constructed according to the process shown in Fig. 3. During modeling, the number of surfaces of the model should be minimized to facilitate the speed of computing and executing. As shown in Fig. 4, to observe the aquatic animals closely, a higher number of surfaces are required to ensure the models appear similar to natural aquatic animals. After the models are completed, the skeleton system is used to represent the body parts (e.g., fin, body, and other parts movements involve) of the aquatic animals in Maya to simulate the effect of movement.

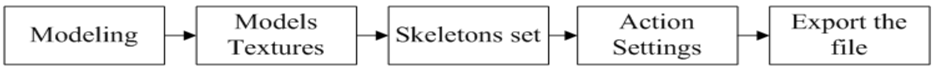


Fig. 3. Model production process

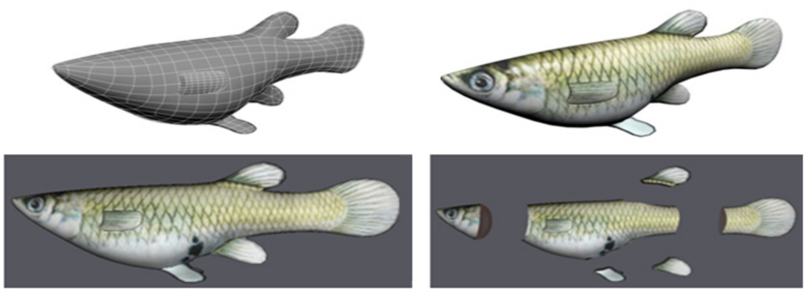


Fig. 4. Models Textures

On the other hand, we designed four kinds of models to let learners select in system to observe the properties of aquatic plants. There are Nelumbo nucifera Gaertn, Nymphaea tetragona, Pistia stratiotes L, and Egeria desa Planch (see Fig. 5).

Fig. 5. Aquatic plants models

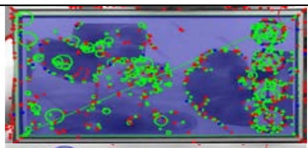
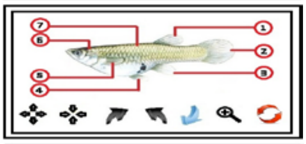
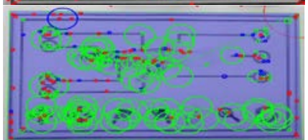
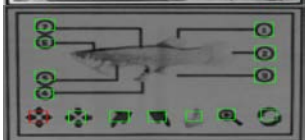
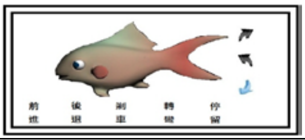
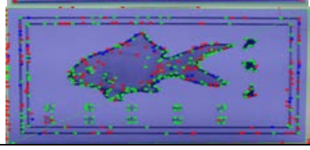
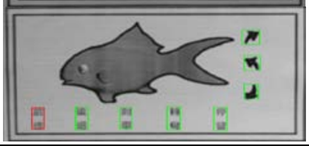
The presentation of augmented reality

For this system, we used Total Immersion D'Fusion to develop the teaching materials. The development process is shown in Fig. 6.

Fig. 6. D'Fusion augmented reality production process

The teaching material markers are defined (see Table 1), where the number of buttons on the marker is adjusted based on the teaching materials. When designing the markers, the buttons must be set at convenient locations and the size of the buttons should match the standard finger size. Additionally, buttons should not overlap other buttons; otherwise, the system may fail to correctly recognize which button was pressed.

Table 1. Teaching material markers

Type	Original Marker	Marker Feature Points	Button Setup
Plant			
Fish Body			
Fish Movement			

When describing the virtual objects, relevant information should be presented in text along the bottom of the monitor for learners' reference (see Fig. 7). The system interaction was designed according to the required functions described previously to satisfy learners' learning and observation needs. Finally, the teaching materials employing augmented reality were presented as web pages. Learners can manipulate the markers to learn, as shown in Fig. 8.

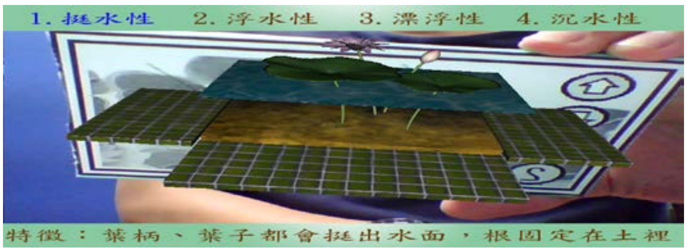


Fig. 7. Operation interface example

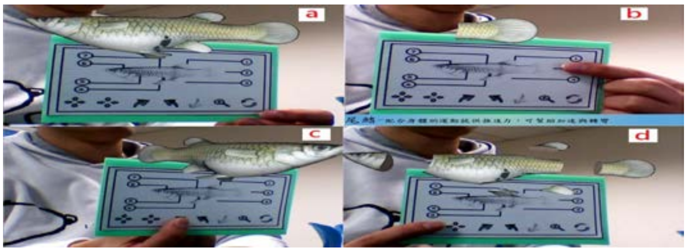


Fig. 8. (a) Presented virtual objects; (b) Independent parts of the information; (c) Free rotation of virtual objects; (d) Separation of fish

Experimental subjects and operation

Subjects are 114 students from the University of Technology in north Taiwan and they take information technology and science courses. We utilize attitude questionnaire which is a questionnaire of Likert Scale to analyze learners' subjective feelings and attitudes about teaching materials, interface design, multimedia features, interactive functions, and practicability when using the system (see Table 2). In the aspect of system satisfaction, attitude questionnaire is an effective and time-conserving way of subjective estimate.

Table 2. Attitude questionnaire

	Attitude Questionnaire
Teaching Materials	I think the “augmented reality assisted instruction” materials lively and interesting.
	I think the “augmented reality assisted instruction” materials help to understand the structure of aquatic organism.
	I think the presentation of “augmented reality assisted instruction” materials can be used in other disciples teaching.
Interface Design	I think the operation of “augmented reality assisted instruction” materials is simple and easy.
	I think the “augmented reality assisted instruction” using marker to interact with materials is more interesting than static images.
	I think the “augmented reality assisted instruction” can articulate express the various features of aquatic organism.
Multimedia Features	I think the "augmented reality assisted instruction" relatively easy to observe the movement of aquatic animals.
	I think the "augmented reality assisted instruction” can help me quickly understand the knowledge of the aquatic organism
	Through any point to observe aquatic organism, the "Augmented reality assisted instruction” is more realistic than the static images.
Interactive Functions	I think the function of "augmented reality assisted instruction” to separate the body structure of fish is very cool.
	I think the amplify function of "augmented reality assisted instruction” can be more clearly observe the fish parts.
	I think that the trigger animation when interact with the "augmented reality assisted instruction” is very interesting.
Practicability	I think using "augmented reality assisted instruction” will allow me to participate more actively in the course.
	I think I would be willing to use "augmented reality assisted instruction” again.
	When learning the knowledge of aquatic organism, I think the "augmented reality assisted instruction” is helpful.

The teaching materials employing augmented reality developed in this study required the use of computers. The learners were sat in seats and provided information regarding the course (see Fig. 9).

Fig. 9. Learners' operation

Evaluation Results

Subjects finish operating the system and fill out the attitude questionnaire. As summarized in Table 3, the mean score of five levels is 4.36. We have discussion with these subjects on their idea about the interactive learning system after they complete operating the system and filling out the attitude questionnaire. Subjects generally agreed that interactive learning system is increase their interest in the concept and make them to find different things.

Table 3. Average responses of learners on AR attitude questionnaire.

Levels	Teaching materials	Interface design	Multimedia features	Interactive functions	Practicality
M	4.4	4.4	4.4	4.3	4.3

For the analysis of the questionnaire (see Table 4), will further discuss the mean score and help us to improve system. Hence, we summarized the following reasons may affect the system satisfaction.

The amplify function of "augmented reality assisted instruction" cannot help learners clearly observe the fish parts. Learners give some comments for us that the materials of fish can add more details when they operate it.

The distance between marker and camera is difficult to control. The materials cannot display properly due to the angle and distance, this solution may confuse learners' operation.

Learners need the support of technical assistant. Some learners do not understand how to operate the maker and system. So we will provide teaching documents or assistant to help them.

Table 4. AR attitude questionnaire details.

Level	Questions	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Teaching Materials	I think the "augmented reality assisted instruction" materials lively and interesting.	44.7%	47.4%	6.1%	1.8%	0.0%
		51	54	7	2	0
	I think the "augmented reality assisted instruction" materials help to understand the structure of aquatic organism.	44.7%	49.1%	6.1%	0.0%	0.0%
		51	56	7	0	0
	I think the presentation of "augmented reality assisted instruction" materials can be used in other disciples teaching.	60.5%	36.9%	2.6%	0.0%	0.0%
		69	42	3	0	0
Interface Design	I think the "augmented reality assisted instruction" design is lively and interesting.	50.9%	36.0%	13.2%	0.0%	0.0%
		58	41	15	0	0
	I think the "augmented reality assisted instruction" using marker to interact with materials is more interesting than static images.	54.4%	42.1%	3.5%	0.0%	0.0%
		62	48	4	0	0
	I think the "augmented reality assisted instruction" can articulate express the various features of aquatic organism.	48.2%	41.2%	8.8%	1.8%	0.0%
		55	47	10	2	0
Multimedia Features	I think the "augmented reality assisted instruction" relatively easy to observe the movement of aquatic animals.	45.6%	43.9%	9.6%	0.9%	0.0%
		52	50	11	1	0
	I think the "augmented reality assisted instruction" can help me quickly understand the knowledge of the aquatic organism	39.5%	53.5%	6.1%	0.9%	0.0%
		45	61	7	1	0
	Through any point to observe aquatic organism, the "Augmented reality assisted instruction" is more realistic than the static images.	55.3%	37.7%	7.0%	0.0%	0.0%
		63	43	8	0	0
Interactive Functions	I think the function of "augmented reality assisted instruction" to separate the body structure of fish is very cool.	55.3%	35.1%	8.8%	0.9%	0.0%
		63	40	10	1	0
	I think the amplify function of "augmented reality assisted instruction" can be more clearly observe the fish parts.	39.5%	40.4%	15.8%	4.4%	0.0%
		45	46	18	5	0
	I think that the trigger animation when interact with the "augmented reality assisted instruction" is very interesting.	50.0%	38.6%	11.4%	0.0%	0.0%
		57	44	13	0	0
Practicability	I think using "augmented reality assisted instruction" will allow me to participate more actively in the course.	37.7%	46.5%	15.8%	0.0%	0.0%
		43	53	18	0	0
	I think I would be willing to use "augmented reality assisted instruction" again.	40.4%	53.5%	5.3%	0.9%	0.0%
		46	61	6	1	0

When learning the knowledge of aquatic organism, I think the "augmented reality assisted instruction" is helpful.	44.7% 51	50.9% 58	4.4% 5	0.0% 0	0.0% 0

Conclusion and Future Work

In this paper, we proposed a multimedia learning system of aquatic organism unit by using augmented reality. Regarding the attitude questionnaire, most learners highly appreciated the teaching materials employing augmented reality and considered the materials interesting, easier to observe than even real fish, and easy to operate using the interactive functions. The learners also reported that the teaching employing augmented reality enhanced their motivation to learn and was helpful for learning natural science. In the future, there are still many parts of system to improve. A small portion of the learners reported that the teaching material employing augmented reality performed less desirable response speed during interactive operation. The buttons should be clearly defined, the unit knowledge should be highlighted, the markers should be appropriately sized, and proper instructions should be provided to ensure the learners are more focused on learning the knowledge expressed in the teaching materials.

Acknowledgements

The funding of this study was supported by the National Science Council of Taiwan under grant NSC 100-2511-S-147-002-MY3.

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THE DEVELOPMENT AND EVALUATİON OF A COMPUTERİZED ADAPTİVE TESTİNG SYSTEM FOR CHİNESE PROFİCİENCY - BASE ON CEFR

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Abstract

In the era of globalization, the trend towards learning Chinese as a foreign language (CFL) has become increasingly popular worldwide. The increasing demand in learning CFL has raised the profile of the Chinese proficiency test (CPT). This study will analyze in depth the inadequacy of current CPT's utilizing the common European framework of reference (CEFR) for language learning, teaching, and assessment to develop a set of reliability and validity standards for a computerized adaptive testing (CAT) CPT system. Actual performance of computerized tests will simulate the empirical data via the CAT system process and assess the efficacy of this system.

Keywords: Chinese Proficiency Test, Common European Framework of Reference, Computerized Adaptive Testing

Introduction

With the growing demand of learning Chinese as a foreign language (CFL), the development and utility of the proficiency test for "non-native Chinese" learners is essential, particularly, countries that are in the preliminary stage of promoting CFL courses in the educational institutions and organizations. For example, United Kingdom language school has included CFL in its foreign language learning curriculum. National Security Language Initiative (NSLI) of the United States has identified Chinese language an important national security strategic language, and is planning on including Chinese in the foreign language learning curriculum in schools and workplaces (U.S. Department of State, 2006). All these programs show that learning CFL is becoming an important issue due to the large demand of Chinese language proficiency. Currently, Test of Chinese as a Foreign Language (TOCFL), Hanyu Shuiping Kaoshi (HSK), Test of Practical Chinese (C. Test), Scholastic Assessment Test (SAT) subject test in Chinese with listening, and Advanced Placement (AP) Chinese language and culture are often used to assess Chinese proficiency (SC-TOP, 2011; HSK, 2011; C. Test, 2011; College Board, 2011a; College Board, 2011b). However, the majority of these tests are administered by the traditional paper and pencil tests (PPT) format. The aims of the present study are: adopting the Common European Framework of Reference (CEFR) for item development; providing a framework by using item response theory (IRT) as the scoring method; constructing computerized adaptive testing (CAT) system.

The data will be analyzed by applying IRT three-parameter logistic (3PL) model. One thousand five hundred and seventy-six participants recruited from Grace Christian Collage in Philippine were administered with Chinese listening tests via CBT in September, 2010. In addition, the effectiveness of applying CAT among the three estimating methods, namely maximum likelihood estimation (MLE), expected a posteriori (EAP), and maximum a posteriori (MAP) will be investigated.

The Common European Framework of Reference, CEFR

CEFR was developed by the Council of Europe (CE) and its members as a framework and guideline for foreign language learning, teaching, and assessment. It was developed as a standard reference and guideline to provide language learning, communication dimension, teaching materials development, and language assessment (Joël Bellassen & Zhang, 2008). The main content of CEFR describes the background of language use, the level of language proficiency, learner acquisition, knowledge, and skills that the language user or learner need to develop (Council of Europe, 2001). CEFR classifies language proficiency and divides proficiency into three categories with a total of six levels (A1, A2, B1, B2, C1, C2). CEFR is an action-oriented approach. It treats language user and learner as part of the community who is able to achieve communication tasks under certain conditions and special circumstances, or some specific behavior aspects (Council of Europe, 2001). Since the 2001 CE recommendation to adopt CEFR, wide spread promotion and application has contributed to the growth of CEFR and has influenced education system in more than 40 countries. Other than CU members countries, countries outside Europe, like Japan, Canada, and New Zealand have referred to CEFR as a framework reference for their foreign language learning, teaching and assessment. Therefore, CEFR is becoming the international language framework reference for language proficiency. Many studies suggest that the most recognized aspect of CEFR is that CEFR has brought positive impact on teaching, curriculum development, and assessment. In the APEC economies research, a survey also showed that CEFR is the best model or reference (Duff, 2008). Therefore, CEFR is a language learning framework that provides clear guidelines for various levels of language learners (Council of Europe, 2001).

The Development of the CEFR-based Chinese Proficiency Test System

Chinese language proficiency indicators proposed by Tsai (2009) have been adopted in this study and items for the A1 and A2 level of the listening test have been developed on a web-based test system. In this section, we will introduce the interfaces of the test system, data collection process and the process of developing adaptive testing.

The User Interfaces of Test System

In this system, there are three types of interfaces, test selection, questionnaire, and listening test. These user interfaces are introduced in the following.

Fig. 1. (a) indicates the test selection interface. Each examinee has an account number and password which enable them to enter into the system and start the test. Each examinee is required to preselect the section for testing after entering into the system. Fig. 1. (b) indicates the questionnaire interface. Each examinee have to fill in the basic information questionnaire before the exam starts. The questionnaire is presented in both English and Chinese.

Fig. 1. (a) Test Interface; (b) Questionnaire Interface

The listening test includes listening comprehension and visual-listening comprehension items. In each item, examinees will hear a phrase or a conversation followed by a set of four options to select. Examinees have to click the box that best fits the option on the computer screen. The response time for each item is limited. When the time is up, the system will automatically go to next item.

Listening Comprehension Item: In Fig. 2, the examinees will hear, "Walking is too slow! Let us take a taxi to the market. Question: How do they get to the market?" followed with (A), (B), (C), and (D) options The examinees are requested to choose one correct answer. Each item will be read twice and there is a five second break between them.

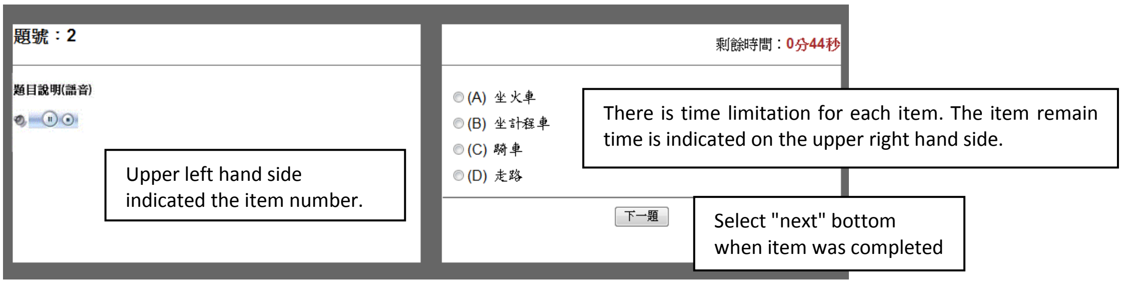

Fig. 2. Listening Comprehension Item

Visual-Listening Comprehension Item: In Fig. 4, the examinees will hear "Please help me buy eggs from the market." and the computer screen will display four options, (A), (B), (C), and (D) on the right hand side. According to this sentence the examinees have to select an appropriate picture from (A), (B), (C), and (D) which matches the item most. Similarly each item will be read twice.

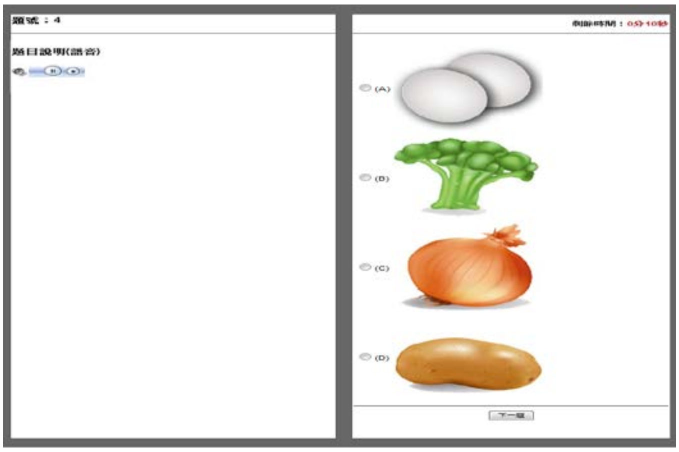

Fig. 3. Visual-Listening Comprehension Item

Data Collection Process

This study conducted computer-based tests with listening section for A1 and A2 level exams in the Grace Christian Chinese School in the Philippines. The participants were grades five to ten students. The test level was assigned according to the amount of time the examinee spent learning Chinese. The 5th to 7th grade examinees were assigned to participate in the A1 level CPT. The 5th to 7th grade examinees were assigned to participate in the A2 level. The test time of each test in each level is 30 minutes with a test length of 35.

The Processes of Parameter Estimation and Developing Adaptive Testing

This study applies a 3PL IRT model for item and ability parameter estimation. The resulting 3PL model (Baker, 1992; Baker & Kim, 2004; Zimowski, Muraki, Mislevy, & Bock, 2003) is

$$P(x_j = 1 | \theta_k, a_j, b_j, c_j) = c_j + \frac{(1-c_j)}{1+\exp^{-D^* a_j(\theta_k - b_j)}} \equiv P_{j1}(\theta_k) \qquad (1)$$

where $P_{j1}(\theta_k)$ is the probability that an examinee with ability θ_k answers item j correctly; a_j is the item discrimination for item j; b_j is the item difficulty for item j and b_j represents the point on the ability scale at which a candidate has a 50% probability of answering item j correctly; c_j is the item guessing for item j; D is a scaling factor and is applied the default value, 1.7.

The marginal maximum likelihood (MMLE) formulation with an expectation-maximization (EM) algorithm is applied to calibrate the item and ability parameters (Zimowski, Muraki, Mislevy, & Bock, 2003). An item bank was established after obtaining the item parameters. One of the goals of this study is to develop a computerized adaptive test for the CPT.

Fig. 4 shows the structure of an adaptive test as a flowchart in this study. The three major steps (starting, continuing, and stopping) were followed the flowchart. The steps were (Wainer, 2000):

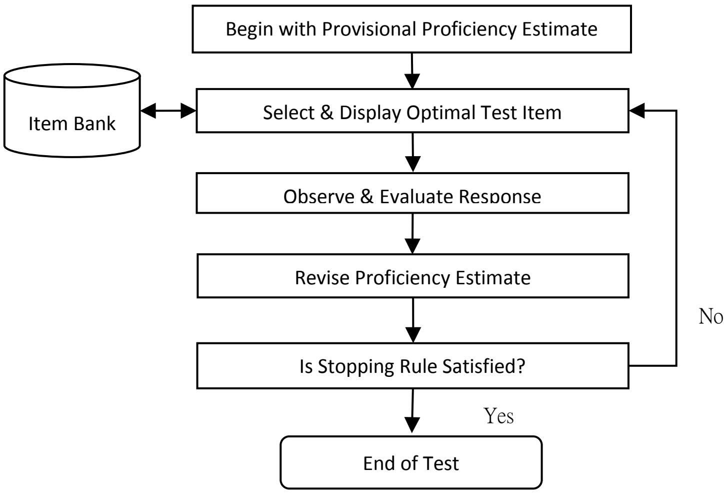

Fig. 4. The Procedure of Computerized Adaptive Testing

Results

The Reliability and Item Parameters of Chinese Proficiency Test

Table 1 shows the reliability (Cronbach's α) of the Chinese proficiency test. The reliability in each section of the test ranged from 0.842 to 0.899 reflect a reasonable degree of reliability. In general, an alpha value of around 0.8 is an acceptable value for Chinese proficiency test (Shen, 2005), this means that these Chinese proficiency tests are reliable.

Table 1. The Test Reliability

Level	Test Length	Effective Sample Size	Cronbach's α
A1	35	798	0.842
A2	35	712	0.899

The averages of item parameters for each section presented in Table 2 show that the average of item discrimination in the listening section were higher than 1.2. This indicated a very high degree of item discrimination had developed in each section. In addition, according to the IRT model, the average correct rates are 68.44% and 69.38% for A1 and A2 listening section respectively.

Table 2. Averages of Item Parameters in Each Section

Level	a	b	c	P(Θ)
A1	1.2223	-0.4742	0.2075	0.6844
A2	1.3145	-0.4637	0.1998	0.6938

The Chinese Proficiencies of Total, Male and Female Groups

Table 3 shows the sample sizes of the total group and the gender subgroups for each of the 2 forms of the CPT. Over the various test forms, the male group comprised 47% to 48% of the total group, and the female group comprised 52% to 53% of the total group. The average number-correct scores and standard deviations for groups taking different forms of the CPT are summarized in Table 4. It shows that the female group had higher mean scores than the male group. The average raw scores across various test forms were similar to one another, both for the total group and for each of the gender subgroups. This provided evidence of random assignment of test forms to candidates (i.e., the groups taking different forms were fairly equivalent). Overall, Table 4 shows that the test forms were designed to be fairly similar to one another.

Table 3. Sample Sizes of Total and Gender Subgroups on CPT

Level	Total Group (n)	Male Group		Female Group	
		n_m	n_m / n	n_f	n_f / n
A1	798	381	0.48	417	0.52
A2	712	337	0.47	375	0.53

Note. n The sample sizes of the total group; n_m The sample sizes of the male group; n_f The sample sizes of the female group

Table 4. Average Raw Scores of Total Group and Gender Subgroups on CPT

Level	N	Total Group		Male Group		Female Group	
		M	SD	M	SD	M	SD
A1	798	23.93	6.31	22.50[b]	6.61	25.25	5.72
A2	712	24.23	6.96	22.62	7.52	25.67[a]	6.07

Note. a. The maximum of means; b. The minimum of means.

The Effectiveness of CAT System for CPT

In this study, a complete computerized test without adaptive process was applied to collect participants' responses. And these responses were used to estimate the items parameters and evaluate the performances of different ability estimation methods in CAT process. The evaluation method is applied the collected data into CAT process mentioned in Fig. 4 to simulate CAT process. At each iteration, CAT assumes one item is draw from item bank and administered to the participant. We can obtain the response of this item in the collected data.

For evaluating the performances of CAT algorithms based on different ability estimation methods, MLE, MAP and EAP, the root mean squared difference (RMSD) between the estimated abilities by CAT and by complete test was applied. The definition of RMSD is stated in following

$$RMSD\ (\hat{\theta}_i^{(k)}) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(\hat{\theta}_i^{(k)} - \tilde{\theta}_i)^2} \qquad (2)$$

where $\tilde{\theta}_i$ represents the i^{th} participant's ability estimated by using all administrated items. $\hat{\theta}_i^{(k)}$ represent the i^{th} participant's temporarily ability estimate after k items had been responded (in Kth iteration); N represents the total number of participants.

In Fig. 5, the vertical axis indicates the RMSDs of EAP, MAP, and MLE and the horizontal axis represents the number of administered items. Fig. 5 shows that there is a significant difference in RMSD decline as the accumulation of items examinees participated in increased. Referring to the estimated result from Figure 9a; it indicated that, using MLE, the RMSDs are greater than 1 when exam items completed number less than 15 and the RMSDs are less than 0.4 when the exam items completed reached 31. In addition, when using MAP, the RMSDs are greater than 1 when exam items completed number less than 5 and the RMSDs are less than 0.4 when the exam items completed reached 19. However, when using EAP, the RMSDs are always less than 1 and the RMSDs are less than 0.4 when the exam items completed reached 6. The other section also showed the same result regarding these three estimation methods. This result indicated that under above three estimation methods, the EAP estimation method resulted in an overall lower RMSD compared with MLE and MAP. This result is similar to the study conducted by Chen (2006), Wang and Vispoel (1998). Therefore, the EAP parameter estimation method was adopted in the proposed CAT system.

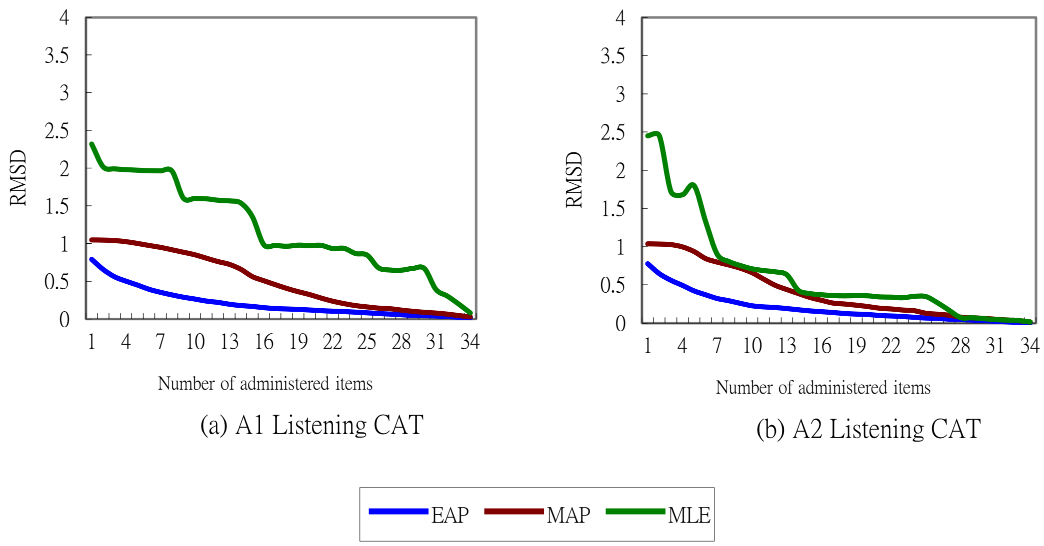

Fig. 5. The Performances of EAP, MAP, and MLE in CAT

Discussion

This study based on CEFR and Tsai (2009) developed A1 and A2 level items for a CPT in listening section. The computerized CPT was performed onsite at the Grace Christian Chinese School in the Philippines. The examinees were 5th to 10th grade CFL learners. The development of the CPT in this study refers to the PISA 2006 test development process (OECD, 2009). The data analysis showed that the computerized CPT possess good reliability and validity. The examinee's item correct response rate in different tests is close to 70%. The results also indicated that females performed better than males.

The CAT system developed in this study included a testing interface and a management interface. For the testing interface, examinees participated in testing according to their proficiency level after login to the interface. The result will also be presented to the examinee as soon as the items are competed. The management interface contains the function of item bank editing. This function also includes test assignment, item bank creation or modification, and item editing in the item bank. In addition, there are different features in the CAT system that are available to the user in accordance to his or her requirement. For example, the user can select different testing formats and different parameter estimation methods. In response to international demand, the CAT system for CPT developed in this study used computer facilities to analyze and calibrate the test and score. This will shorten the data collection time. When performing the CAT simulation through different parameter estimation methods, this study discovered that the RMSD is best performed under the EAP estimation method. Therefore, this study recommends EAP as the preferred parameter estimation method.

During research, valuable experience was acquired during the system implementation process and the actual conduct of the test. This valuable experience can be used as directions in future research and subsequent recommendations are as follows:

This CAT system was developed for multiple-choice items. However, in order to fully utilize computers in the test, this CAT system can be amended to fit more diverse and comprehensive items and to make the exam closer to real scenarios.

The extension of this study is to develop the B level or even the C level of the CPT and focus on new item format development in the near future, not only to enrich and enliven the content of the CPT but also to be able to implement proficiency test according to the examinee's ability in productive activities and strategies, receptive activities and strategies, interactive activities and strategies, and mediating activities and strategies.

Considering the examinee's proficiency and acceptability, future studies can focus more on conducting the test or grading online with a CAT system for the writing and speaking section to make it more common and easy to carry out the assessment.

The CAT system was developed based on traditional Chinese. In consideration of the majority of the users and learners in different countries, a simple Chinese version can also be implemented rendering the test limitless cross the world.

This study can also focus on adding new functions to the CAT system such as the an initial item setup method, item selection strategy, and exposure rate control, in the near future.

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THE DEVELOPMENT OF GROSS MOTOR ANALYSİS SYSTEM SOFTWARE : A PRELİMİNARY CONCEPT.

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Abstract

The purpose of this paper is to discuss about the design and development of gross motor analysis system software. The concept of the development of gross motor analysis system software was based on observation of researcher about the difficulties faced by sports science educators to analyze the performance of young athletes. This software was developed to help sports science educators to manage the gross motor analysis more systematic and efficient. This software is stand-alone software to enable the sports science educators to install it to their personal computer or office's computer. Only authorized personnel can access to the system using user name and password. This is to ensure the gross motor analysis records are well protected. In conclusion, all features in this software were developed to ensure that it help the sports science educators easy to use the system efficiently.

Keywords: Software Development, Loco-motor Skills, Manipulative Skills, Motor Development.

Introduction

Human motor development is a process of changes continuously. Motor development is seen as a progressive change in movement behaviour and occurs over the human life cycle (Gallahue, 1982; Gallahue & Ozmun, 1998; Winnick, 2005). However, expert defined motor development as a study of changes in human behaviour that occur in life, the processes that cause these changes and the factors that influence it (Payne & Isaacs, 2005).

A gross motor skill is the ability to use major muscle involving organizations of joint movement to perform selected basic skills (Bruininks, 1978; Williams, 1983; Gallahue & Ozmun, 2006). Gross motor skills are also required to transfer the body from one location to another and manipulate equipment. Gross motor skills are basis to master advanced motor skills and sport specific skills (Gabbard, 2000; Haywood & Getchell, 2001; Payne & Isaacs, 2002). Development of gross motor skills are very important to be studied at children level as it is a good indicator to see the development of their cognitive skills (Thomaidis, Aderoglou, Stefou, Damianou, & Bakoula, 2000; Payne & Rink, 1997). The process of determining the level of gross motor development of children can be obtained using gross motor development test instrument by Ulrich (2000).

Instrument To Measure Gross Motor Development

Test of Gross Motor Development (Ulrich, 2000) is used in measuring the level of gross motor development. This test are divided into two components of gross motor skills namely locomotor skills and manipulative skills. The items in this test consisted of six items of locomotor skills (24 criteria) and six item of manipulative skills (24 criteria). The sub raw score given is from 0 to 48, resulted from adding and minus the score of test 1 and test 2 for each skill. The locomotor skills proficiency items involve are running, galloping, hopping, leaping, horizontal jump, and sliding. Mean while, manipulative skills also include proficiency items such as hitting, stationary dribbling, catching, kicking, throwing and underhand roll ball. These test item is fixed based on the criteria for treatment purposes as required in Ulrich Gross Motor Development 2000. Chronological age is essential to obtain the locomotor score (SSL), manipulative standard score (SSM), age equivalent of locomotor (AEL), age equivalent of manipulative (AEM) and the gross motor developmental quotient score (GMDQ). Gross motor development test is reliable to measure gross motor development children ages of 3 to 10 years.

Statement of the Problem

The current practice of manual method to determine the level of individual gross motor development is time consuming. Calculation of the raw score requires the examiner to evaluate the recorded behavior for 48 times on locomotor skills and another 48 times on manipulative skills. This is because the examiner need to analyse at each specified criteria assessed either it is exists or not exists in the skills performed. After the raw test scores is recorded, tester refers to percentile score of the sub-test locomotor and manipulative table based on chronological age of the participants. Next, both score of locomotor and manipulative is summed up and the total score of these is then referred to gross motor development table. In order to get the standard score of locomotor and manipulative, the raw score for both skills is referred to the age equivalent score table of locomotor and manipulative. The process of getting SSL, SSM, AEL, AEM and GMDQ score is shown in Figure 1 below

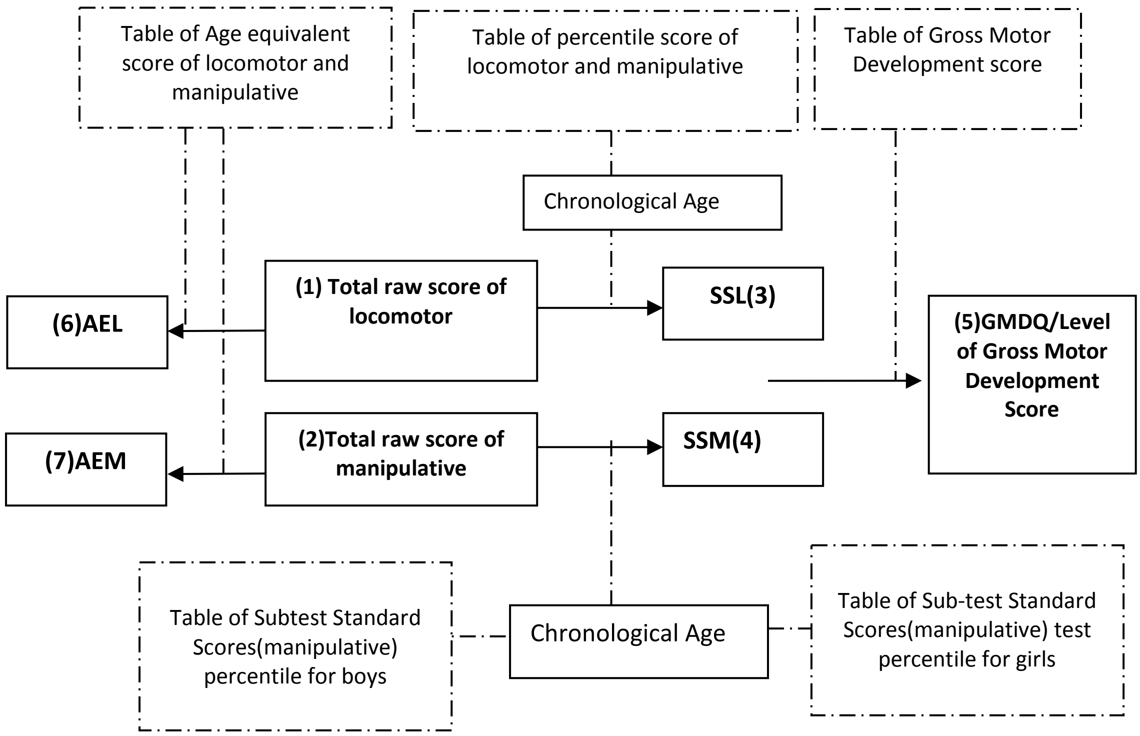

Figure 1 : Manual process of getting scores of SSL, SSM, AEL, AEM and GMDQ

All scores which related to gross motor skills can be acquired through a process of recording locomotor and manipulative skills. The level of participants gross motor skills will be evaluated through the video taken which enable researchers to acquire the raw scores for locomotor and manipulative. Through this raw score, the equivalent age score for locomotor and manipulative skills can be calculated directly through the both age equivalents norm skills.

Scores for gross motor skills, the process became more difficult and could take a long time. After obtaining raw scores for locomotor and manipulative, both scores should be converted to standard score of locomotor and manipulative skills score. To obtain a standard score, the main reference is the chronological age of the participants. Chronological age was achieved through the differences of the date of birth and date of the test taken by the participants. After getting this chronological age, standard scores for locomotor and manipulative skills can be obtained by referring to the norm standard scores and the percentile score for the locomotor and manipulative sub-test. The next process is to obtain the total sum score of locomotor and manipulative skills. By the amount of this sum, we can obtain the level of gross motor skills scores by referring to the norm setting standard score scale to score GMDQ (Figure 2)

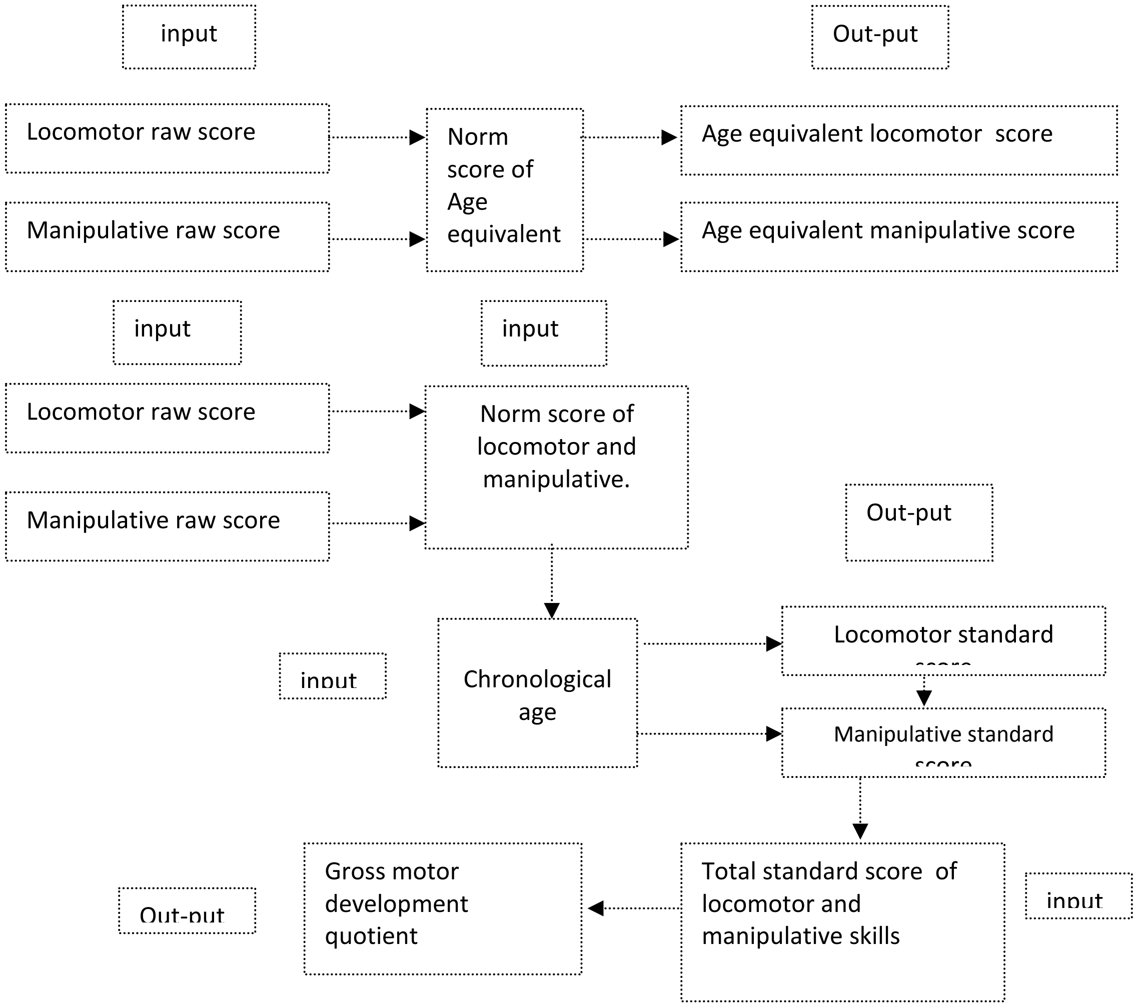

Figure 2 : Structure in gross motor development software

Justification for gross motor development software

The development of the gross motor score software is likely to reduce the time used in getting the score by using manual method. In the manual process, the motor development score is obtained through 7 processes that consume a long time. The processes involved are (i) to get a raw score of locomotor and manipulative skills, (ii) refers to norms of locomotor and manipulative to get the standard score, (iii) summing the standard score of locomotor and manipulative, (iv) refers to the gross motor development score norm and produce gross motor score, (v) refers to the age equivalent locomotor norms and (vii) refers to the age equivalent manipulative norms. Software that will be fostered through the process of obtaining this score will be reduced through three processes namely (i) raw score of locomotor skills, (ii) raw score of manipulative skills and (iii) score SSL, SSM, AEL, AEM and GMDQ continuously. The process of attainment score using gross motor development software development is shown in Figure 3 below.

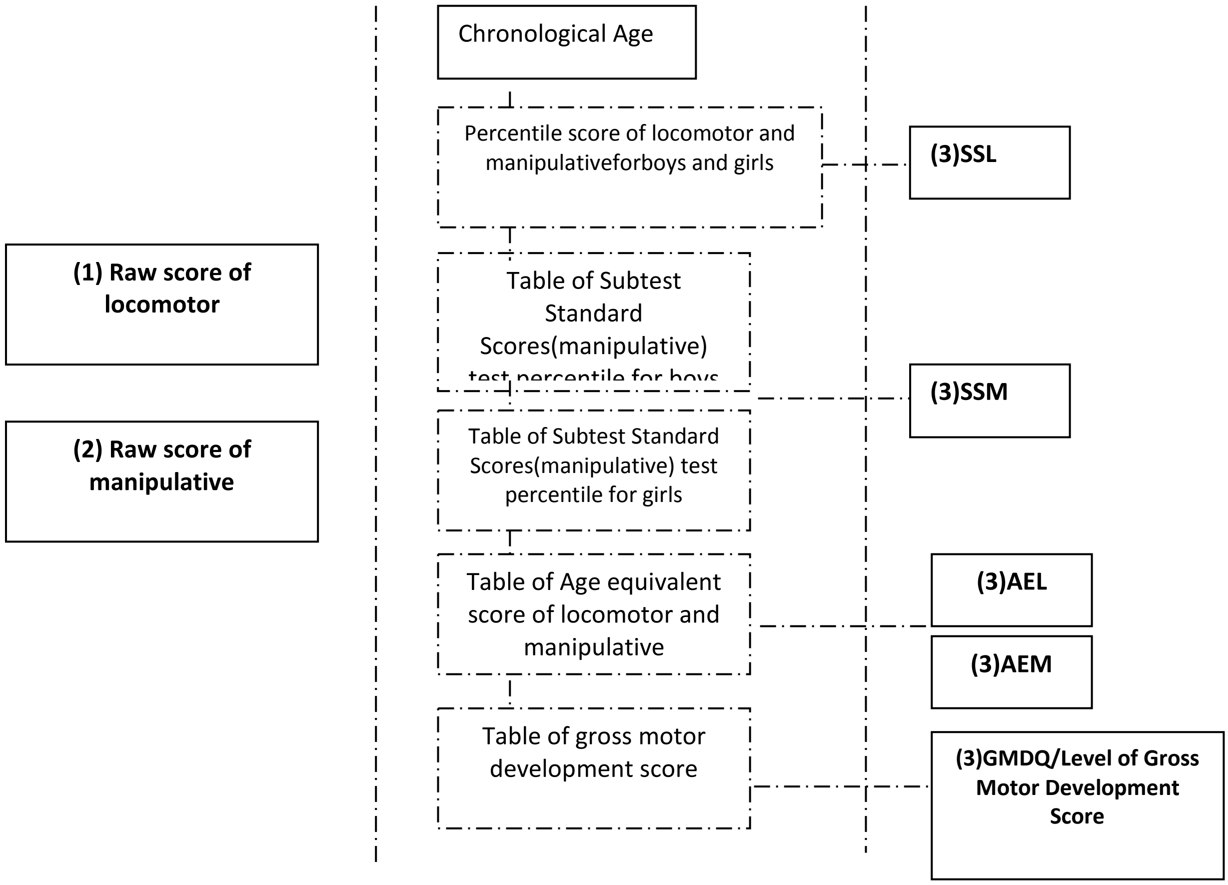

Figure 3 : Process of getting SSL, SSM, AEL, AEM and GMDQ score using software.

Discussion

Through the proposed software analysis of gross motor development, time acquisition for scores; standard score of locomotor, standard score of manipulative, age equivalent score of locomotor, age equivalent score of manipulative and score of gross motor development quotient can be reduced. Software analysis of gross motor development may also be patented and marketed along with user's manual of gross motor development test. It is hoped that this analysis of software production can intensify research efforts based on gross motor development of children among the teachers of early childhood education. This simplified analysis software allows physical education teachers to planning gross motor development programs of school children based on their level of gross motor development.

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THE DEVELOPMENT OF A MALAYSİAN MODEL INTERNSHİP PROGRAMME (*MYMIP*): A PRECEPTOR MODEL FOR NURSES İN THEİR EARLY STAGE OF PROFESSİON

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Abstract

This study reports on the development of a model called M*y*MIP (Malaysian Model Internship Programme) for the fresh graduate nurses. Six themes and sixty three items were obtained for the development of the programme. Reliability and validity were tested by the Rasch Model. Result had shown high reliability index of 0.8 to 1.00 PTMEA (Point – Measure Correlation Index) and in-fit of MNSQ at 0.6 to 1.4 and the *p* value was at 0.001. MyMIP was recommended a model for the fresh graduates nurses to gain self-confidence particularly in the transition period of students status to a qualified nurse.

Keywords: New graduates; internship; supervision model; workplace; nurse

Introduction

In this study, Nurses in their Early Stage of Profession (NESP) mean fresh graduating nurses completing training. They will usually be placed in wards that require manpower in caring for the patients. In this transition period, they are often perceived to be under immense pressure and are often blamed for unintentional mistakes. Kramer (1974), Charnley (1999), Chang (2003) and Charleston & Happell (2005) and Beecroft et al (2008) say that this plunge into reality comes as a reality shock for the nurses. They believe that there should be a balance between patient safety and service when recruiting new nurses. Charnley (1999) believes that the difficulties experienced by fresh graduating nurses such as stress, fatigue, ambiguous roles and heavy workload, result in errors especially in administrating medication. In a study conducted by Hamidah et al (2009) on medication errors among nurses at a hospital in East Malaysia, found that 81.25% of medication error among nurses are made by nurses with less than 5 years of work experience.

Parker, Ashley & Hegney (2003), state that there is constant criticism of nurses in their early stage of profesion (NESP) due to their failure in applying theory to practice. Duchscher (2001), Delaney (2003), Ellerton & Gregor (2003) and Dracup et al. (2004) believe that fresh graduating nurses lack the confidence and ability to combine the knowledge of caring for the patients with the work carried out. Problems experienced by fresh graduating nurses occur during the transition stage from student nurse to trained nurse. Halfer & Graf (2006), Ellerton (2004), Blanzola (2004) and Chang (2003) suggest that during the transition period, NESP will be under immense pressure due to heavy work load, complex roles and vague instructions received. According to Dearmun (2000), each nurse in their early stage of profesion will undergo three stages in the first year of transition, of which the first stage is adaptation, the second stage is mastery and the third stage of acceptance.

Agnew (2000) believes that there are some problems in the recruitment and retention of NESP. These factors result in a shortage of experienced nurses in clinical areas. Baillie (2003) found that in his study of recruitment of NESP in public hospitals, nurses in their early stage of profession experience difficulties during the transition period and in the process of adapting to the roles of a trained nurse. According to Baillie (2003), if they are given the experience to build upon or provide a specific clinical approach, the transition process won't be too difficult to undergo by each NESP. According to Baillie (2003), Lavoie et al (2002) and Fry et al (1998), internship is needed for NESP to provide them with additional learning, individual development and socialisation. Establishing a good orientation program is the initial step in evaluating the efficiency of NESP before they are able to officially step out into the working field (Charlton 2004). In developed countries like the United States, Canada and Great Britain, internship is mandatory for all new nurses (American Association of Colleges of Nursing, 2001).

It is estimated that 7000 fresh graduate nurses register with the Malaysian Nursing Board every year. In the last two years, the number of fresh graduate nurses to register has doubled (LJM Registration Books, 2008). However, there still aren't any nursing institutions that carry out a structured internship programme. What is worrying is that if serious measures are not taken to overcome this problem, it will threaten the health system of the country. The shortage of nurses currently occurring is due to these critical factors. According to Cruez (2006), a total of 174,000 nurses are needed by year 2020. This figure must be achieved in order to obtain a ratio of one nurse to 200 patients, of which the existing ratio is 1: 650. This data shows that the heavy workload of nurses is far from the standards set by the World Health Organization of which one nurse is to monitor 200 patients / clients. The shortage of nurses is discussed in the New Straits Times, dated 10th. March 2006, entitled Shortage of Staff Nurses Still Severe.

Four aspects identified as problems faced by NESP include: stress at work, unsure about the roles of a trained nurse, mistakes made while attending to the patient, and the shortage of nurses by year 2020. Various studies have been carried out to prove that NESP experience most problems in the early stages of their profession. Difficulties experienced by NESP in their transition stage need to be addressed positively in order to retain nurses to work safely and efficiently. Constant criticism of NESP will only demotivate them and deter their interest in the profession.

Weakness experienced by NESP in their transition stage should be handled constructively without pressure so as to avoid a negative impact on the service of the profession. The shortage of nurses in the country will be more pressing if every weakness is scrutinised, when the resolution to the problem has not been thought of. A strategy needs to be implemented in order to produce nurses who are able to function safely and effectively. This strategy hopes to overcome the difficulties mentioned and need to begin at the recruitment of NESP during their transition stage. This study aims to develop a model internship program for nurses in their early stages of profession and measure the implementation of the model.

Methodology

This research is a case study using the Mixed Method approach which involves several methods of qualitative and quantitative data collection. Triangulation of interviews with specialist nurses, NESP focus group discussions, document analyses, and item construction in the form of Likert scale items were used in the development of a model internship program called *My*MIP *(Malaysian Model of Internship Program).*

For the preliminary study, the researcher used two methods of qualitative data collection. The first method consists of in-depth interviews with several specialists nurses from various fields of expertise. The interview protocol was adhered to retrieve the required information (Wiersma, 2002). The interview began with and introduction followed by transitional questions, key questions, and finally closing question. The following data collection was through the focus group discussions (Yin, 2000; Miles & Huberman, 2003). Discussions were conducted with 32 nurses in their early stage of profession. Three open-ended questions were prepared in order to discuss experiences and problems of NESP in their clinical area. Data was collected in the form of written notes, while respondents were requested to write their opinions and views on paper provided. The session was repeated until every question in the protocol reached the saturation point (Debus & Novelli 1986; Khan 1991; Krueger 1988; Morgan 1993; Helitzer et al 1994; Powell 1998).

Data analysis

The information obtained was systematically rewritten. Categories and coding was applied using NviVO analysis version 2. Themes were formed using the content obtained. For example, the statement "they need to be guided and a comprehensive orientation need to be carried out" is categorized under 'Implementation of Orientation Programme'. From the results of the data analysis, six specific themes were drawn i) Implementation of orientation program, ii) Preceptor as a role model, iii) Teaching in clinical areas, iv) Communication and support, v) Management and Leadership, and vi) Evaluation in clinical areas. Once the themes were agreed upon by experts in the field of nursing, the themes were used as the main constructs of the study.

Data obtained from the focus group discussions were then analysed. Each answer was typed systematically until it reached saturation point (Debus& Novelli 1986; Khan 1991; Krueger 1988; Morgan 1993; Helitzer et al 1994; Powell 1998. Data was then analysed using NVivo version 2. A total of 63 items obtained include the six main constructs. 63 five-point likert scale items were constructed in the form of a questionnaire named *My*MIP. Figure 1 shows the framework of the model internship program gathered from interviews, focus group discussions, and analyses of previous studies.

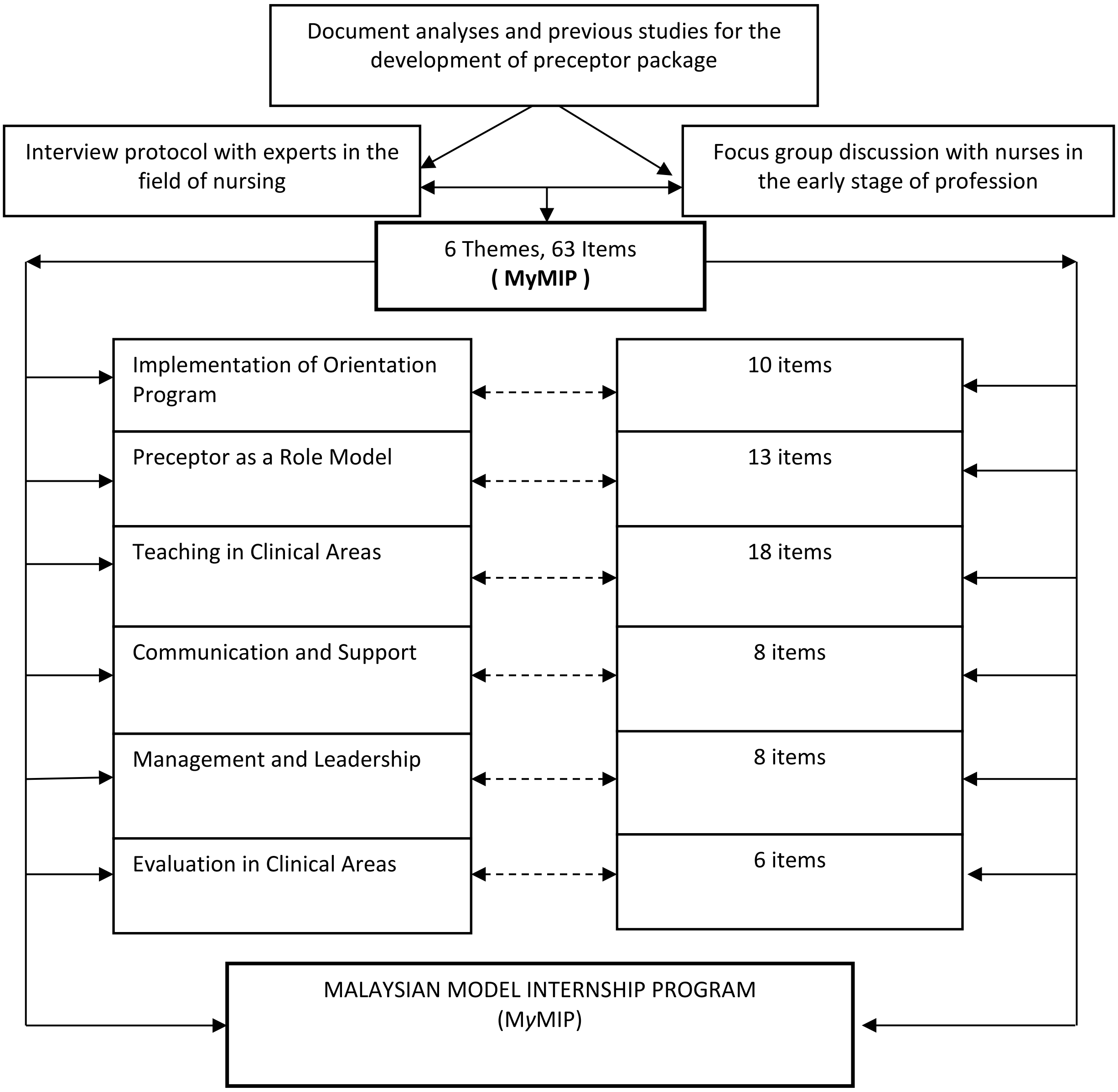

Figure 1. Internship Model Profram for Nurses in their Early Stages of Profession (NESP)

The following triangulation technique used was the analyses of previous studies on the implementation of internship programs. Almost all the analyses conducted found that the execution of an internship program will be successful with the presence of a preceptor (Hands 2008; Burns 2006; RNAO 2003; Myrick 2002; Furgeusson 1996). Preceptor in this study is a registered nurse with extensive experience who is assigned to provide support and guidance to all new nurses and student nurses in the clinical areas. Their main task is to support NESP in their transition stage. Work satisfaction of NESP is related to the orientation session given by preceptors, teaching styles, and learning needs of new nurses. High levels of work satisfaction amongst new nurses are an asset, especially in the long-term (RNAO, 2003 and Anderson 1998).

Implementation Process of Internship Program

This study was conducted in 2007, at Universiti Kebangsaan Malaysia Medical Centre (UKMMC). A total of 386 nurses in their early stage after graduating with a Diploma in Nursing were the main respondents of the study, of which convenience sampling was used (Wiersma 2002, Kerlinger 2000). Fourteen staff nurses fulfilling the necessary requirements and undergone the Preceptorship training program conducted by the researchers were selected. Respondents were placed in fourteen wards in UKMMC supervised by the 14 specialist preceptors placed in wards with their fields of expertise. Each preceptor had a total of about 14 respondents for the morning and afternoon shifts. A round of supervision took duration of two weeks, after which respondents moved to other wards to gain comprehensive experience in the diverse fields required in nursing. Overall implementation of the program covered 9 cycles or 18 weeks. Teaching and learning occur simultaneously, where preceptors supervise respondents according to the guidelines given during the Preceptorship training. Respondents will also evaluate the experience and supervision received using *My*MIP that consists of 63 items and 6 constructs in the form of a Likert scale.

Over the duration of 18 weeks, data is entered into SPSS version 12 every 2 weeks, while the researchers conduct other test analyses using Winstep Software version 3.64.2. The Rasch Model was used to ensure the validity and reliability of the items and constructs developed as well as determining the item difficulty index and item discrimination index.

Findings

Interview results and analyses of the six themes formed the six constructs in *My*MIP. *My*MIP comprises of 63 items, of which 10 items represent the construct Implementation of Orientation Program, 13 items represent the construct Preceptor as a Role Model, 18 items represent the construct Teaching in Clinical Areas, 8 items represent the construct Communication and Support, 8 items represent Management and Leadership, and 6 items represent the construct Evaluation in Clinical Areas. Cronbach's Alpha was used to determine overall consistency and reliability of *My*MIP. Table 1 shows that *My*MIP has a high reliability index of 0.973. A high reliability index indicates that the items are measuring the concept of the study (Trochim 2006; Santos R.J. 1999; Bland & Altman 1997).

Table 1 Overall Reliability of *My*MIP

Alpha Cronbach	*Construct*	*Items*
0.982	1. Implementation of Orientation Program	10
	2. Preceptor as a *Role Model*	
0.972	3. Teaching in Clinical Areas	13
0.976	4. Communication and Support	18
0.960	5. Management and Leadership	8
0.987	6. Evaluation in Clinical Areas	8
0.957		6
0.973	Overall	63

Overall Validity and Reliability *My*MIP (Person)

Overall validity and reliability of *My*MIP was determined using the Rasch Model, Winsteps version 3.62.4. Table 2 shows the reliability of the model program discretely. Overall analysis shows that person reliability index is high at 0.97, where a value of 0.8 and above is acceptable with high reliability (Linacre 2006). Person separation index is at 5.03, which shows the ability of respondents in answering the items. According to Linacre (2006), a good separation index is 2.0 and above. Hence, *My*MIP has a good separation index that is able to separate the abilities of the nurses. Results of this study demonstrate that the ability of the respondents in this study is very agreeable towards the internship program.

Table 2 Overall Person Reliability

INPUT: 386 persons 63 items MEASURED: 386 persons 63 items 5 CATS

	Raw Score	Count	Measure	Model Error	Infit MNSQ	ZSTD	Outfit MNSQ	ZSTD
Mean	283.8	65.0	2.30	0.26	1.07	0.0	1.01	-0.2
S.D.	36.1	0.0	1.45	0.13	0.60	2.6	0.54	2.4
MAX.	324.0	65.0	6.22	1.01	3.79	8.7	3.07	7.0
MIN.	144.0	65.0	-0.97	0.12	0.19	-5.7	0.20	-5.8

REAL RMSE 0.31 ADJ.SD 1.41 SEPARATION 5.03 person RELIABILITY 0.97
MODEL RMSE 0.29 ADJ.SD 1.42 SEPARATION 4.89 person RELIABILITY 0.96
S.E. OF person MEAN = 0.11

SUMMARY OF 162 MEASURED (NON-EXTREME) persons
MAXIMUM EXTREME SCORE: 2 PERSONS

Overall Validity and Reliability *My*MIP (Item)

Table 3.0 shows that item reliability is very high at 0.95, while item separation index is at 4.52. This determines that the difficulty of items in this study were satisfactory to be used in the implementation of the internship program**.**

Table 3 Overall Item Reliability

SUMMARY OF 63 MEASURED (NON-EXTREME) items

	RAW SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	ZSTD	OUTFIT MNSQ	ZSTD
MEAN	707.3	162.0	0.0	0.13	1.02	0.1	1.01	0.2
S.D	35.6	0.0	0.61	0.02	0.23	1.5	0.29	1.6
MAX.	771.0	162.0	1.36	0.19	1.62	3.8	1.77	4.2
MIN.	603.0	162.0	-1.41	0.10	0.64	-2.7	0.55	-2.6
REAL RMSE	0.14 ADJ.SD 0.59		SEPARATION 4.52			item RELIABILITY 0.95		
MODEL RMSE	0.13 ADJ.SD 0.59		SEPARATION 4.39			item RELIABILITY 0.95		
S.E. OF item MEAN = 0.08								

UMEAN = 0.000 USCALE = 1.000

Item RAW SCORE-TO-MEASURE CORRELATION = - 0.99

10530 DATA POINTS. APPROXIMATE LOG-LIKELIHOOD CHI-SQUARE: 16034

Reliability *My*MIP According to Construct

Table 4, is intended to determine the reliability of respondents according to the six themes of Implementation of Orientation Program, Preceptor as a Role Model, Teaching in Clinical Areas, Communication and Support, Management and Leadership, and Evaluation in Clinical Areas. All six constructs have an acceptable index of 0.8 and above according to Linacre (2006), while all six constructs have a good separation index of above 2.0. This means that all items in the six constructs are valid and reliable.

Table 4 Reliability of MyMIP according to Construct

Reliability of MyMIP	**Separation**	**Person**	**Separation**	**ITEM**
Implementation of Orientation Program	SEPARATION 2.46	RELIABILITY 0.86	SEPARATION 2.79	RELIABILITY 0.89
	SEPARATION 2.6	RELIABILITY 0.88	SEPARATION 2.96	RELIABILITY 0.90
Preceptor as a Role Model	SEPARATION 2.0	RELIABILITY 0.80	SEPARATION 3.85	RELIABILITY 0.94
	SEPARATION 2.15	RELIABILITY 0.82	SEPARATION 4.07	RELIABILITY 0.94
Teaching in Clinical Areas	SEPARATION 2.63	RELIABILITY 0.87	SEPARATION 3.11	RELIABILITY 0.91
	SEPARATION 2.81	RELIABILITY 0.89	SEPARATION 3.21	RELIABILITY 0.91
Communication and Support	SEPARATION 2.45	RELIABILITY 0.86	SEPARATION 2.12	RELIABILITY 0.85
	SEPARATION 2.70	RELIABILITY 0.88	SEPARATION 2.0	RELIABILITY 0.82
Management and Leadership	SEPARATION 2.0	RELIABILITY 0.80	SEPARATION 3.40	RELIABILITY 0.92
	SEPARATION 2.16	RELIABILITY 0 .82	SEPARATION 3.65	RELIABILITY 0.93

	SEPARATION 2.50	RELIABILITY 0.88	SEPARATION 2.23	RELIABILITY 0.85
Evaluation in Clinical Areas				RELIABILITY 0.88
	SEPARATION 2.85	RELIABILITY 0.82	SEPARATION 2.0	

Discussion

In this study, internship program is defined as the space to provide opportunities and work experience while learning in order to enhance interaction with senior staff (University Wincosin-EauClaire 2009; Oregon Health & Science University 2002; California State University Northridge 2004; Hofmeister 2004; Erdogan 2009). Work experience while undergoing structured learning is a temporary process which hopes to shape individuals to achieve high levels. In this study, the individuals groomed are nurses in their early stages of professions.

Results of this study were able to contribute to the Malaysian Ministry of Higher Education Malaysia, specifically in the development of nursing programs. Among these, significant contributions of this study include;

Firstly, the theme and the items found in MyMIP are appropriate to the needs of the Malaysian Qualifications Agency (2008) which is a framework that unifies all qualifications recognised by the Malaysian Ministry of Higher Education.
All six themes present in MyMIP; Implementation of orientation program, Preceptor as a Role Model, Teaching in clinical areas, Communication and Support, Management and Leadership, and Evaluation clinical areas, fulfil the requirement of the 8 domains of learning outcomes that form the pillar of the Malaysian Qualification Agency (2008)
The findings of this study have also contributed significantly to the teaching, learning and supervision of nursing in the country. The six themes obtained in this study, also meet the requirements of the Integrated Student Generic Competency Evaluation System of Universiti Kebangsaan Malaysia (UKM).
iv) *My*MIP has also contributed to the implementation of the Nursing curriculum at the Medical Faculty at UKM. *My*MIP has a robust reliability that can be used in the arena of nursing in the country.
The items of *My*MIP focus on individual characteristics of a good role model for teachers, mentors, leaders, managers, and communication. Subsequently, *My*MIP is able to help a good individual / professional.

Hence, a model internship program to guide nurses in their early stages of profession was successfully developed and named the Malaysian Model of Internship Program (*My*MIP). This model comprised of 6 themes and 63 items, each of which went through a structured process of review and evaluation of validity and reliability. The number of items present in each construct was as follows: Implementation of Orientation Program (10 items), Preceptor as a Role Model (13 items), teaching in clinical areas (18 items), Communication and Support (8 items), Management and Leadership (8 items), and Evaluation in clinical area (6 items). Overall, the instrument displayed high consistency and correlation of coefficient alpha = 0.973 and a separation index at 4.57 which showed a high level of ability.

Conclusion

This study has successfully met the research objectives which include: i) developing a model programs to guide nurses in their early stages of profession; ii) the assurance of resources needed to build the model; iii) formation of important constructs for the model iv) the construction of items that complement the model; v) identifying method of model implementation; vi) method of evaluating the model. In conclusion, this study has acquired two findings, namely, a model internship program (*My*MIP) that has been certified to provide guidance to fresh graduating nurses before embarking into the working field, and the notion of a preceptor who can lead and guide.

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THE EFFECTS OF USING ENGLISH CAPTIONS ON IRANIAN EFL STUDENTS' LISTENING COMPREHENSION

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Abstract

The purpose of this study was to examine the effect of the presence or absence of English captions with an English-language sound track on the university-level Iranian EFL students' listening comprehension of video passage material. A total of 60 homogenized students of English literature at the second-year of university participated in the study. The students were randomly assigned to two groups to receive different treatments. Both groups watched a short episode (20 minutes) of an English film and they were required to take a 20-item multiple choice (MC) teacher-made listening-comprehension test while they were watching the film. The difference between these groups was in the presence of the caption of the film; that is, the experimental group watched the film with English captions and the control group watched the film without captions. The results of the post-test MC exam revealed that using captions had a significant effect on students' listening comprehension and those who received the English captions outperformed the other group. Based on the obtained results, it was concluded that providing captions for Iranian university-level EFL students could be helpful in overcoming some of their listening comprehension difficulties.

Key words: Foreign language learning; English captions; listening comprehension; Dual-coding theory

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1. Introduction

Listening is a vital skill in the language acquisition process. Listening comprehension is a complex cognitive process that, although in terms of the mother tongue seems easily acquired, needs a great deal of effort in a second and specifically foreign language learning process. Besides, being in constant exposure to television, radio, and satellite broadcasts has increased the necessity to be prepared to receive and process information gained through the aural channel more than before.

Research in second language acquisition (SLA) has shown that if learning is to be effective and permanent it must be meaningful, involve active mental processes, and be reliable with the existing knowledge in the learner's mind (Hanley, Herron, & Cole, 1995).

In this regard, Dual-coding theory - a theory of cognition - first advanced by Allan Paivio (1971, 1986) proposes that memory consists of two separate but interrelated coding systems for processing information - one verbal and the other visual. The verbal and visual systems can be activated independently, but there are interconnections between the two systems that allow dual coding of information. If information is coded in both systems (as with captions and verbal language), the learner retains and recalls it more easily, because associations will be formed between the two systems.

This theory was supported by Paivio's own research (1971) in first language setting. The value of dual coding theory in increasing our understanding of comprehension processes has been confirmed by subsequent studies. Paivio and Lambert (1981) extended the dual coding inquiry into bilingual context and found similar positive evidence. Captions provide additional reading input to the already existing pictorial and audio input provided by various forms of commonly used video technology.

Nowadays DVD options with their flexible dimensions are particularly useful in the second and specifically foreign language settings. Offering both multilingual captions and multilingual soundtracks, DVD technology allows for various combinations of oral and written language through different sensory channels.

Meanwhile, it is necessary to distinguish subtitles from captions. Subtitles refer to on-screen text in the students' native language combined with a second language soundtrack while captions refer to on-screen text in a given language combined with a soundtrack in the same language. In this study, the term "captions" will be used throughout to avoid repeated, confusing label changes.

In order to examine the effect of film captions on EFL learners' listening comprehension, the following research questions were proposed for this study:

Does providing captions for films have any significant impact on Iranian university-level EFL students' listening comprehension?
Is the presence of English captions with an English language soundtrack more effective in improving EFL learners' listening comprehension as compared to the absence of captions?

Based on the above research questions the following null hypotheses were investigated.

HO1: Providing captions has no significant impact on Iranian university-level EFL students' listening comprehension.
HO2: The presence of English captions with an English language soundtrack is not more effective in improving EFL learners' listening comprehension compared to the absence of captions.

2. Method

2.1. Participants

The participants were randomly selected from amongst 150 Iranian undergraduate EFL students of English literature. From this group based on the results of a MC TOEFL exam, 60 homogenized learners were chosen for the actual phase of the study. The participants were all native Persian speakers and English was their second language. Their age range was between 18 to 26 years old and their level of English language proficiency was between pre-intermediate to upper-intermediate. All the participants were female students chosen from the only unisex university in Iran, i.e. Alzahra University - a state university in Tehran, the capital of Iran.

2.2. Research Design

The present study aimed at examining the effect of the presence/absence of captions accompanied by films on Iranian EFL learners' listening comprehension. In order to reach this aim a pre-test post-test quasi-experimental design was adopted for the purpose of this research study. Research sample was chosen by the use of access sampling method and the participants were randomly assigned to experimental and control groups. To fulfil this purpose, a 50 item listening comprehension test was administered to both experimental and control groups as a pre-test. Only the experimental group received the treatment, that is, the presence of captions while viewing films. At the end of the study, a 20 item teacher-made listening comprehension test was administered to both groups to see the possible effect of the presence of captions, if any. Thus the design of the study which is depicted in the following table was quasi-experimental.

Table 1. Research design

	Research design		
Experimental group	T1	X	T3
Control group	T2	O	T4

X (Treatment), O (no treatment), T1 and T2 (pre-tests), T3 and T4 (post-tests)

2.3. Instruments

First, in order to have a homogeneous sample, an English proficiency test of TOEFL consisting of 50 multiple-choice questions was administered. This test included three sections of listening comprehension. The first part consisted of 30 questions based on short conversations. The second part included 7 questions based on a longer conversation. And the last part had 13 questions based on short talks. Participants had 25 minutes to complete the test. The test was administered at the beginning of the term in one of the participants' "Listening and Speaking Laboratory" sessions, before running the actual study.

Second, to check the listening comprehension of the participants, the researcher administered a 20 item teacher-made listening comprehension test based on the film's content. The test was multiple-choice and was based on a 20 minutes film that students viewed. The film was presented with English-language sound track and two treatments of the presence or absence of English captions were provided. The teacher-made listening-comprehension test was given to the participants while they were watching the film, so the participants had to watch and answer the test simultaneously.

2.4. Procedure

In order to calculate the reliability of the pre-test TOEFL exam, it was administered to 30 students of an English Language Institute as the pilot group of this study. Using Cronbach alpha coefficient, the reliability coefficient was calculated as 0.71 which is an acceptable reliability coefficient. Therefore, there was no need to eliminate any of the questions. Also, after the final administration of the TOEFL test on 60 participants of this study, the reliability coefficient was again calculated by using Cronbach alpha coefficient and the result was 0.74 which is an acceptable and favourable reliability coefficient.

The TOEFL test consisted of 50 multiple-choice questions and it was given to 80 university level EFL students at the beginning of their "Listening and Speaking Laboratory" session. Among all the students, only those whose scores fell within one standard deviation above and below the mean were selected as the subjects of this study which counted to 60.

As the next step, the participants were randomly assigned to experimental and control groups. The participants watched 20 minutes of a film. The audio portion of the episode was presented in English. The experimental group watched the film accompanied by English captions while the control group watched it without captions.

The measurement task involved one written multiple-choice test in English which was derived from the passage of the film. This test consisted of 20 questions and in each question just one choice was the right answer. For using the teacher-made listening comprehension test, its reliability and validity was measured besides the item analysis of the questions.

Item discrimination coefficient, item discrimination index, and item difficulty coefficient were determined to check for the favourable psychometric characteristics of the teacher-made listening comprehension test.

Content, face and criterion validity was conducted to validate the teacher-made listening comprehension test. To check for the Concurrent validity of the test, the relationship between the teacher-made test and the achievement test of the subjects was studied by using Pearson correlation coefficient and the result ($r = 0.737$) was significant and meaningful.

Finally, after determining the correlation coefficient of the teacher-made listening comprehension test it was distributed among 60 participants and the reliability coefficient was again calculated and the result was 0.78 which is a significant reliability coefficient.

In addition to Cronbach alpha coefficient, the reliability coefficient of the teacher-made test was calculated by using test-retest method. In this way, the test was again administered to the pilot group after two weeks and correlation coefficient value was calculated by using Pearson correlation ($r = 0.88$) and the result was significant at $\alpha = 0.01$.

3. Findings

In order to ensure the homogeneity of the participants a t-test was carried out to find out whether any differences existed between the two groups.

Table 2. t-test of "TOEFL score" in two groups of control and experimental

Groups	Mean	Standard deviation	t value	Degrees of freedom	Significance level
Control (watching film without caption)	35.90	8.06	0.48	58	0.629
Experimental (watching film with caption)	36.86	7.35			

As can been seen from the above table, the *t value* (0.48) is not significant since it was found that there wasn't any significant difference between the means of the control group ($M = 35.90$) as compared with the experimental group ($M = 36.86$) at 0.05 probability level. As the result indicates, it was concluded that the two groups were homogeneous and therefore they could safely be assigned to control and experimental groups.

Table 3 below shows the descriptive statistics related to the scores of teacher-made listening comprehension exam in both groups.

Table 3. Descriptive statistics of the scores for teacher-made "listening comprehension" exam

Groups	Central tendency indexes	Distribution indexes	Dispersion indexes

	Mode	Median	Mean	Range	Variance	Standard deviation	Standard error of mean	Kurtosis coefficient	Skewness coefficient
Control (without caption)	14.50	14.50	14.46	9	6.60	2.56	0.46	-0.02	0.60
Experimental (with caption)	19	19	18.73	4	1.09	1.04	0.19	-0.96	0.31

According to the above table, it could be observed that there was little difference among mode, median, and mean. And also as the table indicates the amount of Kurtosis coefficient and Skewness coefficient was less than 1. Therefore the assumption of normality has been satisfied. Consequently, we could use the mean as an indicator of central tendency index, besides using the parametric statistics models.

Table 4. t-test for "listening comprehension test"

Groups	Mean	Standard deviation	t value	Degrees of freedom	Significance level
Control (watching film without caption)	14.46	2.56	8.42	58	0.01
Experimental (watching film with caption)	18.73	1.04			

According to Table 4 and regarding *t value* which was 8.42, it was found that there was a significant difference at ($\alpha = 0.01$) between the means of the research samples' listening comprehension scores in the two groups of control (14.46) and experimental (18.73). Therefore, by considering that the mean of the experimental group was significantly higher than the control group, it could be concluded that the presence of English captions with the film was influential in improving Iranian EFL learners' listening comprehension skill.

4. Discussion

As the result revealed, the students in the experimental group who watched the film with English captions outperformed the students in the control group. The experimental group answered the researcher-made questions, which were based on the film's content, better than the control group.

According to the result of this research, the first and the second null hypotheses could be safely rejected and it was concluded that providing captions was helpful and influential in improving EFL learners' listening comprehension. By providing captions learners would have a better chance of understanding the film's content and captions are a means of enhancing students' comprehension of the films in their second language.

The results of this study are consistent with some other studies done in this area (Bowe & Kaufman, 2007; Garza, 1991; Markham, Peter, & McCarthy, 2001; Rubin, 1994; Stewart & Pertusa, 2004; Taylor, 2005; and Vanderplank, 1988).

5. Conclusion and Recommendation

This study was an attempt to investigate the impact of the presence of English captions on Iranian EFL students' listening comprehension. Based on the results of this study, it is suggested that teachers and language teaching scholars consider the benefits of using captions when teaching listening skills through watching video. Teachers should devote time on using captions in their classes.

Using captions with English films, helps foreign language students in their understanding and comprehension of film content. Captions can increase the students' knowledge of the target language and enhance language learning by the use of new lexicons and phrases in an appropriate context. This view is supported by Paivio (1971), Garza (1991), Krashen (1981, cited in Stewart and Pertusa, 2004) and Vanderplank (1988).

Vanderplank (1988) believes that captions might have potential value in helping the language-acquisition process, by providing language learners with the key to massive quantities of authentic and comprehensible language input.

When the students have access to the captions, their reading ability will help their listening comprehension, and their understanding of the film will be improved. Furthermore, providing captions can reduce the level of anxiety which is common during the listening comprehension tasks, at least among lower proficiency level language learners.

Based on the results of this study the following suggestions are made:

Future studies can investigate the long term effect of using captions on students' listening comprehension.

Further research can employ different videos of different contents; for example, news reports, dramas, academic lectures, or even scientific fictions.

One can carry out an experiment to find out whether the length of the video might produce different result.

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THE EFFECTS OF AN AUTOMATIC SPEECH ANALYSIS SYSTEM ON ENHANCING EFL LEARNERS' ORAL READING FLUENCY

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Abstract

The purpose of the study was to investigate the effects of an ASAS (Automatic Speech Analysis System) on EFL learners' oral reading fluency from the perspectives of WCPM (words read correctly per minute), MFS (multidimensional fluency scale), and accuracy rate. A three by two between-subject design was conducted. Three classes of English-majored college students in central Taiwan were conveniently sampled and participated in the training. From each class, eight learners of low oral reading fluency and another eight of high oral reading fluency were chosen for data analysis. Learners in Class 1 enhanced their oral reading fluency with an audio player, Class 2 with a system-paced ASAS, and Class 3 with a learner-paced ASAS. Pretest and posttest were conducted before and after the training. During the 8-week training period, each student was required to read half of an article by repeating after the model speaker for thirty minutes each week. Two-way ANOVA simple main effect was conducted to analyze the data. Four conclusions were made. First, the training either with an audio player or with an ASAS enhanced learners' WCPM more than their MFS scores. Second, students of low oral reading fluency benefited more by practicing with the ASAS. Third, training either with an audio player or an ASAS didn't seem to help learners of high oral reading fluency much. Fourth, learners' enhancement of WCPM came mainly from the improvement of reading speed rather than accuracy rate.

Keywords: automatic speech analysis system, oral reading fluency, multidimensional fluency, oral reading accuracy rate

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Introduction

Background and Motivation of the Study

One of the crucial components to the development of English reading ability is oral reading fluency which has been neglected in the curriculum of any English programs in Taiwan. In fact, sufficient oral reading fluency is essential to good reading comprehension and enjoyable reading experience (Zon,, 2002; Orosco, et al., 2008). When students read fluently, they make less effort on decoding and article chucking and therefore they may pay more attention to reading, comprehension (LaBerge &Samules, 1974). Clearly, students will understand better what they read when they are able to pay more attention to comprehension. Moreover, students' knowledge of word meaning with its intonation, expression, phrasing and pausing determines their interpretation of the text (Rasinski, 2003).

Despite its importance to skilled reading, oral reading fluency has often been left out in the classroom (Allington, 1983; Zon, 2002; Bashir and Hook, 2009; National Institute of Child Health and Human Development, n.d.). In order to develop oral reading fluency, one of the approaches, guided repeated oral reading, is suggested. That is, teachers should encourage students to read passages orally with systematic and explicit guidance and feedback. Nonetheless, it is a common phenomenon that EFL learners in Taiwan usually do not read aloud when they read an English passage or article. One important reason to this negligence is test-oriented instruction prevalent in Taiwan. Another reason is the limited instructional materials and insufficient time for building students' oral reading fluency.

In this study, students were required to read aloud by using an ASAS (Automatic Speech Analysis System) and were expected to promote their oral reading fluency (Samuels, 1979; Chiu, Liou & Yeh, 2007; Schwienhorst (2008). Now, many speech analysis coursewares, such us PASTE, GoldenWave Digital Audio Editor, Voice Paramas, have become more and more reliable in promoting students' English oral ability. Among these, MyET (My English Tutor) (http://www.myet.com/), a language learning and web-based software, is developed as an individual tutor by professional speech recognition researchers in Taiwan. It is categorized as an ASAS in helping language learners improve speaking skills. MyET offers acoustic analyses of learners' English oral performance according to pitch, timing, pronunciation and emphasis. Learners listen to native speakers' demonstration in this system, and then imitate the model through microphone recording. Next, learners are provided immediately scores and feedbacks by the system. Furthermore, MyET analyzes the voice problems on segments and suprasegments through graphic displays of pitch profile for each learner. Because of the function of MyET, this study attempts to use it to motivate and model students' practice of reading aloud and to investigate its effect on students' oral reading fluency as the result of each practice.

Purpose of the Study and Research Questions

This study tried to investigate the effect of an ASAS on EFL college students' oral reading fluency from three perspectives: WCPM (Words read Correctly Per Minute), multidimensional fluency, and oral reading accuracy rate.

Based on the above purposes, four research questions are hereby proposed.

1. Is an ASAS more efficient than an audio player in improving EFL learners' oral reading fluency in terms of WCPM?
2. Is an ASAS more efficient than an audio player in improving EFL learners' oral reading fluency in terms of multidimensional fluency?
3. Is EFL learners' oral reading accuracy rate enhanced with the use of an ASAS?

Literature Review

Oral Reading Fluency

Laberge and Samuels (1974) and Carver (1997) had agreed that efficient oral reading could be defined as "that level of reading competence at which textual material can be effortlessly, smoothly, and automatically understood" (Schreiber, 1980, p.177). Moreover, Meyer and Felton (1999) defined fluency in a similar definition as "the ability to read connected text rapidly, smoothly, effortlessly, and automatically with little conscious attention to the mechanics of reading such as deciding" (p.284). Hudson, Mercer and Lane (2000) argued that oral reading fluency involved "accurate reading at a minimal rate with appropriate prosodic features and deep understanding" (p16).

Oral reading fluency could be determined or counted by reading correct words per minute. Hence, the scores mirror small, approximately equal interval units (L.S. Fuchs & Fuchs, 1999). Basically, fluent reading had been featured as the accurate and swift expressing of a passage, associated with adequate reading comprehension (Levy, Ablleo & Lysynchuk, 1997). "Oral reading fluency is the ability to read accurately, quickly, effortlessly, and with appropriate expression and meaning" (Rasinski, 2003, p.31). Oral reading fluency was indexed by the speed and accurate recognition of isolated words in order to predict reading ability and comprehension (Martin-Chang S. & Levy B.2006). Wolf and Katzir-Cohen (2001) also defined reading fluency as "a level of accuracy and rate where decoding was relatively effortless; where oral reading was smooth and accurate with correct prosody; and where attention can be allocated to comprehension" (p.219). To be specifically, reading fluency meant a level of correctness and pace at which decoding was effortless and at which oral reading was stable and accurate with right prosody. Basically, fluent reading could be seen as a feature of accurate and speedy understanding of a text and could be conjoined with reading comprehension (Levy, Ablleo & Lysynchuk, 1997).

Computer-Assisted Modeling and Oral Reading Fluency

The computer has been seen as an effective tool to assist students to improve oral reading fluency. Computer could provide a model of fluent reading and learners follow the model. Carver & Hoffman (1981) said that computer-assisted programs could help learners improve oral reading fluency. Computer-assisted language learning is related to behavioristic and cognitive styles in teaching such as drill-and-practice and tutorial software (Wyatt, 1984; Juel, 1996; Thaler, Ebner, Wimmer and Landerl, 2004; Kartal, 2006). Specifically, August (2003) stated that the use of technology could help EFL literary education. The National Reading Panel (NRP) stated that the applied speech recognition technology in reading curriculum is a field in need of advanced research (NRP, 2000).

According to Poulsen, Hastings and Allbritton's study (2007), a Reading Tutor which uses automated speech recognition to "listen" to children read aloud, providing both spoken and graphical feedback., had significant evidence to enhance of EFL students' oral reading fluency. This technology analyzes children's oral reading, record their location within the context of a passage and offer feedback to children immediately and in response to difficulties they face during the oral reading task. The measurement of fluency includes two parts: total words per minutes in reading and correct words per minute. Furthermore, researchers also measured sight word recognition measure as indication of fluency. The result showed that participants' fluency and sight word recognition were improved under the LISTEN system. In other words, a Reading Tutor had significant evidence to enhance of EFL students' oral reading fluency.

Methodology

Design of the Study

A three by two between-subject design was conducted. Two independent variables are included in the study: 1. training method including reading aloud with an audio player, reading aloud with a system-paced ASAS and read aloud with a learner-paced ASAS and 2. learners' original oral reading fluency, categorized as learners of low oral reading fluency (LORF) and high oral reading fluency (HORF). There were 8 participants in each cell. All participants took the pretest and the posttest before and after the training. Their words read correctly per minute (WCPM), multidimensional fluency scores (MFS), and accuracy rate (words read correctly / words read per minute) are dependent variables.

Participants

Three classes of English-majored college students in central Taiwan were conveniently sampled. Learners in Class 1 received the training with an audio player, Class 2 with a system-paced ASAS, and Class 3 with a learner-paced ASAS. From each class, eight learners of low oral reading fluency and another eight of high oral reading fluency were chosen for data analysis. Among them, 24 were male and 24 female. They aged from 18 to 21 and had learned English for more than 6 years.

Instruments

Sixteen multimedia computers with an ASAS were used in this study. Each participant in Class 2 and Class 3 had his/her own username and password for logging into the ASAS. When learners finished reading each sentence, the scores of pronunciation, pitch, timing and emphasis were given on the right part of the screen. The model’s and the learner's spectral wave was compared on the bottom of the screen. Four articles were from the Studio Classroom magazine – advanced level (2006), one of the most popular magazines for English learning in Taiwan. They were put in the ASAS for ORF practice. All contexts were related to the topic of technology. Each article was divided into two parts, one part as one lesson in the ASAS. Their readability ranges from 5 to college grade level, calculated by Flesch-Kincaid and SMOG formulas. Some sentences from the four articles were selected to be the contents of the pretest and posttest.

Procedure of Data Collection

The pretest, training, and posttest were conducted over 10 weeks. In the first week, each participant read one article, which was one of the article used in the training, aloud to be recorded as the pretest data. From the second to the ninth week, participants were required to read four articles aloud, half an article in one week for 30 minutes, with an audio player (Class 1), the system-paced ASAS (Class 2), or the learner-paced ASAS (Class 3). In the tenth week, the posttest was done. Each participant read the same article as in the pretest aloud and their voice was recorded for later analysis.

Data Analysis Method

Three scoring included 3 parts: words read per minute (WPM), words read correctly in a minute (WCPM) and multidimensional fluency score (MFS). The standard of determining words read correctly (Table 1) was adopted from Blevins' article (2001). Participants’ multidimensional fluency score was given on a multiple reading scale, adopted from Rasinski and Zutell’s study (1996). There are four items: accuracy, phrasing, smoothness and pace, with 1 to 4 points for each item. Two raters scored participants WCPM and MFS for acceptable inter-rater reliability above .85 (Cohen & Manion, 1994, p.139-140).

Table 1. Standard of Word Read Correctly or Incorrectly

Words read correctly	Words read incorrectly
● Pronounce correctly	● Mispronunciation
● Self-correction within 3 seconds	● Substitution
● Read repeatedly	● Omission
	● Don’t read within 3 seconds

Two-way ANOVA simple main effect was conducted to compare pretest and posttest scores for the effectiveness of the ASAS and the influence of original oral reading fluency on the enhancement of WCPM, MFS, and accuracy rate.

Results and Discussion

Two raters were responsible for scoring students' oral reading fluency with the standard of WCPM and MFS, as described above. Both raters were graduate students in a graduate institute of applied foreign languages and one of them is an English teacher at a junior high school in central Taiwan. The inter-rater reliability, indicated by Pearson Correlation Coefficient, is .99 for WCPM and .89 for MFS.

Analysis of WCPM

In terms of WCPM, Class 1, Class 2, or Class 3 all made significant progress with the training. As hypothesized, in enhancing oral reading fluency the ASAS helped learners more than the audio player, especially for those learners of low oral reading fluency (LORF).

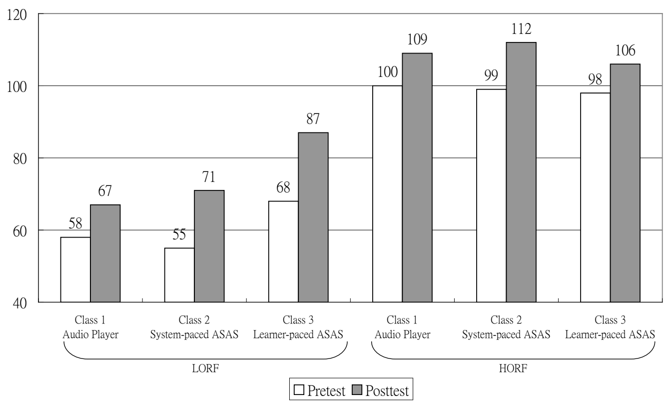

Figure 1. Comparison between Pretest and Posttest of WCPM

The three different training methods help students significantly improve their WCPM after the training. For those learners of LORF, Table 2 shows that they benefited more from the use of the ASAS. (Comparison between Pretest & Posttest within Class 1: F=5.43, p=.030; within Class 2: F=17.07, p=.000; within Class 3: F=23.41, p=.000). Figure 1 further shows that learners in Class 2 and Class 3 made more progress than those in Class 1 (Class 3: 87-68=19 > Class 2: 71-55=16 > Class 1: 67-58=9).

Table 2. Two- way ANOVA Simple Main Effect of WCPM

ORF	Source of Variation	SS	*df*	MS	F	*p*
	Within Cells	1269.95	21	60.47		
	Comparison between Pretest & Posttest					
Low	within Class 1	328.52	1	328.52	5.43	.030
	within Class 2	1032.02	1	1032.02	17.07	.000
	within Class 3	1415.64	1	1415.64	23.41	.000
	Within Cells	668.59	21	31.84		
	Comparison between Pretest & Posttest					
High	within Class 1	356.27	1	356.27	11.19	.003
	within Class 2	656.64	1	656.64	20.62	.000
	within Class 3	306.25	1	306.25	9.62	.005

Regarding learners of high oral reading fluency (HORF), Table 2 indicates that all three classes made significant progress from the pretest to the posttest (Comparison between Pretest & Posttest within Class 1: F=11.19, *p*=.003; within Class2: F=20.62, *p*=.000; within Class 3: F=9.62, *p*=.005). Learners in Class 2, practicing with the system-paced ASAS, made the most progress (in Figure 1, Class 2: 112-99=13 > Class 1: 109-100=9 > Class 3: 106-98=8). The effects of the ASAS seem not very consistent for the HORF learners.

Analysis of Multidimensional Fluency

In investigating learners' multidimensional fluency scores (MFS), Table 3 shows that LORF learners made significant progress with the use of the ASAS (Class 2: F=9.64, *p*=.005; Class 3: F=8.10, *p*=.010), but not with the use of the audio player (Class 1: F=.19, *p*=.671). Figure 2 indicates the progress that LORF learners made from the pretest to the posttest (Class 2: 8.00-5.75=2.25 > Class 3: 10.63-8.56=2.07 > Class 1: 6.38-6.69=-0.31). The ASAS is helpful in enhancing LORF learners' multidimensional fluency.

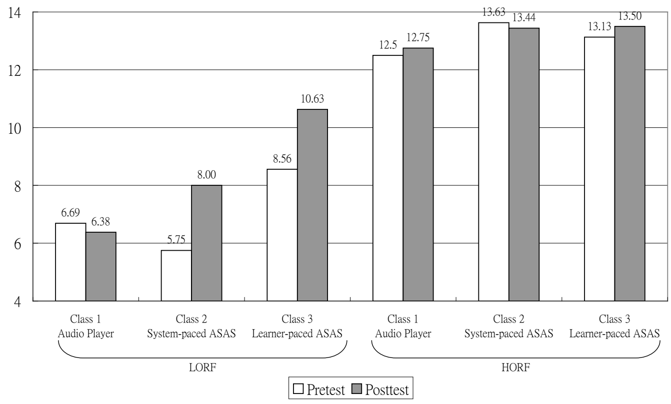

Figure 2. Comparison between Pretest and Posttest of Multidimensional Fluency

On the other hand, for HORF learners, no matter what tool the learners used, all the learners did not make progress from the pretest to the posttest (in Table 3, Comparison between Pretest & Posttest within Class 1: F=.21, *p*=.654; within Class 2: F=.12, *p*=.737; within Class 3: F=.46, *p*=.503). Furthermore, Figure 2 displays that differences between the pretest and posttest are very small and even negative for Class 2 (Class 1: 12.75-12.50=0.25; Class 2: 13.44-13.63=-0.19, Class 3; 13.50-13.13=0.37).

Table 3. Two-way ANOVA Simple Main Effect of Multidimensional Fluency

ORF	Source of Variation	SS	*df*	MS	F	*p*
	Within Cells	44.09	21	2.10		
	Comparison between Pretest & Posttest					
Low	within Class 1	.39	1	.39	.19	.671
	within Class 2	20.25	1	20.25	9.64	.005
	within Class 3	17.02	1	17.02	8.10	.010
	Within Cells	25.42	21	1.21		
	Comparison between Pretest & Posttest					
High	within Class 1	.25	1	.25	.21	.654
	within Class 2	.14	1	.14	.12	.737
	within Class 3	.56	1	.56	.46	.503

The above finding, answering part of research question 1, indicates that an ASAS is more efficient than an audio player in improving EFL learners' oral reading fluency in terms of WCPM, but only LORF learners benefit from practicing with the ASAS in terms of multidimensional fluency. In fact, WCPM only involves accuracy and speed, but MFS includes other two parts: phrasing and smoothness. This is understandable in that the ASAS does not provide training on phrasing and smoothness. The results comply with Li's (2002) argument that students of low oral reading fluency interact effectively with an ASAS.

Analysis of Accuracy Rate

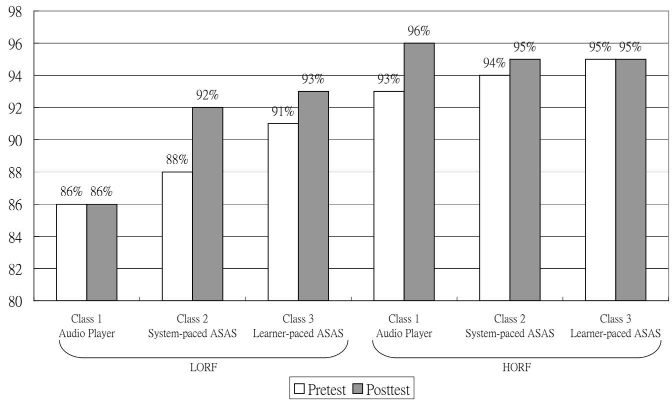

Figure 3 Comparison between Pretest and Posttest of Accuracy Rate

Although the ORF training brought about certain effects on the enhancement of EFL learners' oral reading fluency from the perspectives of WCPM and MFS, when accuracy rate, the percentage of WCPM over WPM, is concerned, learners' accuracy rate was not improved regardless of what tool those learners used (Table 4). For those LORF learners, only learners in Class 2 made significant progress on their accuracy rate (Comparison between Pretest and Posttest Class 1: F=.10, *p*=.759 ; within Class 2: F=6.66, *p*= .017 ; Class 3: F=1.88, *p*=.185). Figure 3 shows that LORF learners in Class 1 improved by 0% (86%-86%), Class 2 by 4% (92%-88%) and Class 3 by 2% (93%-91%).

On the other hand, according to Table 4 HORF learners' accuracy rate was not enhanced either by using the audio player or the ASAS (Comparison between Pretest & Posttest within Class 1: F=1.72, *p*=.204; within Class 2:F=.83, *p*=.373; within Class 3: F=.05, *p*=.832). Figure 3 shows that these learners made less than 3% of progress in reading words correctly (Class 1: 96%-93%=3%; Class 2: 95%-94% =1%; Class 3: 95%-95%=0%).

Table 4. Two-way ANOVA Simple Main Effect of Accuracy Rate

ORF	Source of Variation	SS	*df*	MS	F	*p*
	Within Cells	141.39	21	6.73		
	Comparison between Pretest & Posttest					
Low	within Class 1	.65	1	.65	.10	.759
	within Class 2	44.82	1	44.82	6.66	.017
	within Class 3	12.64	1	12.64	1.88	.185
	Within Cells	242.58	21	11.55		
	Comparison between Pretest & Posttest					
High	within Class 1	19.85	1	19.85	1.72	.204
	within Class 2	9.58	1	9.58	.83	.373
	within Class 3	.53	1	.53	.05	.832

The above results imply that learners' oral reading speed is enhanced after the oral reading training, but the number of words read correctly is in fact not higher. That is, it is easier for learners to model the reading speed, but pronunciation of individual words may need other methods, such as the teacher's or peer's guidance and feedback.

Conclusions

From above results of data analysis, four conclusions are made here. First, training of ORF with an audio player or an ASAS enhances students' WCPM more than their MFS scores. WCPM only involves accuracy and speed (pace); whereas, the MFS includes other two parts: phrasing and smoothness. Instructor's individual or detailed explanation and corrective feedback may be necessary for students to improve phrasing and smoothness.

Second, students of LORF benefit more by practicing with the ASAS. This is especially true when students practiced their oral reading with the learner-paced ASAS. In this mode, they were able to repeat those sentences which they felt more difficult or unfamiliar. Therefore, they could read these sentences more fluently after the repeated practice. The finding corresponds to Taguchi, Takayasu-Mass and Gorsuch’s research (2004) in arguing that assisted repeated reading could potentially help weak EFL learners’ fluency. Begeny and Martens (2006) also argued that students who had the low oral reading fluency benefited from repeated reading.

Third, training either with an audio player or an ASAS doesn't seem to help students of HORF much. Since those students have already reached a certain level of reading fluency, individual instructor's or more specific guidance, such as linking of sounds, stopping, omission of sounds, and etc. may be more helpful.

Fourth, learners' enhancement of WCPM comes mainly from the improvement of reading speed rather than accuracy rate. Tijms (2007) pointed out that an ASAS made prominent development of reading speed, especially for the reading fluency of individuals with low proficient level. Many studies found that repeated reading improves students’ reading fluency (Meyer & Felton, 1999; National Institute, 2000; Therreien, 2004). However, either an audio or an ASAS has limitation on improving learners' accuracy rate (Hintikka, Landerl & Aro, 2008; Klicpera and Schabmann, 1993). One-way modeling in an audio player or an ASAS could not give individual feedback for students to learn correct pronunciation. The enhancement of accuracy needs more interactive and individual instruction or feedback.

Acknowledgements

The study was funded by the National Science Council, Taiwan, under the NSC grant number 99-2511-S-212-001.

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THE EFFECTS OF VOCABULARY INTERVENTİON ON SECOND GRADERS' WORD LEARNİNG: LSA-BASED CHİNESE VOCABULARY LEARNİNG SYSTEM

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Abstract

The present study aimed to help children to learn Chinese vocabulary in an easy and effective way by using the LSA-based Chinese Vocabulary Learning System. With the system, Chinese words that were being taught and learned were selected systematically by statistical computation of LSA (Latent Semantic Analysis) method. Latent semantic correlation measures how likely two words will appear in the children reading materials, which in turn provide judgment of words that are semantically similar. The effectiveness of the system was examined by comparing the learning outcomes of the traditional vocabulary learning and LSA-based vocabulary learning. In grade 2, Twenty-three children were intervened by traditional vocabulary teaching method (control group), whereas the other twenty-eight children were intervened by LSA-based Vocabulary System (experimental group). The interventions were conducted in a seven-week period. The Peabody Vocabulary test, the Chinese Character Recognition test, and the Word Association test were administered before and after the interventions. The results of paired t-tests showed that the experimental group made significantly higher gains with the intervention that used LSA-based Chinese Vocabulary Learning System, however the same was not found with the control group. The results of ANCOVA indicate that after controlling for the effects of pre-tests, the experimental group performed significantly better than the control group on the post-tests. The study demonstrates the effectiveness and application of the present system.

Keywords: Latent Semantic Analysis, LSA-based Chinese Vocabulary Learning System, Vocabulary learning, Word association

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THE EVALUATION OF STUDENTS AND TEACHERS VIEWS ON PHYSICAL ARRANGEMENT OF CLASSROOM

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Abstract:

Being an essential part of the education school and its sub-system classroom are the environment in which take place almost all educational activities. In providing the physical structure and the internal hardware of a class, in general, all measures to facilitate the learning of students by teachers and administrators need to be established. It is then required to get a conclusion by the school board, teachers and duties of the state how to arrange the class and how it is regulated. In addition, the big difference of this study with others is asking students ideas about the arranging of the class. A scale was developed for obtaining data in this study and its Cronbach's alpha value was found as 0767. As a result of the findings of the present study constructive recommendations are given.

*Keywords***:** Class, Environment, Teacher-Student, Physical state.

1. Introduction:

An effective education to occur, arranging classes, school buildings and services should be held in an entirety way which is among the main objectives of national education (METK. M: 1). In order to form an effective education; in the same time administrators, teachers, parents, school-family units, all with an interest should act together for the sake of educational environment. So, these elements will work together with school and school surroundings. The school is scheduled for a particular realization of educational objectives, educational activities and for an environment that is being carried out (Celep, 2008: 3). School administrators, teachers, students and the educational supplement for a team are located there. While in school, students get training in the basic media classes.

Classes are generally described as having specific capacity located with the tables or desks, walls, posters bearing the features of the class they belong to (for example, the maps on the walls of the social studies class and English words written on the walls, in science and technology class such as the microscope on the desk and either drawn on the wall as the presence of the periodic table), and training activities taking.

Classroom environment comprises the properties of the space allocated for educational activities. Desks, tables, cupboards and empty spaces, space heat, light, and a number of factors, such as color scheme, they all create environment variables. So, teacher-student relationships are largely influenced by these physical variables cited above (Aydın, 1988).

However, a few maps and a table are not enough for designing a class effectively. That is, with the renewed and changing world of technology and greater use of tools and equipment, there is also a need to address multiple senses. The recall rates also to be learned for a person cited as follows: "20% of the reading, remembering, hearing 30% as a result of learning, visual learning as a result of 40%, 50% recall rate as a result of telling what they read, the application of learning by 60% as a result. Taking this, it highly increases the learning rate that your sense of how to learn. With eye, ear and tongue, the learning is around 90%. Therefore, the learning environment of the vehicle-equipment is required to take as much as possible. The classes in the editing job should be done all over again.

2. Method Aim Of The Study:

For the realization of better learning, classroom environment should be regulated. Teachers and students are suspected and they should obtain opinions of how to develop classroom environment. Accordingly, the aim of this study is to give ideas to students and teachers for better creating a classroom environment. Arrangement of classes according to students' age, interests, and failure to comply with the requirements of criteria such as whether to be arranged by looking at the classroom criteria should be overviewed all over again. This is the purpose of the study criteria. The student's own learning can be ensured, and that it is the ultimate goal of this study.

3. Importance Of The Study:

During the issuance of the class in terms of education, teachers' and students' opinion is very important to use as a class constant. Until now organizing a class environment in general views of the administrators came to the fore on the eyes of not only experts in a particular branch but also of the authorities. For this reason, the atmosphere of the classroom environment and their branches are susceptible to regulation by the center. In this study, teachers in the classroom and learning environment being the most active members of the dominant ideas of the students in the classroom environment which is created for the teacher and students' perspectives are important for which it is based. This study will then complete a gap in the related literature.

4. Sampling:

This study was carried out in second semester of 2011 - 2012 Education and Training in the province of Aydın, Karacasu. Five different schools’ students and teachers were selected for this study. This district was chosen randomly because the researcher’s working in this county. All of these were selected from the school and elementary school teachers. Section is formed by students studying in 6-7-8 grade. If the reason for the class of primary school students that makes up the second echelon to think that they could have more comfortable in expressing their own thoughts. Yet in this age group as adolescence and studying on their own, the habit of winning, such as the ability to think in the abstract, thinking freely and to express their own words is to know that they are capable of. Adolescence: it is described as having biological, psychological, social and cognitive development and maturation (Erikson, 1968; Trans. Gürçay, 2008). In addition, this work, with students and their ideas of value, aims to show the representation that it is important for adults.

Randomly selected five schools’ teachers and students profiles are as follows.

	Teacher		Student		
	Male	**Female**	**6. class**	**7. class**	**8. class**
	37	**34**	**143**	**156**	**113**
Total	**71**		**412**		

The study sample consists of 71 teachers (37 male, 34 female) and 412 students (143, 6^{th} grade students; 156, 7^{th} grade students; 113, 8^{th} grade students) for a total of 483 people.

5. Data Collection:

The nature of this study is a descriptive way to determine the status with "survey" or "screening" model. Scanning the past or currently existing models aim to describe a method to investigate the situation as it exists (Karasar, 1999; 77). Based on the principles of this method, topic and field have been selected for suitability of the research.

It is aimed especially to explain how to design the classroom in this study. However, teachers and students in the class think about editing a tool that measures these criteria. Literature was a gene for this purpose the researchers, teacher and students reviewed the literature on the classes' dynamics. They created a series of questions, and thanks to the information obtained from material brought into the scale of these questions and administered to students and teachers. Responses from teachers and students, the answers and then recovered, under Article 5 Likert scale consisting of 26 pieces of Font "Effective Classroom Building Scale" will have been held. At first, it is primarily a certain number of items of the scale for teachers (14 pieces) and students (51 units) were applied. The data obtained as a result of the Cronbach's Alpha was found as 0.711. Affective characteristics in determining the reliability of measurement instruments that measure the value of Cronbach's alpha is used, and 0.70's to be on the recommended (Şeker and Gençdoğan, 2006, 81). But four of scale through the scale, they were to the material results in the negative direction. After removal of these items from the 22-item scale, a new "Effective Classroom Building Questionnaire" was created and new Cronbach's alpha value was found to be 0767. The scale of the groove is applied.

Creating Effective Classroom Scale Development Phase KMO and Bartlett Tests

Kaiser-Meyer-Olkin Measurement of sample compliance		,663
Bartlett's Test		1311,642
Ki-kare	Df	539
	Sig.	,000

KMO sample relates to the suitability and appropriateness of the correlation between scale items. The value 0.60 is considered to be on the value (Ntoumanis, 2001, 240, Trans, Şeker, 2006). 0.663 is a value that is acceptable. KMO is high, statistically significant benefits in Bartlett's Test. The applicability of the test substances being higher and the correlation between both factors indicate a larger value.

The scale was administered to the population in this study. The scale is applied for 71 teachers, and elementary school teachers Karacasu being 51% of the district is located. The scale was applied in the same way stated above, the number of secondary school students studying in the District of Karacasu being 47.35% second grade students' constitute the population. It is rarely necessary to have more than 10% of the sample. If the study population sample of 1000 while the number of experienced researchers usually take 100 or so. If the universe, such as 5000 may be the lowest practical sample 100 or 10% of the universe can be a maximum of around 500. If the population is greater than 10,000 or a number of researchers experienced between 200 and 1000, a sample that runs. (Allreck and Settle, 1995; 62, Trans, Şeker, 2006; 73).

6. Results:

- Totally, 483 people participated in the survey. This is 14% of the respondents, 69 teachers, and the remaining 85%, 31 of the students.
- 91.54% of teachers believe that education is not appropriate for.
- 77.46% of teachers agree that the school's facilities are not sufficient to organize classes.
- 95.77% of participating teachers' class does not have color, light, heat based on factors such as physical attributes.
- As to editing classes in which teachers participated in the research, there is enough to complain about the material.
- Teachers did not have enough time to organize classes; even using the time of the output classes of the school stated that they were insufficient to address this problem.
- Teachers processing in a classroom course projector, computer, internet, overhead and so on reported not having such facilities. In fact, 63.38% of teachers participating in the survey "I did not have any of these facilities" they reported. This is the learning environment more visual, more technological tools

not to be equipped show the possibility of processing. In this case, that is the lower the quality of education.

- Classroom teachers make up the internal design of the very old tables or desks. They are preventing students from committing a comfortable course of the class. They reported that cleanliness has changed in the negative direction.
- 86.16% of the students' classes were not satisfied of which they have expressed. Moreover, this discontent was observed that the class rates were the higher. Because dissatisfaction with the situation where the 6th grade was 84.05%; 7th grade was 88.46% due to dissatisfaction with the situation; 8th grade was 93.80% of dissatisfaction with the situation.
- Classes of which the students surveyed were reported that most of the time they come reluctantly. The sentence of "We are willing to enter the courses" was rated 80.09% by the students in a scale "completely disagree" or "disagree" following the receipt. 5.09% rated the "undecided". This shows that the classes in which students have been participating are not satisfied. Already, the current class students who enter as reluctant were indifferent to teaching and training in classrooms.
- As for table-row and boards in classrooms, students complain about their being too old. Because 78.64% of the students said that "table-row or woods are old" in a scale by degrading "completely disagree" or "disagree" following the receipt. Also, students in times of opening and closing of schools are very hot out because of enough grades.
- Students surveyed "I love my school" phrase when asked about their thoughts about the school. 91.50 % of them graded "completely disagree" or "disagree" following the receipt.

7. Suggestions:

- It should be given enough opportunities to the school administration and teachers for organizing the school. The greatest shortcoming of this subject is not to be given funds to schools. The appropriation should be tried to be met by the school and by parent-teacher associations. However, this is quite insufficient for the needs of the school. Appropriation by the state schools should be separated immediately.
- State schools, classes are not able to meet the requirements of a new era for the arrangement of the conditions. Again, this issue should be increased opportunities for the school.
- The appropriate functioning of the classes must be taken when editing the program covering the course. For example, when editing the Social Studies Class, on the walls, tapes, maps should be placed in an appropriate and meaningful way. The student enters the class grade by drawing it. Subliminal messages in current class should be given to the student. Subliminal message: Subliminal message or else is a sign of an object that is embedded into the message. It stays under the limits of normal human perception that is designed to be less apparent at that time (http://tr.wikipedia.org/wiki/Subliminal_mesaj). It is required to allow the student to learn in the classroom.
- The biggest problems for students are their prejudices against the school or after-school coming from previous experiences.
- Lack of the economic situation should be arranged in the schools in terms of heat-temperature etc. Students coming to school should be happy that there can be ready to receive the information provided for them.
- Upon willing to enter students in the class, they should be arranged according to age and interests. The best ones will hold classes on this subject. But teachers say that they do not have enough times. For this reason, teachers should try to devote more time to the students.
- According to the findings, the students are more discontent against the school by ageing. For this reason, apart from the schools, teachers and school administrators should work in accordance with the regulations of the age required desires of students. Here, again, in order to increase opportunities for the school, the school should be given more funds by the state.

As a result of the findings from this study, we gave some suggestions. As, however, although teachers and administrators take place in the organization for doing their best if they had wanted to do everything with their power, the biggest problem faced by them is not to be appropriated enough funds. So, teachers could not change the school and make innovation on school system. Accordingly, students do not get interested to the school and to lessons. For this reason, these issues urgently need to be taken into consideration as a precaution.

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24/06/1973 Tarih ve 14574 Sayılı Milli Eğitim Temel Kanunu Madde 1.

THE IGNORED CONCEPT ON DEVELOPMENT OF EDUCATIONAL INFORMATION TECHNOLOGY

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Abstract

On the surface, educational information technology (EIT) is progress with more and fantastic functions. But what factors motivate students to use EIT more was not clear enough. The research utilized technology acceptance model, easy to use as the hygiene factor of use and perceived usefulness and perceived enjoyment as the motivators of retain, to test the influencing variables of acceptance of EIT. The results indicated that pedagogic design and community were two motivators while functionality and interface design were two hygiene factors in EIT acceptance. The authors suggested that the development of EIT better considered the possibility of value added to pedagogic and community by functionality and interface design.

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Keyword: Technology acceptance model; Two- factors theory; Perceived usefulness; Perceived enjoyment

Introduction

eLearning is acclaimed as enabling education that is more accessible, effective and efficient (Mark Nichols, 2004). They employ new pedagogic strategies and different students' assessment of the learning (Swan, 2004). Websites are capable of providing a richer degree of knowledge and multimedia content, which is particularly in self-learning through fluent Web material and collaborative learning with a virtual community. With potentials, what is the focus of the future development of educational information technology (EIT) will be? Previous researches indicated that the attitudes and perceptions which students hold toward their learning experiences become increasingly important hints in the growth of eLearning system(Chao, Saj, Tessier, 2006).

For understanding user attitudes and perceptions of eLearning usage, two popular theories in information technology acceptance may be useful. One is the Technology Acceptance Model (TAM) which explored the intentional usage of new information technology by beliefs of easy to use and perceived usefulness (Davis, Bagozzi, Warshaw, 2002). The factor of perceived enjoyment played a key role in the Extended TAM due to the importance of leisureliness in online usage and students' ability to cultivate their learning experience (Heijden, 2003).

The other is Herzberg's motivation-hygiene theory. It suggested that motivation factors and hygiene factors are two different sets of factors that influence web usage. Without satisfying of hygiene factor, users would not try to use a web site while with the more satisfying on motivation factors, users would stay the longer in a web site. (Wu, Chuang, and Chen, 2008).

To apply the above two theory in eLearning, What factors would influence students' attitude and belief still in investigation. The comprehensive measurements – Website Quality, which has long progressed from SERQUAL (Parasuraman, Zeitham, and Berry, 1988), and information system quality measurement – may be suitable for external variables of the Extended TAM. Therefore, in this study we validate the relationships among students' perceptions, beliefs, attitude, and usage toward eLearning. We try to figure out, particularly from students' point of view, what are the hygiene factors and motivation factors for e-learning system acceptance.

Literature Review

The Students' Attitude Toward the E-Learning System Acceptance

In order to predict and explain user acceptance of information technology, the TAM was a very simple but effective model . It suggested that external variables would influence one's beliefs, attitudes and intentions regarding an information system. In the model, two beliefs – "perceived usefulness" and "perceived ease to use" – were found to be positively related to the usage. Perceived usefulness was defined as "the degree of one's job performance that would be improved by a specific system." Perceived ease to use was defined as "the degree of lack of difficulty in using a specific system" (Davis, Bagozzi & Warshaw, 2002). Besides extrinsic motivation, such as perceived usefulness, the intrinsic motivation of perceived enjoyment is defined as "all enjoyment generated from participating in the computer-based activity itself, independent of any other predictable result of the activity" (Prensky, 2001; Kiili, 2005). Since browsing behavior on Websites was being controlled more by the self-directed intentions of users," user enjoyment" was placed in the spotlight in current empirical studies (Johnson & Hignite, 2000).

External variables: Web-Site Quality for On-Line Course

External variables in TAM played important roles in the process of understanding the relationship between internal beliefs, attitudes and intentions (Davis, Bagozzi & Warshaw, 2002). To evaluate the effectiveness of or students' satisfaction with information technology products in particular learning contexts, researchers suggested that three other factors – the student's background, pedagogic, and content presentation – should be considered together (Chao, Saj & Tessier, 2006). In online learning, the system functions that enhance flexibility and interaction as well as learning materials, indeed also influence perceived usefulness (Parasuraman, Zeitham & Berry, 1988). "Perceived visual attractiveness" is positively related to perceived usefulness, perceived ease to use and perceived enjoyment (Heijden, 2003).

Ample research states that Website quality influences users' perception of effectiveness (Kim, Shaw & Schneider, 2003). The factors that determine the quality of e-commerce Websites include information content, content reliability, Website attractiveness, navigation, speed, security, and customer service (Kim, Shaw & Schneider, 2003). Another body of research on Website quality did not originate from studies on the quality of information systems, but from PZB measurement (SERQUAL). SERQUAL contains five dimensions: physic, service reliability, responsiveness, assurance, and sympathy (Parasuraman, Zeitham & Berry, 1988).

Herzberg's Two-factors theory

Herzberg's two-factor theory (1959), also known as Hygiene-Motivation theory, has been a long standing component in motivation-related research and has been used to explain such motivation-related problems as why consumers who do not dislike an item are not necessarily motivated to purchase that item, and in regards to web site design is suitable for understanding why users who do not dislike a web site may not be inclined to revisit. At its heart, Herzberg's two-factor theory proposes that Hygiene factors are those things we "expect" to be in place. When they are there, we almost take them for granted. When they are not present, they become demotivational. Motivational factors are those things that will encourage us to work harder, longer, smarter etc(Herzberg, 1987).

The validation and verification of this dual structured model of motivation has not been easy - some subsequent studies support it (e.g. Schwab & Cummings, 1970) while others have failed to replicate Herzberg's et al., findings (e. g. French, Metersky, Thaler & Trexler, 1973). Yet despite the criticism of Herzberg's et al. methodology, the two-factor theory has been widely used across different industries in areas such as, mapping work environment motivations or understanding product and service satisfaction factors (e.g. Tuten & August, 1998; Hendriks, 1999). In recent years, the two factor theory has also been applied to website design for understanding how to retain visitors and customers. Zhang and von Dran (2000) applied Herzberg's theory to study perceptions of users who were introduced to a site for the first time, and found there existed corresponding likes and dislikes similar to the hygiene and motivation classification of the Hygiene-Motivation theory. The research results of another group, Liang and Lai (2002), showed that external hygiene factors are basic requirements which determine whether consumers enter the e-market in the first place and that internal motivation factors play a key role in consumers' decision on electronic store choice. Wu, Chang and Chen (2008) validated that hygiene (external context-related) factors of search engines were more influential towards attracting new users to a first try, while the motivation (internal content-related) factors played a more important role in long-term user retention.

Herzberg's theory is of interest to eLearning because it provides important clues for practice (Nichols, 2004). The conceptual model presented in Herzberg's motivation-hygiene theory that distinguishes hygienic and motivational factors that affect job attitudes is applicable to analyzing learners' attitudes toward online training programs(Chyung, 2007). In our study, motivator factors included both intrinsic and extrinsic factors. The factors are based on a learner's ability to achieve and maintain a positive attitude towards e-learning system acceptance. The second set of factors were labeled hygiene factors. Hygiene factors may influence an individual's satisfaction level in their current e-learning systems but do not affect their motivation to learn.

Research Methodology

Framework and Hypotheses of Interaction Activated TAM on E-Learning

The research framework was adjusted from previous TAM and added an extra belief, perceived enjoyment to accommodate the application of e-learning (Heijden, 2003; Moon & Kim, 2001), as shown in Figure 1. The adjusted measurement of Website quality consisted of system functionality, interface design, pedagogic and content design, and community as external variables (Bagozzi & Yi, 1988; Barnes & Vidgen, 2003; Swan, 2004). Therefore it was hypothesized that:

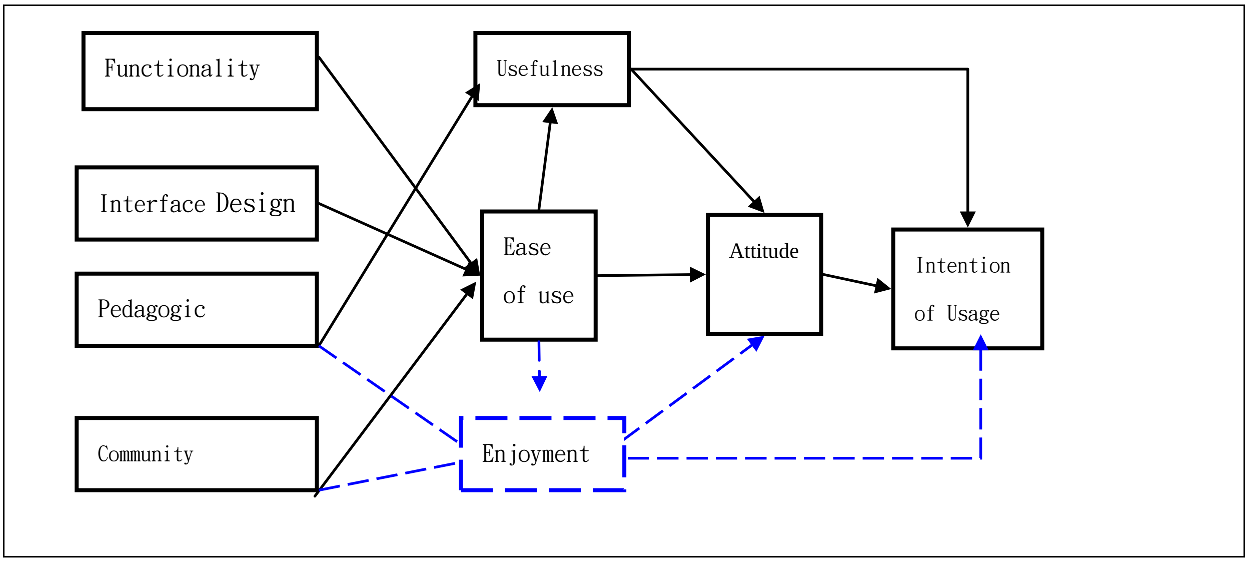

Fig. 1. Research Framework

H1: The system functionality will positively influence perceived ease to use.
H2: Interface design will positively influence perceived ease to use.
H3: Pedagogic and content will positively influence perceived usefulness.
H4: Pedagogic and content will positively influence perceived enjoyment.
H5: Community will positively influence perceived ease of use.
H6: Community will positively influence perceived enjoyment.
H7: Perceived ease of use will positively influence perceived usefulness.
H8: Perceived ease of use will positively influence attitude.
H9: Perceived usefulness will positively influence attitude.
H10: Perceived usefulness will positively influence intention of usage.
H11: Attitude will positively influence intention of usage.
H12: Perceived ease of use will positively influence perceived enjoyment.
H13: Perceived enjoyment will positively influence attitude.
H14: Perceived enjoyment will positively influence intention of usage.

Design of Questionnaire

Table 1. Reliability and validity of the questionnaire

Construction	Content of Item	Factor Loading	Extraction of	
System functionality	The Website is reliable	0.82	0.69	0.87
	Satisfied with the waiting time to connect	0.74		
	Links on the Website are working and correct	0.77		
Interface Design	The appearance of the Website is attractive	0.87	0.77	0.91
	The method of use is consistent	0.84		
	The interface design of the Website is consistent	0.90		
Pedagogic and content	The content is rich in quantity and quality	0.94	0.72	0.88
	The content is neither too easy nor too difficult	0.94		
	The content is clear and easy to read	0.85		
Community	Easy to get support from staff and classmate	0.88	0.67	0.86
	The facilities support peer interaction	0.87		
	The Website served as a learning community to me	0.88		
Perceived Ease to Use	It is easy to browse the Website	0.82	0.62	0.82
	It is easy to access to the Website	0.74		
	It is easy to search the materials in the Website	0.77		
Perceived Usefulness	The Website is useful	0.87	0.76	0.90
	The Website helps me learn more effectively	0.84		
	Using the Website improved my performance	0.90		
Perceived Enjoyment	Using the Website is an enjoyable experience	0.91	0.87	0.95
	Using the Website is a happy experience	0.96		
	Using the Website is an interesting experience	0.93		
Attitude	I like to use the Website	0.94	0.83	0.94
	I feel comfortable to learn with the Website	0.94		
	I have positive attitude toward using the Website	0.85		

The operation definition of the extended TAM was an adjusted version of the models of Lin & Lu (2000) and Davis (2003). The external variables of TAM in the study that measured Website quality were based on Swan's [19] suggestions and included system functionality (Barnes & Vidgen, 2003; Lin & Lu, 2000; Swan, 2004), interface design (Cox & Dale, 2002; Swan, 2004), pedagogic and content design (Swan, 2004), and community (Barnes & Vidgen, 2003). All items were measured using a seven-point Likert scale.

The reliability and validity of the measurement were tested through confirmation factor analyses using the Structural Equation Model. The confirmatory factor analyses were used for validity tests. According to the LAMBCA value calculated by the software LISREL, all items reported factor loadings greater than 0.7, indicating high validity (Table 1). The values of total extraction of variance were greater than 0.6 for each dimension (Table 1) – higher than the acceptable of level 0.5. This also indicated that the measurement was valid. Coefficients of internal consistency (Cronbach α) were greater than 0.8 (Table 1) for each of the dimensions, further indicating that these measurements are reliable.

Data Analyses

Sample Analyses

An online survey was conducted in a Taiwanese university. The subjects taking the survey were volunteer students who had taken at least one online course. The total valid sample was 451, 39% of which majored in business and 23.9% of which majored in social science. The majority were not new Internet users, as 72.5% reported having more than 3 years of online surfing experience.

Evaluation of the Model

Results from all three fit indexes of the Structural Equation Model were good, indicating that the extended TAM model is applicable to e-learning. The indexes are listed as follows:
Absolute Fit Measures: Absolute fitness could be measured through coefficient of RMSEA. The acceptable value is said to be either smaller than 0.06 (Hu & Bentler, 1999) or smaller then 0.08 (McDonald & Ho, 2002). The value of RMSEA in the study was 0.06. The absolute fitness could also be indicated by the value of SRMR, which should be smaller than 0.08 (Hu & Bentler, 1999). The value of RMSR in this study was 0.058.
Incremental Fit Measures: The common measurement is the value of CFI, which should be equal to or greater than 0.95 (Bentler, 1995). Other indicators are NFI or NNFI. Their values are always between 0 and 1. At the same time, the model cannot be considered as meeting the standards unless the value of NFI or NNFI is greater than 0.9 (Hu & Bentler, 1999). In this study, the value of CFI was 0.98, greater 0.95. Both the value of NNFI and NFI were 0.98, greater than 0.9.
Parsimonious Fit Measures: The number of estimates that fulfill a specific level of appropriateness for the model. The model was considered good if the value of PGFI was greater than 0.5(Mulaik, et. al., 1989). The value of PGFI in this study was 0.7.

Results of the Model

In Fig. 2, coefficients of the paths are demonstrated by the arrows, with t-values listed between the brackets. All t-values in Fig. 2 were greater than the value 1.96 at the significant level of 0.05, indicating that all null hypotheses were rejected. For example, for the Hypothesis 1, the coefficient of path =0.16 while t-value=2.51, implying that students who consider the e-learning system as more quickly accessible and more reliable will perceive the system as easier to use. The other hypotheses can also be proven according to their coefficients of path and t-values.

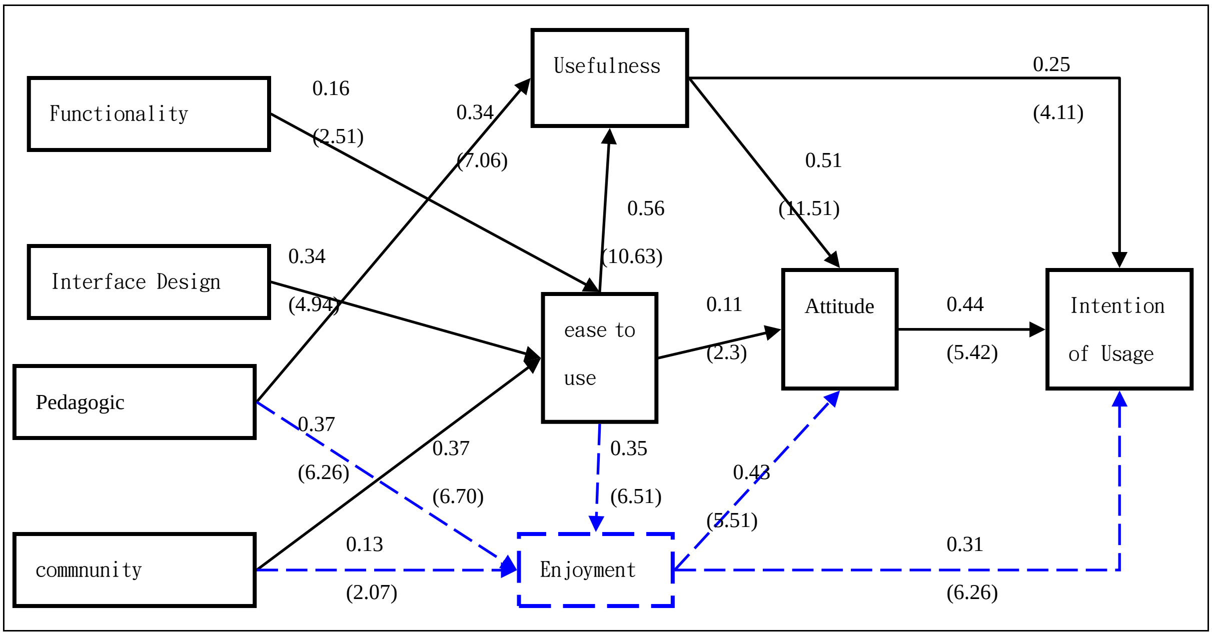

Fig. 2. Path Analyses

Discussions and Conclusions

The development of educational information technology (EIT) to date, from the technology standpoint, the function has been enough. But for teacher, they often not have enough knowledge to apply the functions properly to pedagogic design to get the synergy effect. The direction of EIT development should to create models of integrating functions and applications to help teachers feel that the EIT is easy to use and effective.

The research is an exploration of relationships between EIT and its application. The hypotheses and concept framework were established basing on the relationships between perceptions, motivations (beliefs), attitude and usage of extended TAM. And then the authors added the two(hygiene/motivation)-factored theory to classify the beliefs of TAM. Easy to use was considered as hygiene factor, students wouldn't use the eLearning system if they didn't believe they could know how to use it. Only the motivation factors: perceived usefulness and perceived enjoyment would motive students to stay relatively longer in the eLearning system.

According to the data analyses, we summarized the findings as follows:

(1) Because the values of model fitness testing were good, the researchers inferred that the conceptual framework (Fig. 1) could effectively explain that relationships between perception factors, motivation, attitude and usage.

(2) All three beliefs: easy to use, perceived usefulness, and perceived enjoyment showed significantly impact on students' willingness to use at .05 level (t value > 1.96), but only the last two beliefs still significant at more strict .01 level (t value > 2.54) (Fig. 2). The β values of three motivations (beliefs): easy to use, perceived usefulness, and perceived enjoyment, being 0.11, 0.51, and 0.43, also showed their degree of impact on students' attitude of willing to use. The researchers thus inferred belief on easy to use is the hygiene factor and beliefs on perceived usefulness and perceived enjoyment were two motivation factors of EIT usage.

(3) There were three factors of perception: functionality, interface design, and community, had significant impact on the belief of easy to use (Fig. 2). According to their β values of above three factors, the researchers concluded that interface design of the eLearning system (β = .34) and community (whether get enough support from staffs and classmates, β = .37) were more impact on students' belief of easy to use than functionality was(β = .16).

(4) Pedagogic design was the major factor to influence of two motivation factors: perceived usefulness and perceived enjoyment by t value greater than 254 at .01 significant level (t = 7.06 and 6.70 in Fig. 2). The researchers suggested that it is necessary to promote co-operate between the EIT and education personnel to create the effective models of applying EIT in pedagogic design.

(5) Community only impact of perceived enjoyment at .05 level (t value =2.07) not at .01 level. The target platform was a very popular e learning system in higher educational institution in Taiwan. It though owned good functionality and even owned too many functions to most of teachers. But the fact was it still was difficult to create the belief of perceived enjoyment. With the popularity of using learning community in Facebook, the authors suggested that the development of EIT can consider more responsive to the habit of Facebook usage, to make data exchange more easily between the E learning system and Facebook, to publish of announcements simultaneously in Facebook or to create learning community automatically in facebook.

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THE IMPACT OF Q&A FORUMS' LEVEL OF ELABORATION ON STUDENTS' LEARNING

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Abstract

Recently online discussion forums have become alternative information resources for student learning. This paper investigated the influences of the quality of online discussion forums on students' discussion behaviors and learning performance. The statistical results revealed that students would have better learning performance and more discussion behaviors when an elaborated online discussion forum was provided as a learning resource.

Keywords: Online discussion forum; learning resources; discussion behaviors; learning performance

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Introduction

The invention of new communication technologies and the Internet not only altered the way of people's communication but also varied educational metaphors (Ozad and Kutoglu, 2010). An obvious change of students' use of Internet was that they usually surfed the Internet for educational purpose (Ruzgar, 2005; Kirkwood, 2008). Ruzgar (2005) investigated 744 students' usage of the Internet and found that 58% of the participants used the Internet as a learning resource for their homework. Moreover, Kirkwood (2008) found that undergraduate students usually sought information from internet for their assignments or studies even although they were not requested to do so by their instructors. The literature disclosed that the Internet has become an important information provider for learners.

Among all the resources on the Internet, the forum was a kind of learning resource that students could easily reach (Sahin et al., 2010). For instance, a type of online discussion forum based on a question-answer format, such as Yahoo knowledge plus, has become a place for learners to share knowledge, seek advice, and gather information and opinions to resolve their questions (Adamic et al., 2008). Accordingly, a research conducted to explore the influence of online forums indicated that an online asynchronous discussion forum had a positive effect on students' knowledge gain (Baran and Keles, 2011).

The phenomenon that students' heavy use of information from online discussion forum attracted the researchers' attention; moreover, the results of previous studies triggered the researchers' curiosity about whether the influences of different online discussion forums on students' learning are the same. These questions led the researchers to set up an experiment to investigate the influences of the quality of online learning resources on students' learning performances and discussion behaviors. Hence, the purpose of this study is to explore whether the students behave and perform differently when different quality of online discussion forums were given to them as learning resources. By answering this question, people can realize the influences of online discussion forums used as learning resource on student learning, which, in turn, proper strategies can be developed to help learners.

The criteria for online discussion forums

For finding out different levels of qualities of online discussion forum which would be provided to the students and used as learning resource, it is necessary to have a set of evaluation criteria for selecting the distinct extents of online discussion forums. The criteria adopted in this study was "Indicators for evaluating online discussion forums" developed by Cheng et al. *(in press)* because this indicators could be used to identify whether an online discussion forum could attract users to continuously use it. Furthermore, the criteria were established based on

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social cognitive theory, therefore; the criteria considered all of the influences in learning activity including the personal influences, behavioral influences and environmental influences. The indicators were listed as below

- Personal influences: 1) Is the information-provider a professional in the field? 2) Do administrators manage the forum? 3) Do new members regularly join the forum? 4) Is the specific level of the members clearly labeled? 5) Is the knowledge domain of members clearly labeled?
- Behavioral influences: 1) Do answerers provide false statements? 2) Do members regularly update the database with new information? 3) Do members provide relevant information on the topic discussed? 4) Do members reply in an organized manner? 5) Do members conduct discussions in a polite manner?
- Environmental influences: 1) Is the information clear or not? 2) Is the reply a copy-paste or original knowledge from the information provider? 3) Is the reply informative? 4) Is the information rich? 5) Is an answer provided soon after posting the question?

These 15 indicators would be employed in filtering out elaborated (forum with satisfactory quality) or less elaborated online discussion forums (forum with unsatisfactory quality).

Methodology

Two online discussion forums provided to students as learning resources

Because Yahoo Knowledge plus and SoftKing have sub-branch of discussion about Internet resources application, the teacher considered both online discussion forums could be used as alternative learning resources for the students. Therefore, these two online discussion forums were selected by the instructor for the further classification.

Two experts from educational technology field were invited to classify these two online discussion forums by using the evaluation indicators. The indicators were first transformed into a six-point Likert's scale checklist (from strongly disagree=1 to strongly agree=6). The checklist has 16 questions among which there are two negative items and their grading score should be transformed (1➔6, 2➔5, 3➔4, 4➔3, 5➔2, 6➔1). The two scores of Yahoo Knowledge plus and SoftKing are 83 and 55, respectively. Therefore, in this study Yahoo knowledge plus forum was considered as a more elaborated learning resource, and SoftKing forum was viewed as a less elaborated learning resource.

The experiment and procedure

To investigate the influences of the quality of online discussion forums on student learning, the researcher performed an experiment applying a post-test with two classes. In addition to the classed-based discussion forum, one elaborated and one less elaborated online discussion forum selected according to the evaluation criterion was provided as learning resources for the students in class A and class B, respectively.

At the very beginning of the program, the instructor introduced the class-based discussion forum and the online learning resource (Yahoo Knowledge plus for class A and SoftKing for class B) to the students. And then, prior teaching each unit, students were asked to collect useful data from the assigned learning resource and posted their discussion and information they found on classed-based forum. During the class, the teacher introduced each unit and discussed one or two unsolved questions with students. Besides of joining the physical classes and online discussion, the students were required to complete a final project in the end of the semester.

The participants

Fifty two part-time students from Early Childhood Department of a university in northern Taiwan enrolled in the course, "Internet Resources Application" in 2010 fall semester have been selected as subjects. They were randomly divided into two classes by the department. Class A had twenty five students (age M=39.08, teaching experiences M=13.40 years, and score of Computer Application course M=89.98) and class B had twenty seven students (age M= 39.74, teaching experiences M=13.48 years, and score of Computer Application course M=89.69). These two classes were taught with same material by a same lecturer. However, each class was treated differently by giving different learning resources.

Data collection and analysis

During the experiment, several variables were collected, the score from the Computer Applications course, the scores for the projects that students produced, the number of students' login, questioning, and replying to others.

The score from the Computer Application course was used as a covariate, and the treatment (online discussion forums with different qualities) was considered as an independent variable, and the score from the project was used as dependent variables. ANCOVA was applied to determine whether there was a difference between class A and class B. Besides, the number of students' login, questioning, and replying were analyzed with T test to investigate the differences of students' learning behaviors in two groups.

Results

The system logs showed that students with the elaborated learning resource (class A) login the online discussion forum 1093 times and students with the less elaborated learning resource (class B) login their online discussion forum 809 times. Besides, the students in class A asked 118 questions and replied to others 199 times while the students in class B only asked 20 questions and replied to their classmates 95 times. Furthermore, in order to answer the question whether the students with the elaborated learning resource perform differently from those with the less elaborated learning resource, the students' final scores have to be compared. An ANCOVA test was then conducted to remove the dull effects of students' personal differences and examine if there is statistic differences between two classes. The summary of the results from ANCOVA test was shown in Table 1.

Table 1. Summary of ANCOVA test

Source	SS	df	MS	F	η^2
Covariate	82.37	1	82.37	14.62***	.23
Between	216.40	1	216.40	38.41***	.45
Error	270.43	48	5.63		
Overall	569.20	50			

* $p < .05$, ** $p < .01$, *** $p < .001$.

The average score of class A was M=92.40 (SD=2.16) while class B was M=88.26 (SD=3.02). The adjusted mean for two classes were 92.37 (class A) and 88.28 (class B). The ANCOVA test on students' performance in Internet Application class, using their Computer Application scores as the covariate, revealed a significant classes main effect, $F(1, 48) = 38.41$, $p=.000 < .001$, and the main effect of between classes reached statistic significance. It revealed that students with the elaborated online discussion forum performed higher than those with the less elaborated online discussion forum.

Discussions and conclusions

Among the applications in the Internet, online discussion forum was frequently used for educational purposes, and previous studies (Yukelturk, 2010; Liu, 2007) found that online discussion forum influenced students' learning outcome positively. However, it is not clearly stated whether online discussion forums with different qualities reach the same effects. Hence, in this study, the researchers conducted an experiment to explore the influences of the quality of online discussion forums on students' discussion behaviors and learning performance. The statistic results of the experiment revealed that students performed and behaved differently when different qualities of online discussion forums were provided as learning resources. The students with the elaborated online discussion forum login more to read others' postings, asked more questions, and were willing to answer others' questions. Besides, they also had better performance in their subject study.

In the study of Cheng et al. *(in press)*, 15 indicators which attract users' continuous using of online discussion forum were identified. By using these indicators, people can see that the selected less elaborated online discussion forum suffered several defects, including "Members do not regularly update the database with new information", "An answer is not provided soon after posting the question", etc. The lack of these crucial characters may explain why the students in class B had fewer numbers of login, questioning, and reply behaviors in the online discussion forum.

Several researches have been conducted to examine the influence of users' participation on their learning performance (Yukelturk, 2010) and indicated that active participation in online discussion has positive impacts on learners' performance. Since the students in class A participated in discussion actively than the those in class B, they performed better than their counterparts. Besides, because the elaborated online discussion forum provide more useful and complete information to the students, it is not surprising that they have superior learning outcome and that they would have more discussion issues generated from the content in the elaborated learning resource.

Numerous studies were conducted to investigate the role played by online discussion forum on students' learning. However, few of them discussed the impacts of the online discussion forum used as learning resources on students' learning performance and discussion behaviors. This paper contributed to the literature related to online discussion forum. More specifically, online discussion forums with different qualities would influence learners' discussion behaviors and learning performance. For further studies, it is recommended that researchers examine the influences of the quality of online discussion forums on students' posting qualities. Increasing the sample size, changing the learning subjects, and using alternative online discussion forums as learning resources are also worthy of researchers' consideration in their future studies.

Acknowledgements

The authors would like to thank the National Science Council of the Republic of China for financially supporting this research under contract nos. NSC 100-2631-S-008-001, NSC 100-2511-S-008-017-MY2, and NSC 100-2511-S-008-006-MY2.

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THE INNOVATIVENESS AND SELF-EFFICACY OF THE IPAD 2 HAS CONVINCED THE GOVERNMENT'S TOP ADMINISTRATORS OF ITS UTILITY IN REDUCING PAPER USAGE

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Abstract

Apple released the first iPad in 2010, and since then various operating systems have emerged. Many corporations have adopted the use of tablets in efforts toward organizational innovation. Innovation is the motivation for organizations to move forward and it is the key in the maintenance of their competitive advantage. The Environmental Protection Administration (EPA) started to use the iPad 2 in 2010. In subsequent years, they wrote a new operating system for an innovative plan to input all meeting materials into the system. The present study used a technology acceptance model (TAM), and its innovativeness, to elucidate the rationale for the use of the iPad 2 by top administrators (most of who were more than 50 years of age and were conditioned to having secretaries handle the work of document processing). We also investigated the factors that affect the use of the iPad 2 in a business-meeting setting, and the acceptance of the iPad 2 by EPA participants. The results of this study revealed the following points. 1.) Innovativeness and iPad self-efficacy had a significant positive influence on each participant's perceived usefulness (PU) and perceived ease of use (PEU) of the iPad 2, as well as on its usefulness in creating a paperless meeting environment. 2.) The PEU had a significant positive influence on participants' PU of the iPad 2 in creating a paperless meeting environment. 3.) PEU and PU had a positive influence on user satisfaction. 4.) User satisfaction had a positive influence on user's will to continue using the iPad.

Keywords: iPad 2; iPad self-efficacy; innovativeness; TAM

Introduction

Climate change has become one of the most stringent and severe international environmental topics of the 21st century. Taiwan as a newly industrialized country (NIC) and an effective party in the United Nations Framework Convention on Climate Change (UNFCC) is at a turning point in terms of development. In order to uphold Taiwan's competitive strength, the Environmental Protection眾, Administration's Executive Yuan, should draft a more constructive policy to reduce carbon dioxide emissions and to save energy. Programs for impact adjustment should also be planned. On January 25, 2010, Executive Yuan issued an official plan to promote the use of electronic official documents to reduce paper consumption and save energy in all government institutions. The most evident benefit from this plan would be a reduction in the quantity of paper used. Judging by the quantity of paper used by Executive Yuan's Research, Development and Evaluation Commission in the past years, the adoption of electronic official documents would significantly reduce the more than 80,000 sheets of paper used per year. There are approximately 8,000 government institutions from local to central with an estimated 30,000 official documents being processed each year. If these government institutions could adopt the electronic official document verification and start using networks for the issuing and approval of official documents, 9,000 trees could be saved. Executive Yuan of Taiwan later announced a regulation requesting government officers to use the iPad 2 as a tool for reducing the use of paper in administrative document processing.

In order to meet the requirements of the new regulation, the EPA started to promote the new policy and requested that top administrators use the iPad 2 at meetings and for all other forms of organizational communication from 2011 on. Eventually, those top administrators had to use the iPad 2 in order to receive, organize and deliver information. The nature of the use of this new technology by the middle-aged officers showed a preference towards relatively low-risk activities, and relatively simple lock-in opportunities (Lichtenstein & Williamson, 2006) to ensure efficient communication with others. The initial reason for use of the new technology might have been because it was a tenant of employment, but as the officers adopted the use of the iPad in their administrative jobs, the ability to perform fast information transactions anywhere, at any time, quickly became apparent. However, in using a new technological device, older adults often tend to report less comfort, lower efficacy, and less of a perception of control (Czaja et at., 2006; Morris & Venkatesh, 2000; Heart & Kalderon, 2011), and this reaction is likely to decrease innovation acceptance (Selwyn, Gorard, & Furlong, 2005; Selwyn, Gorard, Furlong, & Madden, 2003).

Thus, the motivation for this research lay in the differences in attitude that those top administrators had towards the innovation adoption constraint imposed by government policy. The present study was undertaken to understand the intent of top administrators toward the use of an iPad 2 and also the relative factors that affected the use of an iPad 2 at meetings based on the technology acceptance model (TAM); In other words, the acceptance of the iPad 2 was investigated in order to prove the TAM. Also, we investigated the differing behaviors in the use of the iPad 2, in order to explain user intent. We hope the research results provide insights on the experiences of top administrators as they attempted to apply a new technological innovation to Research, Development and Evaluation Commissions, and that these insights will provide concrete evidence and suggestions for the development of an official policy for electronic documentation.

Research Contents and Hypotheses

Apple released the first iPad in 2010, and it brought a new look to the tablet PC market. Users were to interact with the iPad via multi-touch display control — a new means of interaction with computers. Whether this new interaction method would add value to administrative work was something worth trying. Many of the alternative models which have been developed have included variables taken from the TAM in their structures, and the TAM seems to be particularly well-suited for use as the theoretical base for studying the influence of additional variables (Venkatesh & Bala, 2008).

Technology Acceptance Model

In order to achieve the purposes of promoting a new technological device, and taking into consideration the factors that affect acceptance of a new technological device, this study adapted Davis' (1989) technology acceptance model (TAM) to examine the participants' intent to use the new technological device. Davis' TAM was based on the theory of reasoned action (Ajzen, 1988; Fishbein & Ajzen, 1975) and was developed to provide a theoretical basis for determination of the external variables that affect users' internal beliefs, attitudes, and intent, thereby affecting users' information technology usage behavior.

Two motivational factors, PU and PEU, were the main factors that elicited an "attitude." Moreover, the PEU should indirectly impact both PU and user attitude. According to Davis (1989), PU means that users perceive the system as an enhancement for work efficiency. The PEU, however, means that the user perceives that the device being used enhances learning. TAM explains the user acceptance of a technology based on user perceptions (Davis, Bagozzi, & Warshaw, 1989). The mediating roles of PU and PEU are examined in the relationship between external variables and the intention of system usage. Both PU and PEU influence an individual's attitude toward use (ATU) of an information system. Attitude and PU, in turn, predict the individual's behavioral intention (BI) to use (Venkatesh & Bala, 2008). Davis (1989) also believed in different research applications, or when predicting or interpreting the acceptance of technology through different theories and studies, external variables should be elaborated on to expand discussion of the degree of acceptance. Therefore, when scholars adapted the TAM, they would normally omit the attitude variable in order to simplify it (Davis et al., 1992; Igbaria et al., 1996；Teo et al., 1999；Venkantesh and Davis, 2000; Teo 2001; Gefen et al., 2003), as shown in Figure 1.

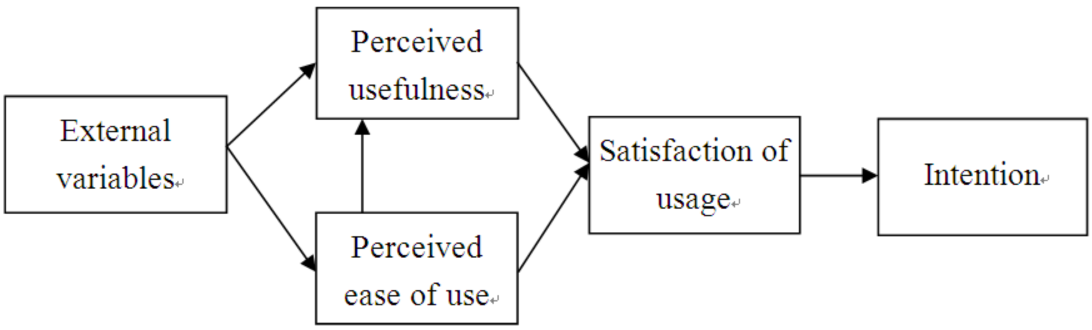

Fig. 1. Research model

Based on the above statements, we examined users' PU and PEU for the iPad 2, and we proposed a hypothesis for the relationship between innovativeness and iPad self-efficacy. We also probed the behavioral intent of top administrators at the EPA to use the iPad 2 in meetings.

Innovativeness

Innovativeness has to do with how early in the process of adoption of new ideas, practices, etc., that an individual or an organization is likely to accept a change. Rogers (1976, p.292) defined *innovation* as "an idea, practice or object perceived as new by an *individual* or other *relevant unit* of adoption." Adoption has been studied as a technology-related concept and is defined by Rogers (2002) as a behavior exhibited by individuals when they first put a new technology to use. With this perspective, the prerequisites of adoption — acceptance that is related to overwhelming complexity, innovation overloads, and difficult-to-learn interfaces of such products — may cause a change in the apprehensions of the user. Thus, the resistance to a new product, system or process. Personal innovativeness, or the tendency to accept innovations, is influenced by demographics, product experience and personal values, the perceived relative advantage of the innovation, perceived compatibility, complexity, observability and trial-ability, and additionally the social context and social norms of an organization (Woodside & Biemans, 2005). Dillon and Morris' (1998) stated i**nnovativeness** is driven by *utility*, the "technical capability of the tool," and by *usability*, "the extent to which users can exploit the utility of the system." As such, utility can be referred to as usefulness, and usability can be regarded as ease of use. Then, how the constructs of innovativeness affect the constructs of TAM would be a matter of realizing the acceptance of using iPad 2 as a tool to reduce the use of paper in document processing.

iPad self-efficacy (ISE)

The concept of self-efficacy, which comes from the Social Cognitive Theory, refers to the belief that one has the capability to perform a task (Bandura, 1997). Bandura (1986) defined it as “people’s judgment of their capabilities to organize and execute courses of action required to attain designated types of performances.” The nature of self-efficacy as a task-specific psychometric property is that it is measured directly (Cassidy & Eachus, 2002). Over the past decade, a number of studies have been focused on computer and Internet self-efficacy (Eastin & LaRose, 2000) and have been revised as technology has progressed. In order to be consistent with the “specificity” notion of self-efficacy theory, self-efficacy perceptions have involved beliefs about specific skills and abilities needed for a given behavioral performance (Bandura, 1986). In the present study to examine iPad usage by older individuals, the effect of self-efficacy beliefs which determine propensity and intensity of iPad use was examined, and positive beliefs were associated with early adoption, and increased use, of the iPad. For the new iPad, the present study used the term “iPad self-efficacy” as an extension of the TAM.

Research hypotheses and model

The research sample of the present study was selected from persons in high ranking positions who may not have used computers as often as youngsters or as lower-ranking persons; some of them may even have subordinates who operate computers for them. These high ranking officers seemed to have a high digital divide (Lenhart et al., 2003; Rice & Katz, 2003). Some studies have focused on the intention-to-use digital divide from a cognitive prospective, e.g., examining how new technology self-efficacy influences new technology use intent (Lam & Lee, 2005), others have examined the effects of innovation (Rogers, 2003) on bridging the digital gap (Zhao et al., 2010).

Bhattacherjee (2001) proposed the Information Systems Continuance Model (ISCM). This model is based on the individual behavior theory of Expectation–Confirmation and the TAM. The ISCM has been modified and used by a number of researchers and has been used to predict a user’s intention to continue to use a new information system (Ifinedo, 2006). DeLone and McLean’s (2003) ISCM suggested that there are three success dimensions that have causal relationships with user satisfaction and intention-to-use, which can ultimately allow net benefits to accrue. In this sense, the present study replaced "attitude-towards-use" with "satisfaction with usage (SU)" as the construct of success, and used innovation and iPad self-efficacy (ISE) as the external variables to form the research hypotheses as follows.

H1: PEU will have a positive effect on the PU of an iPad used for document processing.

H2: PEU will have a positive effect on the SU of an iPad used for document processing.

H3: PU will have a positive effect on the SU of an iPad used for document processing;

H4: PU will have a positive effect on the intention to use an iPad;

H5: SU usage will have a positive effect on the intention to use an iPad for document processing;

H6: Innovation will have a positive effect on the PU of an iPad used for document processing;

H7: Innovation will have a positive effect on the PEU of an iPad used for document processing;

H8: ISE will have a positive effect on the PU of an iPad used for document processing;

H9: ISE innovation will have a positive effect on the PEU of an iPad used for document processing

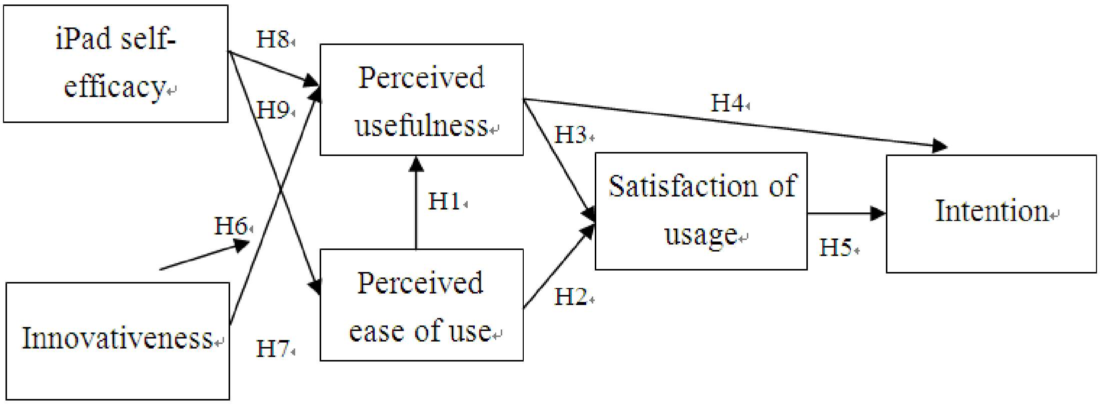

Fig. 2.

Research model

Research Design

2.5.1 Research participants

The present study targeted the top administrators attending meetings at the EPA. A total of 58 questionnaires were distributed and 42 were returned. After scanning, 2 incomplete questionnaires were discarded resulting in a total of 40 effective questionnaires, for a return rate of 68.96%. Descriptive statistics were performed on the valid questionnaires to analyze each variable. Among those valid returns, 83.3% were male and 16.7% were female. With respect to age distribution, 23.8 % were 50 years-of-age, and 76.2% were 55 years-of-age. With respect to the experience in using iPad 2 before replying to the questionnaire, 78.6% had no experience where 11.9% had more than a half year of experience in using iPad.

2.5.2 Research instruments

The present study used a questionnaire to survey "Innovativeness, and how the iPad 2 self-efficacy affects the intention and satisfaction of iPad use as a tool to process administrative documents," and a 5-point Likert-type scale was used to measure the perceptions of the participants. **The innovativeness** scale referred to Hurt, Joseph, and Cook's (1977) individual innovativeness scale which was designed to measure individuals' orientations toward change. Research has indicated that this orientation is associated with several **communication variables. For the purposes of this study,** 5 items were included: 1.) I would like to try all kinds of new inventions or new ideas; 2.) I would try to use new methods to sort things out; 3.) I could often think of different ways to solve difficult problems; 4.) My thinking and behavior are original; and, 5.) New concepts can trigger my creativity.

This study employed Compeau and Higgings' (1995) computer self-efficacy and Lam and Lee's (2005) Internet self-efficacy to define iPad self-efficacy, which included 5 items for this construct: 1.) I can use iPad 2 without any obstruction even when no one has taught me how to use it; 2.) I'm able to use iPad 2 if I have the user manual as a reference; 3.) I have confidence in utilizing all the functions on the iPad 2; 4.) I have the confidence to use iPad 2 if someone could demonstrate the operating methods briefly for me once; and, 5.) I have previous experience in using technology products similar to iPad 2, therefore, I have confidence in using it.

The TAM constructs used in the present study referred to David's (1989) TAM for items such as perceived usefulness, ease of use and behavioral intent. In addition, the present study employed satisfaction to replace the behavioral attitude that was used in DeLone and McLean's (2003) study. Thus, the sub-constructs in our TAM were as follows. Six items were included as determinants of PU, and three examples follow: "Using iPad 2 can enhance the efficiency of the document process"; "Using iPad 2 can promote job performance"; and, "Using iPad 2 can enhance the effectiveness of meetings." There were 5 items included in the PEU construct, and three examples follow: "The function of iPad 2 is easy to learn"; "The function of iPad 2 is easy to master"; and, "It is convenient for me to use iPad 2 for any occasion." There were five items included in the satisfaction of usage construct, and three examples follow: "I am satisfied with using iPad 2 as a document processing tool"; I am satisfied with the reduced rate of paper use by using iPad 2"; and, "I am satisfied with using iPad 2 as an organization communication tool." There were four items included in the BI construct, and three examples follow: "I will continue using iPad 2 as a document processing tool"; "I will continue using iPad 2 as an organization communication tool"; and, "I will recommend the use of iPad 2 as a document processing tool for all occasions."

Research Results

3.1. Reliability and validity

Factor analysis was conducted in this study, and the common factors were extracted from its principle components. The Kaiser normalized Varimax method was used to conduct shafts. The purpose of the factor analysis was to determine the "construct validity" of the questionnaires, in order to view the nature or concept of the dimensions and the concepts and quantify the explainable characteristics. According to Kaiser (1947), a KMO value higher than 0.7 means factor analysis is suitable. In the present study, all the KMO values were higher than 0.8, indicating the existence of common factors. A Cronbach's α was used to verify the internal consistency. Nunnally (1978) believes that a reliability coefficient α higher than 0.7 means the reliability is high. Since the α value was .954, and the respective analyzed dimensions were higher than 0.85, the validity and reliability were deemed acceptable.

Table 1 Cronbach α, Mean and SD

Constructs	Mean	SD	Cronbach's α
innovativeness	4.34	0.56	0.85
ISE	3.69	0.94	0.89
PU	4.11	0.68	0.95
PEU	4.24	0.61	0.87
SU of usage	4.35	0.58	0.85
BI	4.39	0.64	0.93

Correlation coefficient analysis

A Pearson Correlation was adopted to analyze the correlation among the above-listed constructs. Table 2 lists the relevant analysis of various dimensions of this research, and shows that most of the constructs were highly interrelated. We found that innovativeness was significantly correlated to PU (r=.541，p<.000) and PEU (r=.599，p<.000)，, and this indicated that the administrators with a high level of innovativeness perceived that iPad 2 was easy to use and useful for the processing of their documents.

In addition, to examine the correlation between ISE and PU, this study found a causal correlation (*r*=.693，*p*<.000) indicating that if the level of participants' ISE， was high, then the administrators were likely to perceive the usefulness of iPad2 would be high. ISE, however, was not significantly associated with PEU (*r*=.273，*p*<.080), which suggested that the function of operating the iPad2 might be easy to figure out even if the participants lacked sufficient confidence and competence. However, the satisfaction of usage was positively correlated to PU (*r*=.767，*p*<.000) and PEU(*r*=.827，*p*<.000); meanwhile, participants' iPad2 satisfaction of usage was positively associated with behavioral intention (*r*=.78，*p*<.000).

Table 2. Correlation coefficient analysis between constructs

Constructs	Innovativeness	ISE	PU	PEU	SU	BI
Innovativeness	1					
ISE	.178	1				
PU	.541**	.693**	1			
PEU	.599***	.273	.736***	1		
SU	.630***	.551***	.767***	.827***	1	
BI	.590***	.353*	.627***	.818***	.780***	1

Notes: *N*=42；two-tailed test; 2.* *p<0.05*; 3. ** *p<0.001*; 4. *** *p<0.000*

Path Analysis

For the present study, a multiple regression analysis was conducted using PU as a dependent variable and innovativeness and iPad self-efficacy as independent variables. The standardized regression coefficient β (Beta coefficient) for innovativeness and ISE to PU were .431 and .616, respectively, and were both significant. Another multiple regression analysis was conducted using PEU as the dependent variable with no change in the independent variables, and the standardized β coefficient for innovativeness and ISE also were significant at .569 and .172, respectively.

Satisfaction of usage was used as a dependent variable where the PU and PEU were used as independent variables. The standardized β coefficients were .346 and .572 for PU and PEU, respectively, and both were significant. Further analysis was conducted using behavioral intent as the dependent variable and satisfaction of usage as the independent variable. The β coefficient was significant at .57. Behavioral intent was kept as the dependent variable, but the independent variable was changed to PU, and the path diagram and β coefficients of the analysis are shown in Figure 3 below. According to the path analysis, results indicated that a higher ISE and/or innovativeness for administrators equated to a higher level of behavioral intent and satisfaction with respect to use of the iPad 2 for document processing, when mediated by PU (indirect effect value was 0. 19) and PEU (indirect effect value was 0.33).

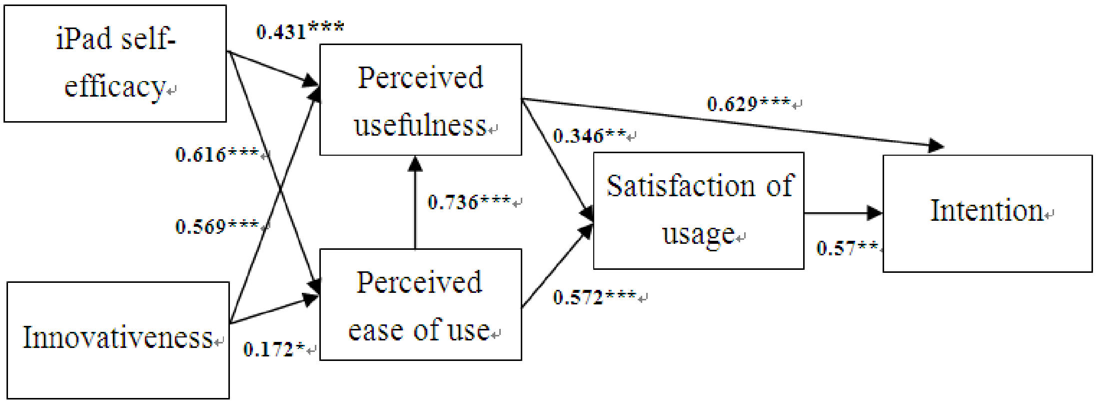

Fig. 3. Path analysis

Discussion

This research applied a revised TAM as the basic framework to examine how much the innovativeness of top administrators and the self-efficacy of the iPad would affect satisfaction and behavioral intent on the part of the administrators to use the iPad, and the analysis was mediated by perceived usefulness and ease of use. Consequently, the statistical results indicated most hypotheses were supported, except for the effect of ISE innovativeness on the perceived ease of use. A majority of the research participants were older than 55 years, and were assumed to have used the iPad 2 as a tool to reduce paper, so as to set an example for other top administrators in other governmental sections. Nevertheless, researchers found that older users tended to focus on benefit more than on cost (Melenhorst, Rogers, & Bouwhuis, 2006; Selwyn, Gorard, & Furlong, 2003). This evidence somewhat contradicted the common assertion that limited use of technology by older adults stems from low self-efficacy, computer anxiety, or technophobia — a negative attitude toward modern technology in general (Selwyn, 2004, 2006). The results of the present study were consistent with Selwyn's studies showing that a higher level of iPad self-efficacy led to a higher perception of usefulness and ease of use. This result also is supported by Agarwal and Prasad (1998), Gilly and Zeithaml (1985), and Zeithaml and Gilly (1987). In those studies, the results indicated that elderly users' patterns of acceptance towards adopting new technologies was governed by the fact that the elderly users were relatively unaware of the new technologies and had infrequent use of the technological products. Thus, the elderly users were among the last to adopt new technologies, and were less aware of retailing innovations.

However, the mean of ISE was 3.69, which was lower than either PU or PEU with means of 4.11 and 4.24, respectively. This result may be explained by participants who had experienced difficulties using other new devices, but their interaction with iPad had been more comfortable.

Conclusion

There are numerous factors that affect the use of a new technological device. In the present study, the TAM theory was adopted to elaborate on the discussion of innovativeness and iPad self-efficacy. Since the issue of new technologies has been widely discussed by researchers and others within the industry, different influential factors may be included in the discussion of user intent with respect to new technological devices. In order to enhance future use by other government sections, such as the ministry of education, which also includes the promotion of environment education, the results of the present study may be applied to encourage more top administrators to use iPad2 for their document processing.

Acknowledgement

We are grateful to those participants who took part in this research, and we thank the National Science Council of Taiwan for a grant to complete this survey (NSC 100-2511-S-003-022-).

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THE PERFORMANCE ON A COMPUTERIZED ATTENTION ASSESSMENT SYSTEM BETWEEN CHILDREN WITH AND WITHOUT LEARNING DISABILITIES

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Abstract

Attention is an essential function for children's learning. Cancellation tasks are one of most popular tools used for the assessment of visuospatial attention. A computerized cancellation test system was developed to investigate whether the children with or without learning disabilities (LD) would have different performances on cancellation tasks. The result showed that group differences regarding task performance are all significant and independent from types of stimulus and layout. Post hoc analysis of between-group effects showed that the control group had more correct responses (F = 28.177, p < .001), and spent less time (F = 5.592, p = .021) than the LD group.

Keywords: Computerized assessment; cancellation test; learning disabilities; visuospatial attention; selective attention.

Introduction

Various classification schemes have been used to define learning disabilities (LD), and they are mostly referred to have difficulties in the acquisition and use of academic skills resulted from central nervous system dysfunction (Semrud-Clikeman, 2005). Previous studies supported that comprehensive neurocognitive assessments can help determine the brain functions that are effective or with deficits for an individual's academic and daily life performance (Silver et al., 2008), and can make teachers and parents be aware of the individual's limitations for cognitive components to establish remediation strategies without re-addressing their inadequacies. Among the cognitive abilities, visual attention deficits have been widely documented in children with LD, and may interfere with the effectiveness of a remediation program (Copeland & Reiner, 1984; Richards, Samuels, Turnure, & Ysseldyke, 1990).

Attention is an essential function for children's learning, and it is also concerned mostly by parents and teachers for their children with learning or behavior problems (Ek et al., 2004). Visual attention is how one focuses attention on the specific targets in spite of distractions surrounded in the visual scene. Children with LD may have visual attention problems that exacerbated their management of visual materials during the academic learning. The encoding of reading materials may be hampered by inefficient processing of visual information. Research reports suggested children with LD, compared with the normal cohorts, showed impaired performance in both speed and capacity of information processing, such as slower response time and more response errors (Aman & Turbott, 1986; Casco & Prunetti, 1996; Casco, Tressoldi, & Dellantonio, 1998; Lockwood, Marcotte, & Stern, 2001; Vidyasagar & Pammer, 1999; Williams, Brannan, & Lartigue, 1987). Casco, Tressoldi, and Dellantonio (1998) found that poor reading ability is associated with higher visual error in the cancellation task, indicating the role of selective attention in reading performance. Therefore, this study would explore how is the effect of visual display organization for the visual attention function in children with or without LD.

Cancellation tests have been frequently used to examine selective attention as well as visual search abilities (Copeland & Reiner, 1984; Weintraub & Mesulam, 1988). Performance on cancellation tests gives information about how one attends to and explores the external environment (Wang, Huang, & Huang, 2006). The search path represents the visual search trajectory that an individual shifts his or her attention to locate the target. Some studies (Byrd, Touradji, Tang, & Manly, 2004; Geldmacher, Fritsch, & Riedel, 2000; Lowery, Ragland, Gur, Gur, & Moberg, 2004; Uttl & Pilkenton-Taylor, 2001) have acknowledged the utility of cancellation tasks in children with LD. Re-examination for the relationships between visual search pattern and performance parameters, as well as the visuospatial performance on target detection would provide an understanding of how children with LD attend to the reading layout.

In this study, a computer-assisted tool was used as the same computer-assisted testing procedure in Wang, Huang, and Huang (2006) but varied in the stimulus characteristics: symbols and Chinese-radical, to study whether the children with or without LD would have different performances on these two cancellation tasks, and whether the Chinese cancellation tasks would be more difficult than symbol ones for both groups to process.

Methods

Subjects

A total of 36 children with learning disabilities (25 boys [69.4%] and 11 girls [30.6%]) was recruited from an education project. Children with LD had been screened by local Education Bureau and gone through an evaluation protocol including WISC-III, Word recognition, reading comprehension tests, as well as class teacher observations. For this LD group, the mean age was 9.8 ±1.10 years, the mean IQ was 90.63 ±5.28, and the mean reading age was 8.34 ± 0.88.

An age-matched comparison group consisted of 42 children with no learning disabilities (NLD), 28 boys (66.7%) and 14 girls (33.3%). Participants in both groups did not have any neurological disease, physical illness, or visual or motor problems.

Apparatus and stimuli

In this study, 2 cancellation forms (symbol and Chinese-radical) with 2 test layouts (structured and random organized) were administered with computerized testing procedures by the Computer-Assisted Cancellation Test System (CACTS; Wang, Huang, & Huang, 2006). The CACTS was established on a tablet PC sized 9'×12' with a stylus pen for data input. Symbol form was reconstructed from Muslam's symbol cancellation task (1985) and consists of 52 different symbolic figures such as"☼" and "●". The Chinese form is a parallel form from the symbol cancellation and was designed by Wang et al. (2006). It composed of 26 traditional Chinese radicals which was used on the keyboard for Chinese typing, such as "日" and "工". Radicals are the basic components of Chinese characters (also called *Han characters*). Every Chinese character is composed of one or more radicals, and radicals themselves are meaningful and readable characters.

To avoid any issues caused by the complexity of language cognition, the Chinese radicals is used instead of Chinese characters as stimulus materials. The target on the symbol test was set as "✵" and the target on the Chinese-radical test was the radical "日" (meaning "sun"). Targets or distractors were presented in 24-point font. Set size was fixed at 374 items, presented at fixed locations in a 17 x 22 matrix for the structured layout. The experiment display contains 60 targets (15 targets in each quadrant) and 314 distractors scattered on the display. For the structured layout, the spacing of any two adjacent stimuli in a row or column was equivalent, but for the random layout, the spacing of any two adjacent stimuli varied. When a subject uses the stylus pen pointing onto the target shown on the screen, the CACTS automatically crossed it out with a blue cross sign and synchronously recorded the outcome data (time-stamped x- and y- coordinates) with temporal order in the database.

Procedure

Each subject was given detailed instructions and 3 practice trials until the subject felt ready for the test. Time was not limited but subjects were instructed to complete the test as fast as possible without sacrificing accuracy. When finished, subjects could press any key on the keyboard to terminate the trial. Normally, each experiment took less than 5 minutes to complete and each subject should have been able to finish all four trials within 20 minutes. Both groups were given tests by the order of symbol in structured and random layouts, then Chinese radical in structured and random layouts. The tablet was placed in front of the subject with 15 degree tilt and a distance of 20 cm from the edge of the table. Movement of head and eyes were not restricted.

Data collection and analysis

Multivariate analysis of variance (MANOVA) was used to examine the effects of group, stimulus (symbols and Chinese-radicals), and layouts (random and structured layouts) on the spatial and temporal parameters. The dependent variables were the number of correctness, task completion-time and total length of search path.

Results

There was no gender difference between the two groups (X^2 = .281, *df* = 1, *p* = .596). The descriptive data of each form for both groups were shown in Table 1. There were one between-subject factor (group) and two within-subject factors (stimulus and layout). Multivariate analysis showed that there were significant main effects of group [$F(3, 74)$ = 12.532, *Wilk's lamba* = .663, $p < .001$]; stimulus [$F(3, 74)$ = 10.132, *Wilk's lamba* = .709, $p < .001$], layout [$F(3, 74)$ = 61.748, *Wilk's lamba* = .285, $p < .001$], and a significant interactions of stimulus by layout [$F(3, 74)$ = 10.340, *Wilk's lamba* = .705, $p < .001$]. The interactions of group by stimulus, group by layout, and group by stimulus by layout were not significant. That is, group differences regarding task performance (i.e., correctness, completion time, and search path) are all significant and independent from types of stimulus and layout. Post hoc analysis of between-group effects showed that the NLD group had more correct responses (F = 28.177, $p < .001$), and spent less time (F = 5.592, p = .021) than the LD group. However, there is no difference between LD and NLD groups in the search-path length (F = 0.010, p = .921).

Table 1. Descriptive data for each form and group comparisons

	Symbol-R Mean(SD)	Symbol-S Mean(SD)	Chinese-R Mean(SD)	Chinese-S Mean(SD)	Group Mean(SE)	Between group comparison		
						Mean Square	*F*	*Sig.*
Correctness								
LD	54.3(6.3)	54.3(6.1)	53.8(6.1)	54.3(6.3)	54.1(.60)	1469.361	28.177	<.001*
NLD	58.7(2.9)	58.8(1.6)	58.1(2.1)	58.4(1.8)	58.5(.55)			
Completion time (sec.)								
LD	170.8(48.7)	197.4(59.0)	203.9(72.1)	171.7(41.7)	186.0(6.62)	35297.71	5.592	.021*
NLD	153.5(61.6)	170.1(45.9)	177.9(46.6)	156.9(40.2)	164.6(6.13)			
Search path (cm)								
LD	303.1(42.4)	412.7(103.3)	333.6(76.8)	438.5(90.3)	372.0(8.14)	94.99	0.010	.921
NLD	298.7(44.0)	395.0(114.0)	338.1(61.1)	460.4(72.0)	373.1(7.53)			

Note: R = Random, S = Structured, LD = Learning Disability, NLD = Non-Learning Disability; * $p < .05$

Group effect was examined for the test performance for post hoc analysis. The results showed that only correctness of all tests showed significance (*p's* < .001). Time was not a significant factor. LD group used more searching path on both symbol forms (random: p = .002; structured: p = .015).

The repeated one way ANOVA was used in each group to examine the test performance in terms of correctness, time, and searching path on different forms. Both groups showed equally correctness across the 4 forms (*p's* > .05). That is, Chinese or symbol form did not affect the correctness of test (See Table 2). Searching path was greater in structured than random form, and greater in Chinese form than symbol form. For NLD group, searching path from the longest to the shortest for different forms are the Chinese structured form, symbol structured form, Chinese random form, and then symbol random form with all significant differences (*p*'s ≤ .005). The LD group had the same order for searching path and with significance except for the two structure forms (p = .399). Longer searching path did not associated with longer completion time. For completion time, both group spent the longer in the Chinese random form, and the shorter in the Chinese structured and symbol random forms.

Discussions

The purpose of this study was to explore the performance of visuospatial attention, and comparison of search strategies for the LD and NLD groups. This study employed two different stimulus paradigms, verbal (Chinese-letter) and non-verbal (symbol) forms with two layouts (structured and random array), to examine the relationship between efficiency of visuospatial attention and search patterns. The NLD group outperformed the LD group in correctness in all of cancellation tasks. Though they used less completion time but that was not at a significant level. Whether in different forms (Chinese or symbol) or layouts (random or structured), the children in the LD group achieved around 90% of the correct score of the children in the NLD group, but they spent about 10% longer time than the children in NLD group did, for example, (54.3 vs.59.8) for correctness and (170.87 vs. 153.51) for completion time in symbol cancellation with random forms between the LD group and NLD group (See Table 1). This result revealed that the children in the LD group may have problems in visual selective attention regardless whether the stimulus is with verbal component. The LD group did not perform better in symbol than Chinese form was consisted with previous studies by Roach and Hogben (2004). Some studies suggested the attentional deficit in dyslexia was resulted from the dysfunction of magnocellular system and therefore these children may have shown difficulties in verbal content processing (Facoetti et al., 2003). Roach and Hogben (2004) compared performance on a visual search task and performance on the tasks targeted for magnocellular function in dyslexics. However, they found the dyslexics had poor performance in visual search tasks, but good in "magnocellular" tasks. The results suggested a poor attention problem during the task performance and that possibly contributes to deficiency in magnocellular functioning in the dyslexics. Working slower on the cancellation tasks in this study maybe a compensation for their visual perception problem (though not efficient), or it may represent another problem of visual attention shift (Posner & Rafal, 1987).

Table 2. Between group comparison for significant parameters: correctness and time

	Layout	Mean Square	F	P
Correctness				
Symbol	Random	389.09	16.91	< .001*
	Structured	392.54	20.98	< .001*
Chinese	Random	364.00	18.43	< .001*
	Structured	325.73	16.20	< .001*
Time (sec.)				
Symbol	Random	5843.16	1.86	.177
	Structured	14406.28	5.25	.025*
Chinese	Random	13021.41	3.65	.060
	Structured	4247.85	2.54	.115

$^{*}p < .05$

The experimental result also found the visuospatial attention performance of both group was independent from the stimulus presented. There were no difference of the correctness among different stimulus forms. The LD group performed both forms with the same difficulty as indicated by lower correct scores than the NLD group. The LD group also showed larger within-group variation than the NLD group, and it may indicate the LD group had a bigger discrepancy in visual selective attention among LD children.

With respect to the completion time of cancellation tasks, both groups spent more time in Chinese cancellation with random layout, and symbol random form and Chinese structured form were easier to complete in terms of time. The reason for that may be cognitive habit involved in search strategy. That is, stimulus types which are related to the cognitive habit will affect attention processing capacity (i.e., processing speed). When the target is a Chinese-radical stimulus, the participants (both LD and NLD groups) will recognize the stimulus as verbal words, which are usually read in a structured layout (a vertical or horizontal layout). Therefore, the participants will spend more time in Chinese-radical with the random layout than that with the structured layout. In contrast, when the participants search for a symbol stimulus, they may see symbol stimulus as a general graph, which did not involve any verbal context. The participants will employ another strategy (i.e., search for the closer target) to do target searching. As a result, participants spent less time on the target searching on the task with the random layout. This finding suggested that the processing of selective attention can be fast and efficient on a cancellation task when the participants combine their reading habits (cognitive encoding) as their visual search strategies even though different types of stimuli given in the task.

Conclusions

In this paper, a computer-assisted testing tool, called CACTS, was used to investigate whether children with or without LD had different task performances on cancellation task. The results showed that children with LD had poorer task correctness and their performance patterns generally were similar to the NLD group regardless of form structures. The results indicated a deficit in selective attention rather than verbal selection in the LD group.

Acknowledgements

This work was partially supported by the National Science Council under the Grants NSC100-2511-S-006-005-MY2.

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THE RELATIONSHIP BETWEEN SOCIAL SUPPORTS AND INTERNET ENTREPRENEURIAL INTENTION OF ONLINE STORE OWNERS IN TAIWAN

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Abstract

Online shopping is a form of electronic commerce whereby consumers directly buy goods or services from a seller over the Internet. This study aims to investigate the relationship between entrepreneurs' experiences of accessing social supports and Internet entrepreneurial intention of online store owners in Taiwan. Specifically, the web survey conducted for the present study randomly selected respondents who were members of online store owners. A mix of web-based and mail surveys was carried out on the sample. A total of 281 responses were received, among which 112 were mail responses (39.9%) and 169 were web responses (60.1%), which constitutes a response rate of 64%. The data were analyzed using descriptive statistics, the Pearson correlation coefficients, and structural equation modeling. The results indicate that there is a strong positive relationship between social supports and Internet entrepreneurial intention. Online store owners with greater support have shown better Internet entrepreneurial intention. The research finding implications for educators are also provided.

Keywords: social supports, Internet entrepreneurial intention, online store owners

Introduction

Internet businesses, or e-commerce, have become the fastest and most successful means for entrepreneurs to sell their products online. As the use of information technology increases in business, a shift from the offline business marketing world to the Internet business world has also been occurring. Though traditional entrepreneurs may be similar to Internet entrepreneurs in many ways, the key difference between the two is that Internet entrepreneurs have strong business skills. With the Internet, many entrepreneurs can sell products and services online, and Internet business opportunities have become increasingly popular for them. Therefore, with such opportunities available, it is important to encourage young adults to take up the challenge of starting their own businesses (Moi, Adeline & Dyana, 2011).

Internet Entrepreneurial intention was not investigated by the relevant studies. Colombo and Delmastro (2001) found that many Internet entrepreneurs see themselves as being younger and less experienced than a businessman with less education in technical domains and who is highly market oriented. In the past, Entrepreneurial intention has been an important issue in educational research. Entrepreneurial intentions can be described as a primary predictor for a future entrepreneur (Katz, 1988; Reynolds, 1995; Krueger et al., 2000). Katz and Gartner (1988) define entrepreneurial intention as the search for information that can be used to help fulfill the goal of venture creation. Henley (2007) indicates entrepreneurship as an intentional activity, in that for many, those intentions are formed for the purpose of enhancing a link between entrepreneurship and intention.

Entrepreneurs cannot succeed alone, they need outside support. The role of social supports may shape the entrepreneurial process and outcomes. Social networks include all the people connected by any kind of relationship (Aldrich & Zimmer, 1986) and can refer to venture capital, suppliers, facilities, clients, etc. (Reynolds, 1991). This means that the beliefs of relevant groups and actors, such as family, friends, colleagues

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and customers, will affect the intentions of the entrepreneur as well (Davidson, 1991). Vasiliadis and Poulios (2007) found that family and friends are important for graduates because with help from family resources, they do not use bank loans.

However, only a few empirical studies have focused on the link between social support and entrepreneurial intention (Autio, et al., 2001; Turker & Selcuk, 2009). Results of these studies revealed that social supports have a significant relationship with their entrepreneurial intention (Autio, et al., 2001; Turker & Selcuk, 2009). Among these relevant studies, entrepreneurial intentions have been investigated, but Internet entrepreneurial intention is a relatively new issue for researchers. Hence, the current study also investigated the relationship between entrepreneurs' experiences of accessing social supports and Internet entrepreneurial intention of online store owners in Taiwan. In this study, a model that mainly focuses on the impacts of some contextual factors was proposed and empirically tested on a sample of 281 online store owners. Therefore, the objectives of the study include:

To identify the effect of different types of social supports on Internet entrepreneurial intention of online store owners.

To explore the relationships of different types of social supports and Internet entrepreneurial intention of online store owners.

Literature Review

Social Support

Social support is described in terms of its type, function, and source (Weaver, 2000). Support and encouragement from family members, relatives and friends have been shown to be associated with the development of entrepreneurs (Baughn et al., 2006; Davidson & Honig, 2003). In the entrepreneurship literature, several studies found no significant direct relationship between social supports and entrepreneurial intention. Almobaireek and Manolova's (2012) have investigated the influence of perceived desirability, social support and behavioral control on the entrepreneurial intention of Saudi university youth and found that the entrepreneurial behavior has no significant effect on social support. However, Shiri, Mohammadi and Hosseini (2012) tested the model on a sample of 100 agricultural students and found social supports have a significant and positive influence on entrepreneurial intention of individuals.

Internet Entrepreneurial Intention

The definition of an Internet entrepreneur is an owner or manager of an Internet based business enterprise who makes money through risk and/or initiative (Radoff, 2009). Entrepreneurship is recognized as an intentional process. The definition of entrepreneurial intention can be defined as "a state of mind directing a person's attention toward a specific object or a path in order to achieve something" (Vesalainen & Pihkala, 1999). A strong intention should eventually result in an attempt to start a new business, even though immediate circumstance may cause delay (Singh, Prasad, Mumbai, & Raut, 2012). Chou and Wang (2009) find that the intention to become an entrepreneur has been described as the single best predictor of entrepreneurial behavior.

Social Support and Internet Entrepreneurial Intention

The aim of this paper is to examine the factors of social support and Internet entrepreneurial intention. This study categorized social supports into three dimensions: perceived family support, perceived friend support, and perceived significant other support (Zimet, Dahlem, Zimet & Farley, 1998). Therefore, based on previous research, this study proposed a structural model to analyze social supports and Internet Entrepreneurial intention of online store owners, which is shown in Figure 1.

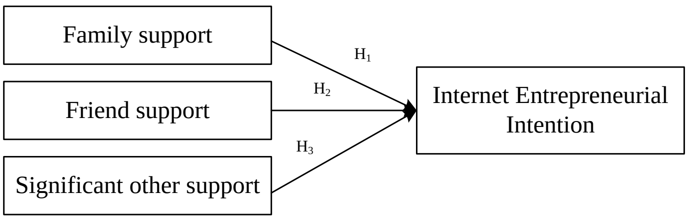

Figure 1. Theoretical framework and hypotheses

The first dimension of the model is perceived family support. In the previous studies, family background has been taken into account as a factor affecting entrepreneurial intention. The first model explaining family influence on forming entrepreneurial intention is family support. For instance, the study of Henderson and Robertson (2000) showed that family was the influencing factor for choosing an entrepreneurial career for the respondents. Previous studies found that the father is the most significant role model in the family to influence the students' desire to own a business (Van Auken et al., 2006). Therefore, based on the above discussion, it is hypothesized that:

H_1: Perceived family support is related to Internet entrepreneurial intention.

The second dimension of the model is perceived friend support. A previous study revealed that friend support is another one of the factors influence entrepreneurial intention. In Hamidi, Wennberg and Berglund's (2008) study, they found that their students are more likely to consider starting their own business in the future if they have relatives or close friends with entrepreneurial experience.

H_2: Perceived friend support is related to Internet entrepreneurial intention.

The third dimension of the model is perceived significant other support. In fact, Dyer (1992) suggests that an individual whose family is not supportive can become discouraged and ultimately not proceed with starting a business. In general, the more support one receives from significant others, the greater the likelihood of an entrepreneurial intent.

H_3: Perceived significant other support is related to Internet entrepreneurial intention.

Method

Participants

The participants of this study were comprised of Internet entrepreneurs from online stores. A total of 281 participants responded, among which 112 were mail responses (39.9%) and 169 were web responses (60.1%), which constitutes a response rate of 64%. Table 1 presents the demographic profile of the sample population, of which 117 (35.9%) were males and 209 (64.1%) were females. The ages of the participants were 75 (26.7%) between 18~24 years, 98 (34.9%) between 25~30 years, 65 (23.1%) between 31~40 years, and 43 (15.3%) 41 years and above. In terms of marital status, 165 (58.8%) were single, and 116 (41.2%) were married. In terms of employment status, 96 (34.1%) were students, 117 (41.6%) were working adults, and the remaining 68 (24.3%) were unemployed.

Table 1 Demographics of respondents

Demographic profile	Frequency	Percentage
Gender		
Male	117	35.9%
Female	209	64.1%
Age		
18~24 years	75	26.7%
25~30	98	34.9%
31~40	65	23.1%
41 and above	43	15.3%
Marital status		
Single	165	58.8%
Married	116	41.2%
Employment status		
Students	96	34.1%
Working adults	117	41.6%
Unemployed	68	24.3%

n=281

Procedures

To develop a valid and reliable questionnaire, this study formulated several items, based on related literature and previous research. Specifically, the web survey conducted for the present study randomly selected respondents who were online store owners. A mix of web-based and mail surveys was carried out on the sample. Each sample completed a self-report questionnaire that included two sections. The first section involved demographic information. The second section contained 14 items, consisting of four items pertaining to the Perceived Family Support Scale, three items concerning the Perceived Friend Support Scale, four items relating to the Significant Other Support Scale, and three items relating to the Internet Entrepreneurial Intention Scale. All items used a 7-point Likert-type scale.

Measures

This study categorized social supports into three dimensions: perceived family support (Fam), perceived friend support (Fri), and perceived significant other support (SO). The multidimensional scale of perceived support implemented in this study was developed by Zimet, Dahlem, Zimet and Farley (1998). The Internet entrepreneurial intention (IEI), employed in this study, was modified from previous studies (Elliott, 2000; Nasurdin, Ahmad & Lin, 2009). All items were rated using a 7-point scale ranging from 1 (Very strongly disagree) to 7 (Very strongly agree).

Perceived family support

The sample questions in the perception of family support included "My family really tries to help me" and "I get the emotional help and support I need from my family." The Cronbach's alpha reflected a good level of internal consistency (α= .85). A one-factor model was determined with a confirmatory factor analysis (CFA), which reflected acceptable goodness-of-fit indexes (χ^2/df =1.882, GFI= .993, AGFI= .965, and RMSEA= .056).

Perceived friend support

Sample items in the perception of friend support included "My friends really try to help me" and "I can count on my friends when things go wrong." Internal consistency is measured with Cronbach's alpha (α= .83). A CFA test of a one-factor model resulted in good goodness-of-fit indexes (χ^2/df =1.129, GFI= .979, AGFI= .996, and RMSEA= .022).

Perceived significant other support

Sample items in the perception of significant other support included "There is a special person who is around when I am in need" and "There is a special person with whom I can share my joys and sorrows." The reliability of this scale is measured with Cronbach's alpha (α= .82). All items were rated using a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Testing the one-factor model with CFA resulted in good fit indexes (χ^2/df=1.959, GFI= .993, AGFI= .965, and RMSEA= .059).

Internet Entrepreneurial intention

The Internet Entrepreneurial Intention Scale (IEI) implemented in this study was developed on the basis of many relevant studies (Elliott, 2000; Nasurdin, Ahmad & Lin, 2009), consisting of three items, each followed by a 7-point response scale ranging from 1 (strongly disagree) to 7 (strongly agree). The sample questions in the perception of Internet entrepreneurial intention included "My professional goal is becoming an Internet entrepreneur" and "I will make every effort to start and run my online store." The reliability of IEI was measured with Cronbach's alpha (α= .75). Testing the one-factor model with CFA resulted in good fit indexes (χ^2/df=1.405, GFI= .995, AGFI= .975, and RMSEA= .038).

Data Analysis

The data were analyzed using descriptive statistics, the Pearson correlation coefficients, and structural equation modeling. Descriptive statistics were used to describe and summarize the properties of the accumulated data collected from respondents. The correlation analysis was then used to find the relationship between perceived family support, perceived friend support, perceived significant other support, and Internet entrepreneurial intention. Structural equation modeling was used to test the model. A model fit can be evaluated by examining several goodness of fit indices, including x2, χ^2/df, GFI, TLI, CFI, and RMSEA.

Results

Development of Instruments

The reliability estimates ranged from .75 to .85, indicating acceptable reliability for the constructs. The composite reliability (CR) estimates are larger than .6 for each model, which is considered desirable (Bagozzi & Yi, 1988). The measure of average variance extracted (AVE) for each construct should exceed a value of .5 (Fornell & Larcker, 1981). The result of this study indicated that the CR extracted exceeded .6 (ranging from .79 to .86), and the AVE extracted exceeded .5 (ranging from .56 to .60). Therefore, AVE and composite reliability also exceeded the .5 and .6 thresholds, respectively (see table 2).

Table 2 Cronbach's alpha coefficient of the constructs

Construct	Cronbach's α	Composite α (CR)	AVE	Number of item
1. Family support	.85	.85	.59	4
2. Friend support	.83	.79	.56	3
3. Significant other support	.82	.86	.60	4
4. Internet Entrepreneurial Intention	.75	.80	.57	3

Relationships between Family Support, Friend Support, Significant Other Support, and Internet Entrepreneurial Intention

Table 3 shows the measurements of the four variables. All variables were significantly and positively correlated with each other. Family support had a significant and positive correlation with friend support (r = .66, p<.01), significant other support (r = .20, p<.01), and Internet entrepreneurial intention (r = .58, p<.01). Likewise, friend support had a significant and positive correlation with significant other support (r = .22, p<.01), and Internet entrepreneurial intention (r = .67, p<.05). Significant other support also had a significant and positive correlation with Internet Entrepreneurial intention (r = .32, p<.01).

Table 3 Correlation Analysis

Variables	M	SD	1	2	3
1. Family support	4.12	0.55	—		
2. Friend support	4.03	0.61	$.66^{**}$	—	
3. Significant other support	4.04	0.91	$.20^{**}$	$.22^{**}$	—
4. Internet Entrepreneurial Intention	4.20	0.57	$.58^{**}$	$.67^{*}$	$.32^{**}$

n=281, $^{*}p< .05$; $^{**}p< .01$

Confirmatory Factor Analysis

There are several indexes to explore the model fit in this study: the goodness-of-fit (GFI), the adjusted goodness-of-fit index (AGFI), the normed fit index (NFI) the comparative fit index (CFI), and the root mean square error of approximation (RMSEA) (Bentler, 1990). Generally, the GFI, AGFI, NFI, and CFI exceeded or were close to 0.9. Browne and Cudeck (1993) suggested guidelines in their work for the interpretation of RMSEA; if its value is in the range between 0.05 and 0.08, it indicates fair fit. Kline (2005) suggested the ratio of chi-square to degrees of freedom represents acceptable fit when the value is less than 5. The model indicates an adequate fit between the hypothesized model and the observed data (χ^2=128.26, *df*=73, χ^2/df=1.76, GFI= .94, AGFI= .92, NFI= .93, CFI= .97, and RMSEA= .05). Table 4 shows the summary of the overall model fit measures. The results of the CFA, including the pattern coefficients, are represented in Figure 2.

Table 4: Summary of goodness-of-fit indices

Fit Index	Recommended Level of Fit	Proposed Research Model
χ^2	n. s. at p < .05	128.26
χ^2/df	< 5	1.76
GFI	> .90	.94
AGFI	> .90	.92
NFI	> .90	.93

CFI	> .90	.97
RMSEA	.05~ .08	.05

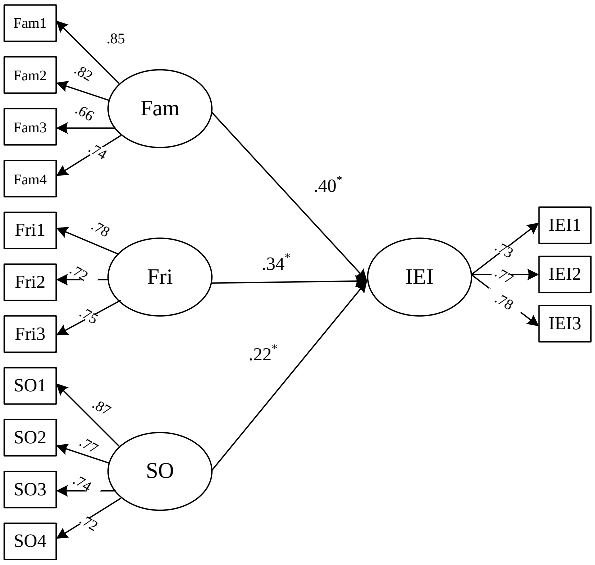

Fig. 2: Hypothesized model with path coefficients

Hypothesis testing

This study developed a conceptual model based on the literature of perceived family support, perceived friend support, perceived significant other support, and Internet entrepreneurial intention. The three hypotheses drawn from this theoretical and empirical literature were supported. First, hypothesis 1 was supported, whereby perceived family support (β = .40, p< .05) was significantly and positively related to Internet entrepreneurial intention. Furthermore, hypothesis 2 was supported whereby perceived friend support (β = .34, p< .05) was significantly and positively related to Internet entrepreneurial intention. Third, hypothesis 3 was supported, whereby perceived significant other support (β = .20, p< .05) was significantly and positively related to Internet entrepreneurial intention. Table 5 illustrates the results of the hypotheses test.

Table 5 Results of the hypotheses test

Hypotheses		Results
H_1:	Perceived family support is related to Internet entrepreneurial intention.	Supported
H_2:	Perceived friend support is related to Internet entrepreneurial intention.	Supported
H_3:	Perceived significant other support is related to Internet entrepreneurial intention.	Supported

Discussion

This study aims to investigate the relationship between entrepreneurs' experiences of accessing social supports and Internet entrepreneurial intention of online store owners in Taiwan. The first result indicates that there was a significant relationship among family support, friend support, significant other support, and Internet entrepreneurial intention. These findings demonstrate the importance of social support factors in influencing a person's intention to become an Internet entrepreneur. According to House (1981), providing emotion support, such as sympathy, concern, love and trust, becomes the most important social support for an individual.

Furthermore, the second result found that perceived family support, perceived friend support, and perceived significant other support had significantly and positively influence on Internet entrepreneurial intention. Internet entrepreneurs who have perceived family support and perceived friend support will express stronger Internet entrepreneurial intention than perceived significant other support. Traditionally, in previous literature, family has tended to be grouped in a category of family and friends (Boissevain, 1988). The finding of this study was consistent with previous studies, whereby perceived social supports were strong predictors of Internet entrepreneurial intention (Gelard & Saleh, 2011; Shiri, Mohamadi, & Hosseini, 2012). Furthermore, family and friends were viewed by some respondents as an important and useful source of support (Fielden & Hunt, 2011). Therefore, these types of support are particularly important when starting a business.

Conclusions

This study has examined the relationship between entrepreneurs' experiences of accessing social supports and Internet entrepreneurial intention. Results indicated that social supports exert a positive influence on Internet entrepreneurial intention. Such social support (family support, friend support, and significant other support) encourage online store owners to have a positive attitude toward Internet entrepreneurial intention to create a new business. The results indicated that family and friend supports have specific roles to increase Internet entrepreneurial intention. Therefore, potential and new entrepreneurs rely heavily on family and friend support when starting a new business. Results suggest that building a strong social support network can be critical to helping you determine the critical success factors.

There are some limitations to be considered. First, most of the variables in this study were measured by self-report measures, which are inflated due to the action of common method variance. Furthermore, there was likely some social desirability bias that may have affected the validity of the questionnaires. Second, the participants in this study are Internet Entrepreneurs from online stores. As such, the external validity could be limited. Third, this study investigated the relationship of social supports and Internet entrepreneurial intention. Future studies should therefore examine factors related to entrepreneurial motivation, entrepreneurial personality traits, and so on, which would be interesting topics for future research.

Acknowledgements

This study was supported by the National Science Council, Taiwan, R.O.C., under Grant NSC 99-2511-S-230-001-MY3.

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THE UTILIZATION OF TECHNOLOGY IN TEACHING OF THE ARABIC LANGUAGE IN SECONDARY SCHOOLS IN RIYADH, SAUDI ARABIA

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Abstract

This study is about how Arabic language teachers use technology in secondary schools. It aims to provide knowledge that will improve understanding of the current usage of technology. Saudi Arabia has introduced computers into their curricula to keep pace with their developed counterparts. Also, this study can provide the Education Ministry in Saudi Arabia with valuable information for addressing future educational policies such as access, usage and training in the use of computers and can help identify the benefit of the current use of technology for students. Specifically, the study explores the availability and usage of technologies as tools that Arabic language teachers use. It examines the main difficulties that prevent the teachers from using them in their teaching. This study utilizes two kinds of methodologies with male teachers because the education system in Saudi Arabia is segregated so it is not possible to collect data from women. Both quantitative and qualitative approaches are used through using a questionnaire and interviews. The data revealed that it appeared from questionnaires that many electronic instructional technology tools were available in secondary schools in Riyadh. Also, using electronic instructional technology activities in teaching the Arabic language in secondary schools was high. Learning theories have great influence on educational practice and how would educators design and develop instructional materials (Duffy & Jonassen, 1992). Learning theories specify students and instructors roles in the learning process (Jonassen et al, 1995).

Keywords: Secondary; Riyadh; utilization of technology

1. Introduction

1.1 Research Proposal

The utilization of technology in the teaching of the Arabic language in secondary schools in Riyadh, Saudi Arabia

How is technology being used currently in teaching the Arabic language?

1.2 Research problem and questions

The goal of this dissertation project is to examine the instructional technology used by teachers of the Arabic language. This study attempts to address four pertinent questions:

What is the history of using technology in teaching the Arabic language in secondary schools in Riyadh? To What extent are instructional technologies available in teaching the Arabic language in secondary schools throughout the Riyadh Governorate? What extend are instructional technologies used in teaching the Arabic language in secondary schools throughout the Riyadh Governorate? What instructional technologies are utilized in teaching the Arabic language in secondary schools throughout the Riyadh Governorate? What differences exist in the use of technology by teachers according to such factors as their formal qualifications and number of years in service? How did you gain instructional technology skills and training?

1.3 Hypotheses

Several assumptions are used in developing this study. Specifically, the study assumes that the teachers of the Arabic language who utilize instructional technology can convey information to the students more easily. Furthermore, the study also assumes that the teachers of the Arabic language who utilize instructional technology have the ability to use computers to solve their educational problems. The study also assumes that the teachers of the Arabic language can utilize the Internet to obtain any necessary information for assisting their students. Moreover, the study assumes that there are certain difficulties which may discourage or prevent teachers of Arabic language from using instructional technologies. Finally, the study assumes that there is an impact on the teachers of Arabic language when technology is used.

1.4 Significance of the Study

This study is significant for several reasons. The reasons to be discussed in the following section can be summarised as follows: A) Very limited amount of research that focuses on how Arabic language teachers use technology in secondary schools. B) This study will help to understand the current of using technology in teaching of the Arabic language area in Saudi Arabian schools. C) Saudi Arabia attempts s to computerized curriculum. D) Provide the Education Ministry (EM) in Saudi Arabia with new information relating to some issues such as access, usage and training. E) Help identify the benefit of the current use of technology in Saudi Arabia for students.

1.5 Purpose of the study

The primary purpose of the study will aim to explore the availability of technologies as tools that Arabic language teachers use. The study will be to investigate the use of instructional technology in the teaching of the Arabic language in secondary schools in Riyadh, Saudi Arabia. Moreover, this study will examine the main difficulties that prevent the teachers of the Arabic language from using instructional technologies in their teaching. This study, also, will examine how using instructional technologies is impacted by some variables including teachers' qualifications, training and experience. Furthermore, this study will investigate the extent of usage of technology by Arabic language teachers in the classroom in secondary schools. This research will identify the strengths and weaknesses that institutes (e.g. schools) may face which can respectively advance or impede the use of technology in teaching the Arabic language.

1.6 Use of technology in language teaching

The Information Age is characterized by rapid technological advancements that have become indispensable in all fields of life. Technology, which has penetrated the entire world, has facilitated the communication process and thus it demands continuous learning in order to be abreast with advancements currently taking place. Several studies have been made about advancements educational technology. However, the use of technology in education goes back a long way in history. The teaching-learning process is not an exception to this technological revolution; rather it is at the heart of such advancement and constitutes an important base from which advances in other fields often emanate. As a result there is a need to create a system of education that is able to keep up with advances and developments to make the best use of the technological inventions. In order to make such education possible, recent technological breakthroughs should be wisely implemented (Aqeel, 2003, p. 22).

2. Literature review:

Instructional technology is a subject of much concern for researchers in countries across the world. Researchers from various countries demonstrate great interest in investigating instructional technology in terms of availability, utilization and obstacles at various school levels from teachers' viewpoints. This section will trace and discuss relevant literature in the area of teaching characteristics, obstacles to the use of technology, availability of technology and teachers' usage of technology in secondary schools education. Issues related to educational policy and the future of education will also be discussed in order to cover issues investigated in prior studies of relevant to this study's research questions.

3. Methodology

This study utilized two kinds of methodologies with man who is teachers of the Arabic language in secondary schools in Riyadh without woman to collect information. It used both quantitative and qualitative approaches through using a questionnaire and interviews.

3.1 Analysis

Miles and Huberman (1994) identified the main stages of analysis for qualitative data as data reduction, data display, verification and drawing of conclusion. For analysis of qualitative data gathered in the study through the interview, open-ended questions, certain steps will be followed: preparation of the data, familiarity with the data, interpretation of the data, verification of the data, and representation of the data. The data would first be prepared, organized, and conceptualised. The second step would be to read and reread the data to gain familiarity with it. In the third step, data would be coded and categorised, using the themes and patterns that are identified. The next step would be to verify the data. Finally, the data would be summarised, compared, triangulated, and presented in descriptive ways relating to the study questions (Denscombe, 2007; Miles & Huberman, 1994; K. Punch, 2005).

3.2 Procedure of the study

First: Sampling**.** Second: researcher would be questioner preparation and he would be arbitration. Third: researcher proceeded transitions of validity and reliability. Fourth: researcher implemented questioner on sample. Fifth: researcher would be answering study questions, presenting results and implications.

3.3 Questionnaire findings

The data revealed that it appeared from table 1 of questionnaires that many electronic instructional technology tools were available in secondary schools in Riyadh. The most commonly available tools were computers (88%), printers (81%), computer labs (71%), floppy discs (66%), data projects in computer labs (64%), and computers for students in a lab (61%). The next most commonly available group of tools in the secondary schools in Riyadh were CD players (59%), overhead projectors (58%), TV monitors (57%), slide projectors (55%), and interactive whiteboards (53%). Finally, tools such as iPods (8%), iPads (9%), computers for students to use in the classroom (10%), and audio-visual laboratories (18%) were less available in these schools.

Table 1: Availability of electronic instructional technology:

Tools	No		Yes	
	Count	%	Count	%
Computer	12	12.0	88	88.0
Computer in the classroom	56	56.0	44	44.0
Laptop computer in the classroom for teacher use	56	56.0	44	44.0
Computer for student use in the classroom	90	90.0	10	10.0
Computer lab	29	29.0	71	71.0
Computer classroom for teacher use	56	56.0	44	44.0
Computer for students in a lab	39	39.0	61	61.0
Computer connected to the internet for teacher use	79	79.0	21	21.0
Portable computer units	62	62.0	38	38.0
Data projector in the classroom	47	47.0	53	53.0
Data projector in a computer lab	36	36.0	64	64.0
Camera	51	51.0	49	49.0
Video camera	51	51.0	49	49.0
Digital camera (photo)	51	51.0	49	49.0
Digital camera with video capability	56	56.0	44	44.0
Digital projector	48	48.0	52	52.0
Ipad	91	91.0	9	9.0
Ipod	92	92.0	8	8.0
Floppy discs	34	34.0	66	66.0
Interactive whiteboard	47	47.0	53	53.0
TV monitor	43	43.0	57	57.0
DVD player	52	52.0	48	48.0
CD player	41	41.0	59	59.0
Printers	19	19.0	81	81.0
Overhead projector	42	42.0	58	58.0

Scanner	72	72.0	28	28.0
Slides projector	45	45.0	55	55.0
Audio cassette, MP3 player	49	49.0	51	51.0
Audio-visual laboratory	82	82.0	18	18.0
Video cassette recorder (VCR)	59	59.0	41	41.0
Radio	52	52.0	48	48.0

It appeared clearly from table 2 of questionnaires that using electronic instructional technology activities in teaching the Arabic language in secondary schools was high. The activities that had the high mean in using electronic instructional technology in teaching for teachers who prepare their work for the classroom was 3.58, using computer in many places 3.55, using a computer to deliver instruction to class 3.30, accessing the Internet for retrieving information, (e.g. research, information, ideas etc.) 3.26. On the other hand, using electronic instructional technology activities in teaching had the lowest mean such as developing Arabic lessons by designing informative flash animations 1.18, developing Arabic lessons by designing informative digital video productions 1.21,using ipod or ipad in the classroom 1.27, using the students their own computer in the class 1.35.

Table 2: For the next table the used guidelines are:

1-2 low 2-3 intermediate 3-4 high 4-5 very high

Using electronic instructional technology in teaching the Arabic language:

activity	N	Minimum	Maximum	Mean	Std. Deviation
Use computer in many places.	96	1	5	3.55	1.660
Use a computer to deliver instruction to your class.	98	1	5	3.30	1.742
Use teacher laptop in the classroom to gain information.	95	1	5	2.77	1.813
Use students own computer in the class.	99	1	5	1.35	1.023
Explaining subject of Arabic in Computer lab.	97	1	5	2.60	1.631
Preparing teachers their work for their classroom.	97	1	5	3.58	1.676
Use lab students to interact in the lesson.	96	1	5	2.72	1.652
Access the Internet for retrieving information, (e.g. research, information, ideas etc.).	97	1	5	3.26	1.616
Use Portable computer units in	96	1	5	2.47	1.556

the lesson.					
Use Digital projector in the class.	95	1	5	2.33	1.722
Use Digital projector in a computer lab.	94	1	5	2.71	1.824
Use the data show to explain subjects.	96	1	5	2.74	1.767
Use photos to add more information about subject.	97	1	5	2.79	1.773
Adding knowledge by use of a Digital camera.	97	1	5	1.57	1.274
Use Digital camera to create a video clip of some scenes such as based on of subject. Use Digital camera with video capability in the Arabic subject	96	1	5	1.40	1.051
Use Digital projector.	97	1	5	2.41	1.749
Using iPod or iPad in the classroom.	100	1	5	1.27	.962
Keeping work on floppy discs.	93	1	5	2.91	1.646
Use Interactive whiteboard to explain subject.	98	1	5	2.71	1.693
Use the TV in the class.	98	1	5	2.18	1.664
Use DVD or CD player in Arabic subject.	99	1	5	2.34	1.451
Scanning homework and sending it to students.	100	1	5	1.48	1.168
Use photo copies in the lessons.	96	1	5	3.07	1.784
Use overhead projector to add more information for student.	92	1	5	2.72	1.725
Use slides to show student example of subject.	95	1	5	2.79	1.713
Use MP3 or Audio cassette to listen to Arabic subject.	98	1	5	2.32	1.596
Doing Arabic lesson in Audio-visual laboratory.	97	1	5	1.54	1.259

Watching Video cassette recorder to increase knowledge.	98	1	5	2.47	1.663
Use radio in the school.	96	1	5	2.09	1.529
Create models resembling the original, using technology and encourage and motivate students to do so.	97	1	5	2.44	1.738
Developing Arabic lessons by designing informative web pages. Developing Arabic lessons by designing informative power point.	98	1	5	1.58	1.235
Developing Arabic lessons by designing informative flash animations.	97	1	5	1.18	.692
Developing Arabic lessons by designing informative digital video productions.	97	1	5	1.21	.790
Use games show review; to encourage students to recall information in a competitive environment.	100	1	5	2.27	1.780
Use Email for professional purposes.	98	1	5	2.52	1.760
Using the technology such as word and XL for administration purposes (e.g. record keeping, reports, etc.).	100	1	5	3.08	1.727
Word processing.	98	1	5	2.85	1.767
Graphics/drawing packages.	99	1	5	2.40	1.749
Internet sites.	96	1	5	2.44	1.608
Specialist subject program e.g. the Arabic language.	99	1	5	2.80	1.761
Use technology when you are teaching a class.	98	1	5	3.10	1.702
Use technology for preparing	97	1	5	3.24	1.676

lessons					
Create an interactive Arabic test by using interactive learning modules to improve students' conception in their Arabic subjects.	99	1	5	1.48	1.190
Create an interactive Arabic quiz by using interactive learning modules to improve students' conception in their Arabic subjects.	99	1	5	1.58	1.286
Valid N (listwise)	61				

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TOWARDS THE E-LEARNING DOCUMENT PROCEDURALISATION IN SPORT

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Abstract

The Work of this research currently underway, (S.EL HARRASSI, P.LAUDATI. 2012) to improve e-learning dispositive in the field of sport, we conducted a field study to the Faculty STAPS FSMS learner's of the University of Valenciennes UVHC in France. We thus found that access to an e-learning document is still very limited, despite the availability of tools for designers on the part of the University. We then tried to understand the reasons by interviewing other actors involved in the process of development and design e-learning document. For this, two protocols of investigation have been implemented, each responding to a different logic: the first based on semi-structured interviews, from educational designers of the FSMS; the second based on a free interview with makers of the UVHC. The intersection of these two logics (designer - maker) with logic "learner", helped us to identify the levers and the constraints of the e-learning document accessibility and to propose the possible solutions for improvement.

Keywords: E-learning; e-learning document; quality; approach quality; protocol ; learner; designer; maker;...

Résumé
Dans le cadre d'un travail de recherche actuellement en cours, (S.EL HARRASSI, P.LAUDATI. 2012) visant à améliorer les dispositifs e-learning dans le domaine du sport, nous avons conduit une étude de terrain auprès des apprenants de la faculté STAPS-FSMS de l'Université de Valenciennes UVHC en France. Nous avons ainsi constaté que l'accès à un cours à distance reste encore très limité, malgré la mise à disposition des outils nécessaires aux concepteurs de la part de l'université. Nous avons alors essayé d'en comprendre les raisons en interviewant les autres acteurs concernés par le processus d'élaboration (conception et édition) des cours à distance. Pour cela, deux protocoles d'enquête ont été mis en place, chacun répondant à une logique différente :le premier basé sur des entretiens semi-directifs, auprès des concepteurs pédagogiques de la FSMS ;le deuxième basé sur un entretien libre auprès des décideurs de l'UVHC. Le croisement de ces deux logiques (concepteur – décideur) avec la logique « apprenant », nous a permis de dégager les leviers et les contraintes de l'accessibilité aux cours à distance et de proposer ainsi des solutions possibles d'amélioration

Mots clés: Cours à distance; qualité; approche qualité; apprenant; concepteur; décideur; protocole;...

Introduction

Dans le domaine d'e-learning, l'abondance de termes, sigles, acronymes concurrents – et pour la plupart quasiment synonymes – utilisés par les acteurs du domaine pour désigner une nouvelle voie de formation ou de support de formation, ne peut manquer de semer la confusion et le doute dans les esprits : Cours à distance, cours en ligne, ressources, support de cours ….: autant de variantes d'expressions utilisées aujourd'hui pour désigner à la fois un contenu et un support de mode de formation ou d'apprentissage différent de la formation classique (communément appelée « formation en présentiel »).
Quatre termes différents pour désigner, sous diverses appellations, des supports de transmission et d'acquisition de savoirs et de compétences. Vers lequel s'orienter? Il est à noter qu'en français, « cours » peut s'employer selon une double acception : sous l'angle du professeur qui donne le cours (et son support) et sous l'angle de l'apprenant qui reçoit le cours (et son) support.
Souvent, lors de la conception d'un cours à distance, au lieu de s'interroger sur les besoins des usagers, on s'est efforcé de fournir les technologies les plus récentes et les plus sophistiquées qui ne conviennent pas forcément aux attentes des apprenants ni à celles des enseignants, mais qui répondent à des critères purement « informatiques ».

Quelques travaux antérieurs ont été publiés dans le domaine de la production (elharrassi & all. 2006), de l'interopérabilité (elharrassi 2010), (elharrassi & all.2007) de la médiatisation (elharrassi.2008), et du déploiement du contenu e-learning : tous montrent l'intérêt d'adopter la logique des usagers dans une démarche qualité. Ainsi, dans l'objectif d'élaborer une modélisation conceptuelle de qualité d'un cours à distance, des enquêtes de terrain se sont avérées indispensables, afin de comprendre à la fois les démarches qualitatives des concepteurs pédagogiques des documents et la satisfaction des apprenants lors de l'utilisation de ces mêmes documents.
Nous avons alors mené des enquêtes de terrain selon trois logiques : le point de vue *apprenant*, le point de vue *concepteur pédagogique* et le point de vue *décideur*. Nous avons ensuite mis en place trois protocoles, chacun répondant à une logique différente. Le premier protocole a concerné environ 200 apprenants de la filière sport STAPS-FSMS de l'Université de Valenciennes[57] et il s'est basé sur la technique des questionnaires. Les premiers résultats de ces questionnaires ont démontré que les documents e-learning ne sont pas facilement accessibles aux apprenants. En fait, l'enquête de terrain, menée au cours du premier semestre 2012 a permis de mettre en évidence que seul un pourcentage très réduit d'apprenants a eu accès à un cours à distance (seul 1% : c.a.d. trois apprenants sur 201 inteviewés)
Le tableau ci-dessous montre les résultats partiels du questionnaire et notamment les réponses à la première question : <u>Avez-vous suivi un cours à distance en Sport ?, </u> Si oui, lequel ?

Q.1.Cours suivi à distance	**Occurrences 201 documents)**	**Fréquence**
Oui (cours de physiologie, anatomie, oui)	3	1%
Non	198	99%
Total	**201**	**100%**

Tab. 1 : Résultats de dépouillement questionnaire apprenants (question n°1) (S.EL HARRASSI, P .LAUDATI.2012)

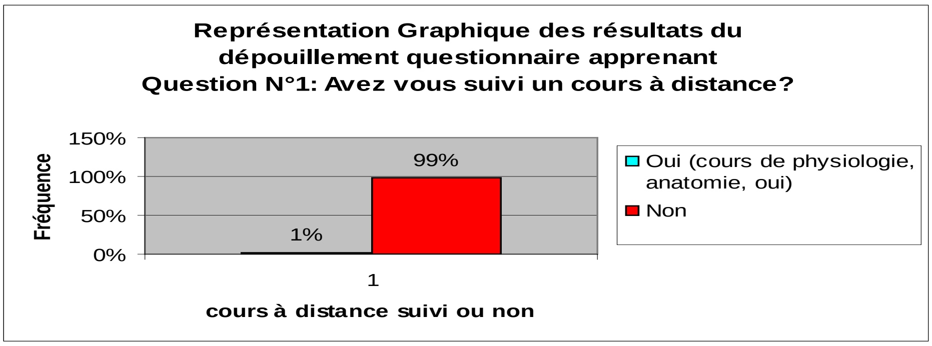

Fig. 1 : Représentation graphique des réponses des apprenants (S.EL HARRASSI, P .LAUDATI.2012)

Le tableau n°1 et la figure n°1 montrent que sur un effectif total de 201 apprenants, seul 1% (3 occurrences) ont répondu avoir suivi un cours à distance et notamment, pour ce qui concerne le domaine du sport, des cours de physiologie et/ou d'anatomie.

L'analyse des réponses aux autres questions nous permet d'avancer deux hypothèses qui, selon le point de vue des apprenants, ont constitué un frein à l'accès aux cours à distance :

- l'indisponibilité de cours à distance en Sport à la FSMS-STAPS-UVHC, par manque d'infrastructures technologiques ou à cause de contraintes budgétaires ;
- le manque d'intérêt de la part des apprenants eux-mêmes ; ou le manque d'intérêt des enseignants à concevoir des cours à distance.

Des recherches bibliographiques ont montré que cette situation est présente aussi dans d'autres universités françaises, malgré le développement des TIC[58] et de la FOAD[59] (UVR, UVT, UVED…)[60], et les financements

[57] Sciences et Techniques des Activités Physiques et Sportives - Faculté des Sciences et des Métiers du Sport – Université de Valenciennes et du Hainaut Cambrésis
[58] ***Technologies de l'Information et de la Communication***
[59] ***Formation Ouverte A Distance***
[60] ***Université Virtuelle Régionale, Université Virtuelle Thématique, Université Virtuelle Environnement et développement Durable…***

engagés par l'Etat pour réaliser ce type de projet. Nous nous interrogeons sur ces résultats : pourquoi si peu d'apprenants utilisent l'e-learning?

Nous nous sommes alors tournés du côté des concepteurs et des décideurs, au travers de deux autres protocoles, pour valider ou infirmer les hypothèses avancées et pour comprendre pourquoi l'université n'a pas mis en place de cours à distance pour les apprenants

Le deuxième protocole, , auprès des concepteurs pédagogiques STAPS de la FSMS de l'Université de Valenciennes en France, est basé sur des entretiens semi-directifs ; le troisième protocole a ciblé les décideurs de l'UVHC, et il est basé sur des entretiens libres.

Le croisement des trois logiques (apprenant/concepteur/décideur) nous a permis de dégager les éléments qui favorisent ou, au contraire, limitent l'accès au cours à distance, et de proposer des solutions possibles pour élaborer un cours de *qualité*[61]. Un cours à distance de qualité est un document dont l'élaboration prend en compte les processus communicationnels entre apprenants, et se révèle susceptible de les aider à surmonter les obstacles aussi bien techniques que de compréhension du contenu et de maîtrise du support.

L'objectif de la démarche qualité est de connaître en amont les besoins des apprenants STAPS et de les satisfaire. L'évaluation auprès du concepteur pédagogique permet une appréciation qualitative du modèle de conception du cours à distance, dans le but de déterminer si celui-ci est capable de satisfaire les besoins spécifiés, et le cas échéant l'améliorer.

La description de la démarche expérimentale menée, pour connaître les besoins des différents acteurs, fait l'objet de la première partie de cette contribution. Dans la deuxième partie, le croisement et l'analyse des résultats sont effectués dans l'objectif d'apporter des éléments de réponse.

Etude expérimentale

L'étude expérimentale présentée dans ce paragraphe, permet à la fois :

- d'avoir des éléments de réponse aux questions soulevées par les résultats du dépouillement du protocole apprenant : seul 1% sur un effectif de 201 apprenants, ont suivi un cours à distance en sport ;

- d'identifier les besoins du responsable de l'Université Numérique en Région-Nord Pas de Calais, et du directeur du service informatique de l'UVHC, en termes d'aide à la décision.

Méthodes de recueil adopté

Pour le protocole Concepteur pédagogique, une méthode d'enquête qualitative a été utilisée pour la collecte de données à l'aide d'un entretien semi directif. Les points de vue pris en compte ici sont ceux des concepteurs pédagogiques. Il est en effet très important de comprendre leur perception afin de comprendre la raison de l'inexistence des cours à distance, et probablement pour un éventuel retour d'expériences essentiel aux pédagogues pour la planification future. En s'appuyant sur les travaux de Griffin et Hauser[62] concernant le choix du public cible à interviewer, nous nous sommes entretenus avec 20 enseignants de la FSMS de l'Université de Valenciennes, qui ont conçu un ou plusieurs modules de cours à distance.

Pour le protocole Décideur, l'objectif est de déterminer la contrainte et la motivation des enseignants à concevoir ou non des cours à distance d'une part. D'autre part pour savoir si une rubrique formation a été programmée sur le plan quinquennal de l'UVHC, concernant la modélisation conceptuelle des cours à distance,

Une méthode d'enquête qualitative a été utilisée pour la collecte de données à l'aide d'un entretien libre. Dans notre cas, le décideur est représenté par le directeur du service informatique de l'Université, responsable de l'Université numérique.

Dans les deux cas, les réponses ont été retranscrites fidèlement sous forme de texte, pour pouvoir ensuite être analysées, selon la méthode qui suit ainsi

[62] Selon Griffin et Hauser -(1991), au-delà de vingt audités, les informations nouvelles deviennent marginales. La fourchette convenable se situe entre 12 et 15, avec un minimum à 7 et un maximum à 20 (Griffin et Hauser, 1991)

Méthode de dépouillement

Plusieurs outils de dépouillement de données existent. Le choix dépend des objectifs assignés et des données recueillies. Nous avons opté pour l'utilisation d'un logiciel d'analyse qualitative des données Weft QDA,. Celui-ci permet de créer ce que le logiciel nomme des catégories : il s'agit de mots, ou de mnémoniques que l'on associe à des passages du texte d'origine, sachant que plusieurs d'entre eux peuvent être associés au même passage. Au cours des 20 entretiens, d'une heure chacun en moyenne, il s'agit de noter toutes les phrases prononcées par l'audité même si elles semblent avoir peu de rapport avec le sujet. C'est en effet dans les expressions à première vue les plus saugrenues que résident bien souvent les fonctions latentes les plus radicalement nouvelles. Les phrases les plus rarement exprimées, et en ce sens marginales, possèdent en outre le plus fort potentiel innovant (Leleu-Merviel, 2008). Les données primaires sont ensuite retranscrites textuellement (avec ponctuation afin de faire ressortir les émotions ou intonations de voix, voire avec des notes [rires, sourires etc.]). La retranscription a été effectuée immédiatement après chaque entretien, avant que la mémoire des détails ne soit effacée, pour faciliter le décodage des notes prises à la va-vite et parfois difficiles à relire quand le laps de temps écoulé est trop long, ou que de nouveaux entretiens sont venus effacer la mémoire immédiate de l'expression sur « le vif ». Le corpus de retranscriptions, transformé en enregistrements numérisés, constitue les données secondaires. Avant d'en arriver au dépouillement, quelques données complémentaires concernant la durée des entretiens et le profil des participants sont précisées.

Notons en outre qu'une fonction de recherche aide à repérer les passages contenant un mot ou une expression. Ainsi, nous avons extrait de la voix des enseignants/concepteurs et des décideurs des résultats saillant qui seront analysés dans le chapitre suivant.

Résultats

1. Résultats du protocole Concepteur STAPS-FSMS-UVHC-Valenciennes-France

De la voix des enseignants chercheurs et chercheurs de la FSMS, nous avons extrait les résultats saillant suivants :

**** Disponibilité des cours à distance***

La disponibilité et l'accessibilité à des cours à distance sont fondamentales. Elles apparaissent comme un élément majeur pour l'appropriation ou le rejet d'un contenu. Des enseignants chercheurs ajoutent dans ce sens :

« …Non, je ss pas entrée dans la logique du cours à distance , je suis plus entrée dans la logique d'un instant privilégié de présentiel avec leur enseignant pour faire évoluer la notion même de prise de notes pour entrer véritablement dans l'étudiant actif dans son apprentissage .avec ce moment privilégié où il y a un enseignant qui est là pour répondre aux questions des étudiants et mieux faire comprendre certaines questions , certaines choses, ce que je trouve pas forcement tangible dans un cours magistral où l'enseignant… » » [CONSTAPS 07]
« …des cours accessibles en ligne, présent en cours c'est intéressant pour mieux comprendre, mais si l'étudiant s'absente là il va trouver un support pour presque ne rien rater quoi! Se st des ressources PDF, j'ai vu des schémas en anatomie en PDF, ppt, … »
CONSTAPS04 [6792-7466]

** D**éficiences des infrastructures technologiques et difficultés d'utilisation***

L'infrastructure Technologique est un facteur attractif du dispositif e-learning comme le souligne un professeur :
Il ressort des entretiens tout d'abord, qu'aucune difficulté liées à la disponibilité des infrastructures technologiques ne se pose. Seulement, l'accès à ces outils technologiques n'est valable pour tous les enseignants. Un professeur qui a la main sur le budget, l'a exprimé implicitement en disant:
« … non le débit est bien et fort même, l'étudiant visualise des séquences vidéo et audio sans aucun problème, des podcasts aussi … » [CONSTAPS04]
Un autre a été contrarié en disant explicitement :
« …illustrations + des images + un film, mais c'est un projet, et nous on n'a pas les moyens actuellement de se filmer et faire des choses comme ca … » CONSTAPS05

**** L'enseignant versus le document numérique***

Cet élément a fait couler beaucoup d'encre, vu que le souci d'être remplacé par des machines et de changer de métier a été implicitement mis en évidence dans les verbatim des audités.

La priorité de l'enseignant en classe est un autre facteur répulsif dans un dispositif e-learning :

Un autre enseignant ajoute :
« …, je suis plus entrée dans la logique d'un instant privilégié de présentiel avec leur enseignant pour faire évoluer la notion même de prise de notes pour entrer véritablement dans l'étudiant actif dans son apprentissage » CONSTAPS07 [12635-13217]

Et il ajoute *: « … la notion même de prise de notes pour entrer véritablement dans l'étudiant actif dans son apprentissage, avec ce moment privilégié où il y a un enseignant qui est là pour répondre aux questions des étudiants et mieux faire comprendre certaines questions , certaines choses, ce que je trouve pas forcement tangible dans un cours magistral ou l'enseignant … »*

Un autre enseignant exprime explicitement son point de vue *:*
«… les étudiants deviennent beaucoup moins intéressé par mon cours .seuls les deux premières rangées de l'amphi suivent et les autres chuchotent tt le temps.ils sont là présent physiquement comme preuve et c'est tout. Aucun intérêt n'est montré pour suivre mon cours ! Je sais pas ce que je peux faire. Mais je ne donnerai pas mon cours aux étudiants, ils doivent le suivre en classe ou en amphi … » [CONSTAPS 15]

**** Satisfaction des parties prenantes***

Concernant la satisfaction des parties prenantes, deux parties prenantes sont prises en compte.

Premièrement, ***l'apprenant*** ; à la question posée aux enseignants : « est-ce que vous avez pris en compte les attentes et besoins des apprenants concernant la façon de concevoir votre cours », presque la totalité des enseignants chercheurs a répondu qu'ils n'ont pas pensé à la satisfaction des apprenants dans la conception du contenu.

Deuxièmement, ***l'enseignant*** ; à la même question, la totalité des enseignants chercheurs ont affirmé que et la formation et la charge de leur volume horaire restera une contrainte pour concevoir un cours à distance.

**** Difficultés rencontrées et solutions proposées***

Concernant les difficultés rencontrées, un enseignant a mis en évidence la résistance des apprenants comme suit :
« …j'incite l'étudiant à devenir actif , en consultant le cours avant et profiter du moment privilégié de face à face avec l'enseignant en réfléchissant et lui posant des questions pour que tous les étudiants en profitent et pour que le cours soit interactif, malheureusement ce n'est pas çà, il n'ont pas encore cette culture.je ne sais pas est ce que c'est mon cours qui n'est pas bien, ou c'est l'étudiant… » [CONSTAPS 07]
Un autre enseignant ajoute dans ce sens : « … et à votre avis c'est dû à quoi ? C'est à cause de notre système d'enseignement, parce que ne sont pas proactifs, ils sont consommateurs,… » [CONSTAPS 09]
Et il rebondit *: « … pour un effectif de 100% d'étudiants ? C'est peut être 2, 3 personnes qui regardent mes cours en ligne, mais pas la majorité des … »*

A l'issue de ce dépouillement, nous constatons qu'aucun cours à distance n'a été crée à la FSMS-STAPS, et que les documents numériques disponibles à la FSMS, se ne sont que des ressources pédagogiques, que de supports de cours et non pas des cours à distance,.
Le dépouillement des verbatim des concepteurs STAPS a confirmé ainsi l'hypothèse soulevée lors du protocole Apprenant ; en fait, aucun cours à distance n'a été conçu. 50% d'enseignants n'ont déposé que des supports de cours en ligne. Nous avons constaté également que 30% des enseignants STAPS restent sceptiques face au document numérique, craignant, entre autres, d'être remplacés par les machines.
Du dépouillement des verbatim des enseignants STAPS, nous soulevons un second problème :
Souvent les enseignants sont convaincus de dispenser un cours à distance, sans faire la différence entre cours et supports de cours qu'ils déposent sur une plateforme e-learning ; et ils pensent que les étudiants ne sont pas intéressés à la démarche.
L'analyse des réponses des concepteurs pédagogiques nous permet de soulever quelques hypothèses qui, selon le point de vue de ces pédagogues, ont montré une restriction à la conception des cours à distance :

- Le manque de formation en la matière des enseignants
- La charge du volume horaire des enseignants
- La motivation des enseignants

Pour répondre à ces questions, nous avons voulu lancer un troisième protocole auprès d'un décideur en la matière au sein de l'UVHC.

2. Résultats du protocole Décideur UVHC :

Le protocole décideur nous a permis d'interroger et d'identifier les besoins d'aide dans les prises de décision du responsable de l'Université Numérique en Région-Nord Pas de Calais, et le directeur du service informatique de l'UVHC,. De la voix des décideurs les éléments suivants ont été mis en évidence ;

**** En terme de disponibilité des cours à distance, les décideurs confirment ce qui suit :***

« …on n'est pas dans la logique du cours à distance, d'ailleurs 4% pour toutes les universités françaises … sont ils installés En Bretagne on sait qu'ils font des masters entre plusieurs universités qui font des cours à distance, apprendre en formation continue au QNAM, donc là forcement il y a de la formation à distance, après dans le domaine du droit chez les juristes qui font de la formation continue … » CONSTAPS04

« …donc ils ne veulent pas suivre x ressources numériques, ils veulent finalement la ressource que l'enseignant préconise ! ca c'est un point qu'on a bien remarqué Oui ca ils aiment bien… » [CONSTAPS04]

*** En terme de satisfaction des apprenants et des enseignants** ,ces décideurs ajoutent :

« …qu'attendent les étudiants, en terme *de service, services numériques, et les étudiants en fait dans ces enquêtes là ce qu'ils ressortent c'est qu'ils attendent finalement des supports de cours de leurs enseignants ou des supports extérieurs mais qui sont préconisés par leurs enseignants Relance ; ah d'accord Même si des cours en master , alors si je leur dis dans tel catalogue vous trouverez des ressources pour approfondir mon cours par ex, eh ben ils st un peu perdu… » » [CONSTAPS 04]*

« …la cellule TIC a pour mission d'être avec les enseignants pour justement analyser leurs attentes, étudier les scénarios pédagogiques proposer après les outils justement pour réaliser des supports de cours en ligne et les méthodologies donc après pour les mettre sur des plateformes de formation pour que les étudiants puissent accéder à ces cours en fonction de leur avancement dans leur parcours de formation … »CONSTAPS16

**** En terme de motivation des enseignants, les décideurs expliquent implicitement que :***

« … avec un projet, ca marche bien , car la il y a une motivation , par contre utiliser une plateforme comme Moodle, la je vais dire, c'est différent, on fait des formations , il y a eu une la semaine dernière, bon il y a quelques enseignants qui viennent voir , ils ont jamais utilisé ou ils ont commencé à utiliser , ont des questions, comment on dépose un cours… » [CONSTAPS04]

Dans ce travail ont été identifiés, de manière non exhaustive, les leviers qu'il faut prendre en compte pour l'élaboration d'un modèle de conception de cours à distance, comme par exemple :

- le rôle de l'environnement social et culturel de l'apprenant

- les difficultés d'utilisation du dispositif technique

- les prestations de services en la matière : formation des enseignants sur la modélisation conceptuelle d'un cours à distance

- …..

Croisement des résultats des trois Protocoles Apprenant, Concepteur & Décideur

Un cours à distance de qualité, utilise tous les aspects pédagogiques : forum, tutorat, concepts pédagogiques en ligne, TP[63].

Nous avons procédé à une analyse comparative des verbatim des enseignants STAPS et du décideur. Cette étude nous a confirmé nos hypothèses concernant_le manque de formation en la matière des enseignants, la charge du volume horaire des enseignants et leur motivation à concevoir un cours à distance, du protocole concepteur STAPS. Suite aux entretiens réalisés avec les décideurs, il résulte que seul 4% des cours à distance ont vu le jour dans certains domaines d'application, mais pas en Sport. Les concepteurs pédagogiques de la FSMS se sont estimés heureux de déposer des supports de cours sur la plateforme Moodle : ce qui ne représente ni un cours à distance, ni un cours en ligne, mais seulement des supports de cours en ligne.

[63] Travaux pratiques

Nous avons constaté également une résistance d'un grand nombre d'apprenants et d'enseignants . Les premiers conçoivent l'e-learning comme une « éducation inférieure » destinée aux apprenants qui ont échoué à l'éducation formelle, ou que leur environnement social n'encourage pas. Les seconds craignent, entre autres, d'être remplacé par les machines.

En effet, les résultats montrent que la question de la modélisation conceptuelle est posée à l'envers. Au lieu de s'interroger sur les besoins et attentes des apprenants, le concepteur pédagogique STAPS s'efforce de fournir les technologies les plus récentes et les plus sophistiquées, qui ne conviennent pas nécessairement aux utilisateurs finaux qui sont leur apprenants. Il en résulte que l'adoption d'une démarche qualité impose une inversion de point de vue, où la satisfaction du besoin prime sur toute forme de déterminisme technologique,..

Un tel projet ne peut être mis en œuvre sans connaître la contrainte et la motivation qui anime les acteurs pour un engagement de ce type. Il s'agit ainsi de définir l'objectif précis du projet, de se poser la question de fond : Pourquoi cette nouvelle approche de cours à distance?

Conclusion

Cette étude veut contribuer aux réformes universitaires en cours, au profit d'une politique favorisant une meilleure réactivité de l'éducation aux attentes et aux besoins des apprenants et de la société. Les résultats de l'étude montrent que la presque totalité des experts audités reconnaissent que l'on ne tient pas compte des attentes et de la satisfaction des besoins des apprenants. Ce constat remet en cause le processus de conception face aux exigences de médiation dans un contexte d'*e-learning*. On ne peut négliger plus longtemps l'apprenant, comme co-acteur incontournable du développement de tout dispositif de formation à distance ou présentielle. On ne peut pas négliger davantage l'apport de l'enseignant : son métier change, certes. Il sera amené à faire autre chose que les machines ne feront pas, comme la conception des contenus, l'évaluation, l'expertise. Déjà les enseignants d'aujourd'hui ne font pas le même travail que ceux du siècle dernier. Une fois l'enseignant libéré des tâches routinières que la machine prend en charge, la rentabilité augmente. Ce débat s'est posé de manière forte et agressive au cours des entretiens.

Il en ressort que l'*e-learning* n'est pas une fin en soi mais est complémentaire à la formation traditionnelle. Désormais, l'enjeu est de taille : il s'agit, bien sûr, de concevoir des documents de qualité, mais surtout de satisfaire les attentes des usagers exprimées explicitement ou implicitement dans leurs verbatim.

Nous recommandons aux décideurs d'intégrer tout de suite les apprenants et les enseignants dans la modélisation conceptuelle des cours à distance, et non pas a posteriori. Le dispositif technique vient comme support d'un service dédié à une cible donnée. Autrement dit avant d'imposer une solution, il faut écouter l'usager pour aboutir de manière structurée à la solution et pour satisfaire ses besoins, afin d'éviter toute complexité d'usage ou tout risque de développer un dispositif inadapté. La formation des enseignants sur tout le processus de modélisation conceptuelle d'un cours à distance en Sport, s'avère indispensable.

Il ne faut pas, non plus, négliger les limites et les difficultés de ce type d'études : qui dit enquête dit également engagement de dépenses. De fait, la préparation de l'enquête doit aussi comporter un volet financier. Car il s'agit d'expérimentations menées dans un monde universitaire avec lequel il faut interagir avant, pendant et après l'enquête.

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TYPES AND LEVELS OF UBIQUITOUS TECHNOLOGY USE AMONG ICT UNDERGRADUATES

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Abstract

Due to the chrysalis of the advanced ubiquitous technology and their capabilities in assisting students to engage and occupy with the ubiquitous learning, most undergraduates have owned an *au courant* technology and using them ubiquitously either for learning or leisure purposes. Hence, this study is to identify the types and levels of ubiquitous technology use among undergraduates from one of four Malaysian Technical Universities. This will actually represent *how* undergraduates at higher learning in Malaysia use ubiquitous technology and the level of use of ubiquitous technology. This will assist the university's administration in preparing a path towards implementing a ubiquitous learning environment at the university. The data of this study is gathered through a 5 point-Likert scale questionaire, with the reliability of 0.819 for levels of use and 0.901 for types of use. The sample is undergraduates studying at Information, Communication & Technology Faculty and statistical analyses of data collected are performed by SPSS 17. Results show that majority of the students is at routine level of ubiquitous technology use (mean = 2.74, SD = 0.484), meanwhile, the central type of ubiquitous technology use is for inquiry and general use, followed by communication use, expression use and construction use.

Keywords: Ubiquitous Technoloy; Types; Level of Use; ICT Students;

Research Background

In this techno-centric world, there just doesn't seem to be one perfect technology for young people including students either for learning or leisure purposes. Some want to carry only one device around, in which case a multi-functional mobile phone is the best bet. Others want to watch movies on a larger screen, which means a different type of technology is called for. There are a number of different technologies are being used by students which including web-enables wireless phones (e.g., smart phones), web-enabled wireless handheld computers (e.g., tablet), wireless laptop computers and Personal Digital Assistants (PDAs). However, the most often technologies used in learning environments are wireless laptop computers, smartphones and tablet (Shin, et al., 2011; Robert, 2011; Russ, 2011; Yalk, 2010 & Wai, 2008)

The types of use of ubiquitous technology either for learning or leisure purposes will open to a thousand possibilities for the students, in creating an open environment and connecting classes around the world and providing more individualized instruction for students (Lei, 2010). Nevertheless, to integrate technology into educational system is not a small task. Starting with the infrastructure, and then working its way through the possibilities and challenges and finally to understand the acceptance and its impact on learners (Weiser, 1993).

Furthermore, technology can help facilitate the knowledge-constructed classroom. A number of researchers (e.g. Young, 2011; Lei, 2010; Zoraini et al, 2009) view technology such as a smartphone and laptop as influential technology that may affect teaching and learning outcomes. They stated that with the use of these technologies, learning environment would focus more on student-centered and individualized learning. In the student-centered learning environment, with the aid of the relevant technology as aforementioned, students are able to collaborate, use critical thinking, develop certain generic skills like lifelong learning skills and find alternatives to solutions of problems (Dewey, 1943).

Researches done by Levin (1997) and Zoraini (2009) indicated that technology like laptop can be used in collaboration for all subjects' areas, such as in engineering, technical, ICT, even in social science field. However, educators have to take into account the different styles of teaching, the involvement of students in learning and importantly the suitable technology to be used as a central mediator during instruction. This type of teaching requires a change in educators’ method of teaching and learning, the amount of time needed to learn how to use the technology and the location of models that work with technology. Meanwhile, (Resnick, 2009) posit:

“…that digital technologies an enable students to become more active and independent learners. The Internet will allow new “knowledge-building communities” in which students and adults from around the globe cab collaborate and learn from each other. Computers will allow students to take charge of their own learning through direct exploration, expression and experience. This shifts the student’s role from “being taught” to “learning” and the educators’ role from “expert” to “collaborators” or “guide” (p. 1).

As the development of technology fast-pace, the number of technology sold at the market was sky-rocket as they offered a reasonable price, so the buying power among undergraduates will also increase, therefore the importance of ubiquitous technology in educational system and integration was magnified. There were many opportunities in using ubiquitous technologies in the classroom; from connecting classes around the world to provide more individualized instruction for students, engage and occupy students with the system and active learning environment while in or outside classroom environment. These tools had become a learning tool for undergraduates constantly on the move and being ‘on’ and networked all time. Although more than half of the undergraduates have not familiar with ubiquitous learning, yet they had an excellent perception of the benefit of the related technologies and without their knowing the technologies support that type of learning are already within their vicinity, very close to them.

Levels of Technology Use

The Level of the Use of the Innovation (LoU) is a concept described in the Concerns-Based Adoption Model (CBAM) by Gene (1975). In line with this study, the LoU dimension describes various behaviours of user in using ubiquitous technology. LoU will represent how ICT undergraduates perceive the use and ease of ubiquitous technology in their daily life either for learning or leisure purposes. There are eight discrete levels that individual may demonstrate, namely, (1) Non-use level; a state which a user has a little or no knowledge of the innovation and no involvement with the innovation. (2) Orientation level; a state in which a user has recently acquired information about the innovation and has recently explored its value orientation and its demands upon user and user system. (3) Preparation level; a state in which the user is preparing for the first use of the innovation and then makes a decision to use the technology by establishing a time to begin and start using the technology. (4) Mechanical use; a state when user focuses most effort on short-term, day-today use of the innovation with little time for reflection. (5) Routine use, a state which user’s use of the innovation is stabilized and only a little preparation or thought is being given in improving technology use or its consequences. (6) Refinement use; a state where user varies the use of technology to increase the impact within immediate sphere of influence. (7) Integration level; where user is combining own efforts to use technology with related activities in order to achieve a collective impact within their common sphere of influence. Finally, (8) renewal stage; where user re-evaluates the quality of use of technology, seeks major modifications of or alternatives to present technology as well as explores new developments in using technology.

Therefore, by defining the level of technology use will greatly increase the probability that the phenomenon of technology use can be understood and measured validly and reliably. At the same time, this concept helps researcher to assess ICT undergraduates in higher learning in terms of the perceptions’ levels of ubiquitous technology use, and to select appropriate intervention strategies and tactics to facilitate their growth in the use of ubiquitous technology while minimizing the trauma of change.

Types of Technology Use

The meaning given to technology and the development of technology-practices gives rise to a continuous cycle of innovation through use. Technology will not conform to any particular user but, rather, users acquire technological essence only when their envision or act towards the technology as a means of accomplishing something (Schlosser, 2002). This implies that although technology themselves are continually evolving; it is the actual use that people put in the technology to which will determine if the technology are truly innovative. From this line of thought, there is a need to find out more about how ICT undergraduates use technology, so the both positive and negative outcomes of its use can be determined. Therefore, for this study, the use of technology refers to the purpose of using ubiquitous technology and been categorized into four categories namely; i) technology for inquiry and general use, ii) technology for communication use, iii) technology for expression use and iv) technology for construction use.

1.3.1 Technology for General Use and Inquiry

According to *Dewan Bahasa dan Pustaka*, Information and Communication Technology encyclopedia (2010), the term general use of technology refers to a common use for certain technology; or a common action that apply by user in using certain technology which not being modified for a particular purpose or function. Meanwhile, according to (Lei, 2010) technology for general use is a technology uses that can be applied or use to any content area and for general purposes. Meanwhile, technology for inquiry is defined as the use of technology for learning purposes especially in the academic world.

1.3.2 Technology for Communication

In ubiquitous learning environment, the use of technology for communication is more compare to face-to-face instruction. The variety of communication options may help students to feel engaged in the learning process through a sense of connectedness, and this is possible with the affordance of ubiquitous technology. The connectedness comes through the immediacy and interpersonal nature of online communication. Face-to-face instruction in a traditional classroom is often public communication, conversely online interaction is more similar to interpersonal communication than other types of communication (Wang, 2009). This interpersonal nature is what gives the potential for informal and personal communication in these learning situations.

1.3.2 Technology for Construction

Technology for construction was defined as using ubiquitous technology for learners to develop new ideas, products and even projects prior to their existing knowledge and achievement in academic context. However, the ideas, products and projects are not being developed for grading purposes. It is for the sake of expressing their personal feeling and fulfilling their leisure time with something good.

At this stage- construction; user puts the elements of usefulness and effectiveness together to form a coherent by reorganizing, constructing and creating new ideas using ubiquitous technology. Users are able to express themselves and produce product(s) of their own (e.g. drawing, music and video) outside the context of formal learning with the affordance of ubiquitous technology, as supported by (Tapscotts, 2010; Lei, 2010).

1.3.4 Technology for Expression

Technologies can also be used as media for learning through expression. The online journaling, for example, engages students' intra personally. Students whose blogging, seem to share the feeling that their communication allows them to develop self-identity and expression (McCullagh, 2008). On top of that, although blogging is somehow categorized and serves as social purposes, it often functions as a tool for sharing personal thoughts and feelings with others too. Particularly interesting for students is the potential of blogging to enhance opportunities to use and express their own voices to speak their stories in a public realm. While this is often done after gathering and later constructing the ideas or original thought together.

2. Research Problem

In Malaysia, the inclination towards mobile technology (including smartphone, laptop and handheld technology) has penetrated to 106 percent compares favourably to Southeast Asia's which is 76 percent. Plus, about 85.1% of Malaysians are using mobile technology and has placed Malaysia in the third position, only behind Singapore and Thailand (MCMC, 2010). More surprisingly, the highest mobile technology usage was recorded among youth between 20 and 24 years old (The Nielsen Mobile Insights Malaysia, 2010) and majority of them were the local undergraduates. Therefore, this has shown a good sign for the successful of the implementation of ubiquitous learning environment in Malaysian's higher learning as the technologies are already within the students' vicinity.

Next, the discussions in the field of technology in education concern a host of issue, including a pedagogical theory, methods of use and effectiveness. However, in many cases these debates leave unexamined some fundamental issue about how and why *these* technologies are being used.

According to Zhao (2007), technology was often examined at a very general level and treat technology as an undifferentiated characteristic of schools and higher institutions. Technologies may have different impacts on students' outcomes, even the same technology can be used differently in various contexts to solve all kinds of problems and thus have different meanings in different settings. Finally, most studies focus on the impact of the quantity of technology use, in other words, *how much* or how frequently technologies are used, but ignore the quality of technology use, that is, *how* technology is used.

Therefore, this study sought to determine the levels of technology use based on LoU concepts and at the same time the level of use of ubiquitous technology which based on the five categories. These categories based on the natural impulse of a child proposed by John Dewey (Dewey, 1943): inquiry, communication, construction and expression and also adapted from Levin & Bruce (2001) for general use.

3. Research Objectives

The objectives of this study were to determine:

The types of ubiquitous technology use among ICT undergraduates.
The levels of ubiquitous technology use among ICT undergraduates.

4. Methodologies & Instruments

A survey was carried out on total sample of 250 ICT undergraduates at one of Malaysian Technical universities. However, only 80 sets of questionnaires were being fully completed by the respondents. Respondents answered on a five-point Likert type scale (1=strongly disagree, 2=disagree, 3=neutral, 4= agree, 5=strongly agree). The questionnaire was divided into two parts. The first part collected the student's demographic information such as gender, race, and technology ownership. The second part of the questionnaire was divided into another three sections. (Section A: Attitude, Belief and Interest in Ubiquitous Technology, Section B: Levels of use of Technology and Section C: Types of use of Technology). However, in this paper the researcher will discuss on the analysis done on Section B and C only; which are the levels and types of technology use of ubiquitous technology.

5. Data analysis

5.1 Reliability Test

For this study, the reliability of the items in the instrument was conducted as it increased the likelihood of success and also developed and test adequacy of research instruments (Edwin, 2001). The reliability test was conducted to 35 of 1st year ICT undergraduates in order to find the consistency of scores or answers provided by an instrument before embark to the real study. From the analysis, the instruments' reliability was r= 0.819 for levels of use and r= 0.901 for types of use. Therefore, the overall reliability of the instrument was satisfactory.

5.2 Demographic Profiles of the Students

The demographic profiles of the sampled students were based on 3 variables, which included gender, program/faculty and ownership of ubiquitous technology. In this research, 46 (57.5%) were male and 34 (42.5%) were female of the 3rd year undergraduates from Information & Communication Technology faculty. The selection of the targeted sample was done according to the list of students' matrix number obtained from the administration of the respective university.

On the technology ownership result, almost of the respondents own a laptop and more than half own a smartphone. Meanwhile, Tablet PCs was not a favourite technology among respondents as only few of them own it where only 9 out of 80 own a Tablet PCs. However, this did not mean that they were not exposing to the use of latest technology, as the respondents might had another technology that complement their learning in the university.

Item	**Frequency /Percentage**	
A. Gender		
Male	N= 46	(57.5%)

Female	N= 34	(42.5%)
B. Program		
Information Technology	N= 80	(100%)
C. Technology Ownership		
Smartphone	N= 51	(63.8%)
Laptop/netbook	N = 70	(87.5%)
Tablet PCs	N = 9	(11.3%)

Fig. 1. Demographic profile

5.3 Types of Technology Use

According to table 1, there were four types of use that obtained mean of 4.00 and above, namely; technology use for completing assignment (mean = 4.44, SD= .691) and downloading notes (mean = 4.29, SD= .834), which felt under the inquiry category. Meanwhile, online chatting; which felt under communication category (mean = 4.18, SD= .808) and as a medium to save file; general category (mean = 4.04, SD= .787). Result also showed that, students shared ideas and willing to express their thoughts by posted online comments and use ubiquitous technology for capturing and recording, both were at (mean= 3.90, SD= .922 and .821).

Students also used ubiquitous technology for analyzing data, such as; using a spreadsheet, building graph and also collaborating with certain software in certain courses while in the university. Then, the usage of ubiquitous technology was not limited to inquiry purposes only, but been used for entertainment and expression too, such as for playing online games (mean= 3.73, SD= .871). Finally, from the table, result showed that the least types of technology use was for construction purposes; like constructing music (mean = 3.45, SD= .884) and creating new innovation (mean= 3.14, SD= .781). This had shown that, the usage of ubiquitous technology for higher thinking order was still at moderate level among ICT undergraduates and perhaps was limited due to their competency in using the ubiquitous technology.

Purposes	***Mean/ SD***	***Category of Technology Use***
Complete assignment	4.44 / .691	Inquiry
Download lecture notes	4.29 / .834	Inquiry
Online chatting	4.18 / .808	Communication
Medium to save files	4.04 / .787	General
Post comment online	3.90 / .922	Expression
Capture and record picture	3.90 / .821	General
Reading online books/newspaper	3.86 / .848	Inquiry
Watch live broadcast	3.84 / .863	General
Find location of friends and family	3.83 / .903	Communication
Analyze data	3.81 / .797	Inquiry
Play online games	3.73 / .871	Expression
Personal diary	3.49 / 1.029	General
Construct music	3.45 / .884	Construction
Express feeling in blog	3.41 / .951	Expression
Online shopping	3.19 / 1.057	Construction
Create new innovation	3.14 / .781	Construction

Fig. 1. The Technology Use

4.4 Levels of Ubiquitous Technology Use

According to table 2 below, majority of the students (n=30, 37.5%; female-18 and male-12) were at level routine. At this level, in term of knowledge-wise, students knew both short and long term requirements for use and how to use them with minimum effort or stress. Therefore, most of them used ubiquitous technology smoothly with minimal management problem. Meanwhile, in term of pattern use, there still a little variation applied to the use of ubiquitous technology. The second largest group was at orientation level (n= 20, 25%; female-4 and male-16). At this level, students discerned general information about ubiquitous technology they owned such as its origin, characteristics and requirements. However, they were still exploring the ubiquitous technology and their requirements by talking, reviewing, gathering information and observing others using it. Lastly, the least number of respondents (n= 1, 1.25%; male-1) felt under the highest level of use; a renewal level where student was able to explore others technology that could be used in combination with or in place of the present technology he/she owned, in an attempt to develop more effective means of achieving good outcomes, especially in learning.

Therefore, in this study, finding indicated that the level of technology use of ICT undergraduates was at routine level, although there was only a little preparation or thought being given in improving ubiquitous technology use and its consequences, the use of ubiquitous technology among them was still at stabilized level and satisfactory; (mean = 2.74, SD = 0.484).

Level of Technology Use	Frequency & Percentage
Non-use	Female (n= 1) Male (n= 2)
Orientation	Female (n= 4) Male (n= 16)
Preparation	Female (n= 1) Male (n= 4)
Mechanical Use	Female (n= 4) Male (n= 6)
*Routine	Female (n= 18)* Male (n= 12)*
Refinement	Female (n= 2) Male (n= 4)
Integration	Female (n= 3) Male (n= 2)
Renewal	Male (n= 1)
Total	**80**

Fig. 2. The Levels of Technology Use

4. Conclusion and Recommendation

The study found that the type of technology use attempted by majority of ICT undergraduates was for inquiry purposes and perceived the ubiquitous technology as a useful technology that might help them to attain gains in their job performance especially for learning purposes. Meanwhile for the level of use, majority of them were at the routine level, where they used the ubiquitous technology smoothly with minimal management problem.

However, a in depth research is required, in order to investigate on the factors that influence the levels of use of ubiquitous technology among ICT undergraduates and find out what are others significant moderators that discriminate the levels in using technology. More efforts are needed to determine the students' actual use of ubiquitous technology and propose a framework that relatively portrayed ICT or perhaps undergraduates from all fields.

Acknowledgements

The research for this article is funded by Ministry of Higher Education of Malaysia (MOHE) and Universiti Teknikal Malaysia Melaka (UTeM). Any findings, conclusions and recommendations expressed here-in are those of the authors and do not necessarily reflect the views of funding agencies.

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UNDERSTANDING E-LEARNING SYSTEM USAGE BEHAVIOR: AN EVOLUTIONARY PSYCHOLOGY PERSPECTIVE

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Abstract

E-learning has been used very widely to offer solutions in higher education in accordance with the demands of the knowledge-based society. This study aimed to generally explain e-learning systems usage behavior in any country and region. From an evolutionary psychology perspective, two important evolved psychological traits (i.e., least effort and social interaction) were explored for their impacts on students' decision making towards e-learning systems. Based on these two psychological traits, a new theoretical framework was developed to propose two relationships linking e-learning system usage and both least effort and social interaction. Propositions were further interpreted with qualitative data collected by the Zaltman Metaphor Elicitation Technique within an e-learning context. Both propositions are supported with collect data from research participants.

Keywords: e-learning , evolutionary psychology, least effort, social interaction, cognitive effort

Introduction

In step with the development of information and communication technologies (ICT), Internet applications such as the Web, e-mail, video conferencing, and virtual reality are commonly applied in the field of higher education. Since Internet based e-learning systems can help educational programs across borders of time and space, they are rapidly becoming an integral part of the teaching and learning process (Pituch and Lee, 2006). Therefore, e-learning is nowadays a widespread technology of producing higher education in universities. Recent studies and statistics indicate that there is a significant growth of utilizing e-learning for delivering of their courses, both on campus and at a distance (Anastasiades et al., 2008; Shee and Wang, 2008). For example, Ozdemir and Abrevaya (2007) found that technology-mediated education had spread rapidly among U.S. higher-education institutions between 1997 and 2000, those offering at least one technology-mediated course increased from 59% to 74%. Various authors have described the growth of e-Learning in higher education as explosive, unprecedented, amazing and disruptive (Garrison et al., 2003; Huynh et al., 2003).

The amount of investment in e-learning systems has been substantia. Despite the emerging trend of using e-Learning systems to facilitate teaching and learning activities, the user acceptance rate of e-learning systems is not increasing as high as expected (Ma et al., 2005). E-learning courses have been argued that have a high rate of dropouts in comparison with traditional on-campus courses (Murray, 2001; Bauman, 2002; Lorenzetti, 2002). Besides, it is documented that online learning is not always effective and sometimes fails to meet learning objectives (Xu and Wang, 2006). These phenomena have attracted much attention of practitioners and researchers to question what the effectiveness of such e-learning projects are and what factors may influence the learner adoption of e-learning. While many scholars have studied various factors that may influence acceptance of e-learning systems, there have been few attempts to extend our understanding of evolved psychological traits in e-learning context. As evolutionary psychology builds on ideas in human evolution, it has been employed by researchers to explain emerging phenomena of information system implementation (e.g., Kock, 2004; Kock, 2005; Kock, 2009). Previous studies have indicated that lots of evolved psychological traits appear in modern humans and affect human behavior toward modern technologies (Bickerton, 1990; Buss, 1995, 1999). For instance, Kock et al. (2007) compared the difference of learners' perception between traditional face-to-face learning and online learning with the evolutionary psychology perspective. Evolutionary psychology has played an increasingly foundational role in obtaining better understanding toward human perceptions and behavior. Hence, it is important to conduct a theoretical model which goes deep into the workings of the human mind and

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takes into account the social aspects of decision making in e-learning systems. For obtaining deeper insights of learners, the purpose of this study is to generally explain e-learning systems usage behavior based on evolutionary psychology. An interpretative approach by means of qualitative method with the Zaltman Metaphor Elicitation Technique (ZMET) was conducted to a University context.

Theoretical framework

The evolved psychological traits, least effort and social interaction, are the basis for the development of theoretical propositions for understanding e-learning system usage behavior. As shown in Fig 1, the construct of e-learning system usage has a positive relationship with both least effort and social interaction. The definitions of least effort and social interaction are described in this section.

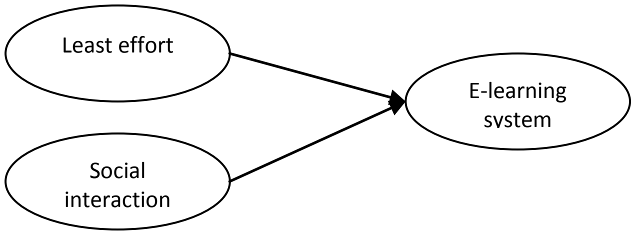

Fig. 2. The consensus map of research participants

Evolutionary psychology

Evolutionary psychology is inspired by Darwin's work and applies his ideas of natural selection to the mind. Darwin's theory of evolution of species by natural selection provides a theoretical basis for functional analyses of human behavior (Darwin, 1859). Darwin postulated that if variant traits could be inherited by offspring from parents, then those traits that helped an organism's survival and reproduction would be transmitted to future generations at greater frequencies than alternatives (Confer et al., 2010). From this point of view, complex aspects of human behavior and experience, including language, memory, and consciousness, all evolved because of their adaptive fitness (Buss, 1995).

The goal of evolutionary psychology is to study human behavior as the product of evolved psychological mechanisms that depend on internal and environmental input for their development and expression in manifest behavior (Confer et al., 2010). The perspective of evolutionary psychology views the mind as a collection of psychological adaptations (Friedenberg & Silverman, 2005). Types of psychological adaptations include language acquisition modules, incest avoidance mechanisms, cheater detection mechanisms, sex-specific mating preferences, foraging mechanisms, kin-recognition mechanisms, and so on (Pinker, 2002; Durrant & Ellis, 2003; Buss, 2004; Tooby & Cosmides, 2005). Psychologists have applied Darwin's theory in explaining how the human mind evolved to benefit the individual. Key developments in evolutionary theory, such as understanding altruism and cooperation (Hamilton, 1963; Trivers, 1971), and emphasizing individual selection (Williams, 1966), were particularly relevant for establishing a more sophisticated analysis of human behavior. Since evolutionary psychology supports a new approach to studying human behavior by explaining how the mind is programmed, it has gradually grown to occupy a central place within psychological science.

Evolved psychological traits

Evolutionary psychologists consider that all psychological traits are adaptations. Adaptations are so-called because they modify their possessors in a beneficial way. As adaptations are beneficial, their possessors will be fitter than those lacking the adaptation, and over time, all members of the population will possess the adaptation. The purpose of evolutionary psychology is to study human behavior as the product of evolved psychological traits. Most evolutionary psychologists believe that behavioral traits are largely inherited through our genes and are the result of complex interactions, between genetic and environmental influences. Much human behavior proceeds in accordance with those psychological traits that evolved to solve recurrent problems in human ancestral surroundings (Kock, 2009). Psychological traits encompass the mental capacity for acquiring language, or the capability to infer emotion by looking at a human face, or the ability to work together, or even the universal fear of snakes and spiders: they are viewed as the foundation for how humans behave. Lots of evolved psychological traits are stored in modern humans, and likely manipulate our behavior toward modern tasks/technologies (Bickerton, 1990; Buss, 1999).

For developing a theoretical model to explain e-learning system usage behavior, two important evolved psychological traits (i.e., least effort and social interaction) of human behaviors were investigated.

The principle of least effort

Largely human behaviors occur in the context of space and time. Humans are inclined to spend the least effort to accomplish their objectives in common, that is to say, humans will naturally choose the path of least resistance or effort. Least effort is not laziness, but instead applauds the foresight of the individual for achieving the objective while saving time and energy. For example, one might consult a generalist co-worker down the hall rather than a specialist in another building, as long as the generalist's answers were within the threshold of acceptability. The natural tendency to spend least effort is so strong that most of the technologies, products and services are aimed at helping people do just that: minimize the effort! For instance, Amazon's "1-Click" made the online shopping experience even more easy and convenient. If one customer clicks the "Buy now with 1-Click" button on any product page, his or her order will be automatically charged to the default payment method and shipped to the default address. Also, current e-learning systems are designed to support lots of functions which could reduce learners' efforts such as allowing part time and off-campus students more easily to obtain course information, announcements, and to check their grades than traditional face-to-face learning does.

The principle of least effort has been analyzed and applied within many fields such as psychology, linguistics, geography, sociology, information retrieval, information systems, and international relations. In library literature, the principle of least effort is a crucial factor that affects whether an information retrieval system will be used by users or not (Chrzastowski, 1995). If a system is not easy to use, users may feel bothered to use it.

Social interaction

The human pattern of survival has been, throughout human evolution, a social one. The most striking characteristic of Homo sapiens is our sociality. According to Simmel (1908), individuals engage with one another and thereby constitute the social. Society is not just the sum total of individual acts, but refers to individuals interconnected through social interaction. Society exists where a number of individuals enter into interaction (interaction is the key to everything with Simmel). The existence of society requires a reciprocal interaction among its individual elements, mere spatial or temporal aggregation of parts is not sufficient. The survival of the human species depends on social abilities to communicate with, understand, and work with other individuals (Cacioppo et al., 2005).

Social interaction has been mentioned in diverse fields. In the pedagogy research, it is defined as "the degree of contact and educational exchange among learners and between learners and instructors" (Piccoli et al., 2001). Since high levels of interaction can ease the feelings of isolation, anxiety, and confusion, it has long been a critical component of the educational process and context (Anderson, 2003b). Garrison (1990) also argued that the quality and integrity of the educational process depends upon sustained, two-way communication.

Method

It is argued that many of the evolved natures influencing our behavior are below our level of conscious awareness (Kock, 2009). For understanding users' actual thoughts toward IS usage, ZMET, a qualitative methodology, was selected for testing the proposed theory and propositions. The rationale for using ZMET to collect and analyze data is that the ZMET process of thinking about and searching for images is able to bring hidden, unconscious thoughts to the surface (Zaltman & Coulter, 1995). The ZMET method provides opportunity for researchers to look at the phenomena in more varied and deeper ways than is possible through other traditional qualitative methods.

Collecting data with ZMET

According to Zaltman (1996), the ZMET steps are described here. Firstly, approximately one week prior to the interview, each recruited participant is contacted and given a set of instructions. Researchers should ask recruited participants to select 8-10 pictures that represent their thoughts and feelings about a given topic. This process is to uncover deeply held, often unconscious, thoughts and feelings inside participants' minds. Secondly, respondents participate in depth interviews conducted by interviewers who are trained in the ZMET methodology and experienced in conducting ZMET interviews.

A total of twelve participants were recruited to participate in this study. Each participant underwent the whole ZMET steps. These steps provided a different opportunity for gaining a deep understanding about students' perceptions. The use of multiple steps also increased the likelihood of uncovering an important idea that might be missed by more narrowly focused techniques. Each ZMET interview was a one-on-one discussion which was digitally recorded and lasted approximately two hours. During the two-hour interview, the core steps in the ZMET method are summarized. They are described below (Zaltman, 1997):

Storytelling: Provided participants with an opportunity to tell their stories. Participants brought eight to ten images and described how each of their pictures related to the e-learning system which they used.

Missed issues and images: Participants described any issues for which they were unable to find a picture to obtain and explain their relevance.

Sorting task: Participants were asked to sort their pictures into meaningful piles and to provide a label or description for each pile.

Construct elicitation: The laddering technique was used to elicit basic constructs and their relationships. Participants' pictures served as stimuli.

Most representative picture: Participants were asked to indicate a picture which most represented their feelings.

Opposite images: The interviewer asked participants about pictures that might describe the opposite of the task they were given.

Sensory images: Participants were asked to use other senses to convey what did and did not describe the taste, touch, smell, sound, color, and emotion of the concept being explored.

The summary image: Participants created a summary image, using scissors to cut photos.

The vignette: Participants were asked to create a story or short imaginary video that communicated important issues related to the topic under consideration.

Consensus maps: The researcher created a mental model (a map or a causal model) for each participant. All the participant s' mental maps were then merged to form a consensus map.

Taped conversations of all participants were transcribed and the transcripts were analyzed to collect concepts that they used to describe their feelings and thoughts. Participants' feelings, thoughts, and behaviors were analyzed based on the means-end chain theory. A means-end chain links attributes of the e-learning system, consequences of these attributes to participants, and the personal values that the consequences reinforce. Next, each participant's transcripts were read to discover the relationships between attributes, consequences, and values. A participant's sequence of attributes, consequences, and values (A-C-V) is called a means-end chain and represents a perceptual orientation of decision criteria. Finally, a serious of A-C-V chains were merged together to derive individual mental models and the aggregate consensus maps of two groups.

Research participants

Data were gathered from students who took part in an e-learning system offered by a university in Taiwan. Based on the ZMET approach, twelve qualitative interviews, including twelve students who were juniors or seniors and had highly participated in e-learning systems, were conducted. The students utilized a blended e-learning system.

All of the participants were instructed to gather eight to ten pictures that represent their thoughts and feelings about the e-learning system which they used. Those pictures could come from any source, including photographs, magazines, books, newspapers, or catalogues, and the instructions were given seven to ten days prior to the interview. All participants were contacted one or two days before their interview to confirm their understanding of the task and the whole process, and each interview took approximately two hours in a quiet room and were recorded.

Data Interpretation

This study adopted the qualitative methodology, ZMET, to elicit participants' feelings and thoughts toward an e-learning system. The elicited data (transcripts and consensus maps) were used to interpret propositions in the new developed theoretical framework.

Once all of the interviews with the ZMET were completed, one consensus map was then produced, as shown in Fig 2. A consensus map represents the main concepts identified by participants and the linkages between the concepts as reflected in their interviews. The consensus map resulted from the linkages between system attributes, usage consequences, and personal values. These linkages are the mental connections that link the different levels of knowledge (Reynolds et al., 1995). Attributes are features or aspects of an e-learning system. Consequences (functional or psychosocial) are generated from using an e-learning system. Functional consequences accrue directly from using the system. Psychological consequences reflect the personal and social outcomes of system usage. Value refers to the personal values or beliefs, which are strengthened or satisfied by the consequences.

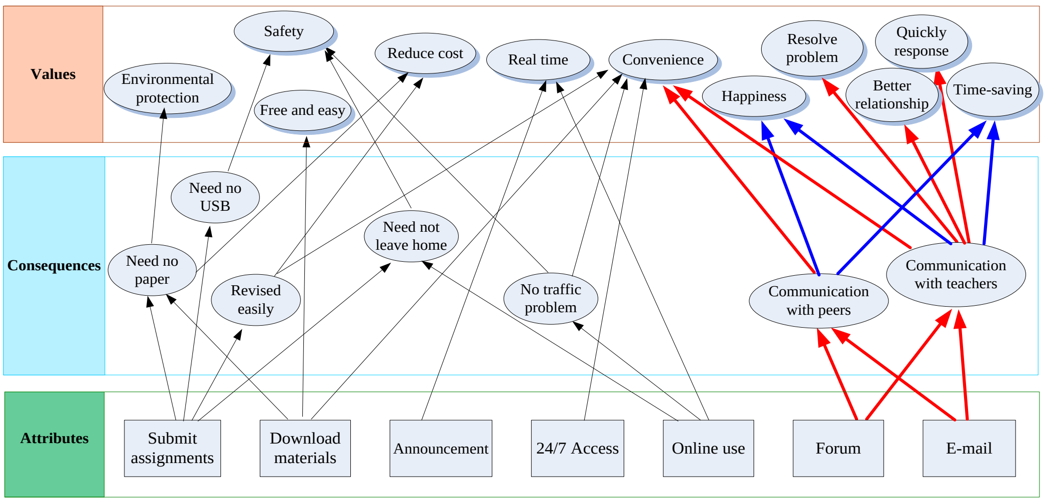

Fig 2 The consensus map of research participants

Based on the consensus map and transcripts derived form all participants' interviews, Proposition 1 was supported by the transcripts of the 7 participants, including P01, P06, P07, P08, P09, P11, and P12, as demonstrated as follows.

P01: I can send an e-mail to my teacher to solve my questions without being limited by his office hours. This outcome made me feel the value of time-saving.

P06: Just having a computer connecting to the Internet, online learning is not limited by time and place. I feel very convenient.

P07: I can send e-mails to teachers and they can directly give responses to me. Thus, I can obtain timely feedback from teachers.

P08: I can ask teacher some questions, and wait for responses from teachers. I am also able to discuss homework with teachers on the e-learning system. It's very convenient.

P09: I consider the e-learning system as a convenient platform for it permitting real-time communication among teachers and students. It is not easy to look for teachers because …, but we can contact teachers on the e-learning system.

P11: Students can discuss with teachers on the e-learning system. It is convenient and easy to further communications with teachers.

P12: The e-learning system offers a communication platform for teachers and students, thus it can improve interactivity. Students therefore are not necessarily looking for their teacher at school.

Proposition 2 was supported by the interview transcripts of P03, P05, P06 and P07, as shown as follows.

P03: If teachers fully utilized the e-learning systems, the relationships between teachers and students will be closer.

P05: On the e-learning platform, I can share information with teachers and peers, thus I feel so happy.

P06: I am able to contact with my teacher by e-mail on the e-learning platform. Moreover, if I have questions, I can ask teachers on the e-learning systems and then solve problems quickly.

P07: E-learning is an interactive system. Teachers and students can communicate with each other and improve their relationships via the forum and e-mail.

Conclusions

As discussed earlier, the principle of least effort argues that humans will act by way of minimizing their potential average workload or effort. According to equity theory, individuals will assess whether a change is favorable or unfavorable to them by evaluating whether the change in inputs (e.g., cognitive effort, time, anxiety) and outcomes (e.g., power, satisfaction, advancement) is fair or equitable for them (Joshi, 2005). Thus, perceived cognitive effort played an import role for better comprehension on the subject of human behavior. Social interaction refers to the nature and process of communication among humans; and it is recognized as the elementary process in all social organizations (Turner, 1988). Accompanied with the marked development of information and communication technologies, it is not surprising that Internet applications such as the e-mail, video conferencing, and social networking are commonly applied in assisting massive interactions between one human and another.

Based on evolutionary psychology, this study conducted an in-depth investigation toward e-learning usage behavior; and then developed a theoretical framework which consisted of three fundamental, generic variables – social interaction, least effort, and usage. The analytical results supported two propositions of our theoretical framework. That is, the usage of e-learning systems has relationships with perceived least effort and perceived social interactions. According to participants' consensus map, communicating with peers and teachers (i.e. social interaction) via e-learning platform result in perceived convenience, happiness, better relationship, and problem solving. Additionally, the principle of least effort is illustrated by participants as free and easy, cost saving, time saving, and convenience. These perceived values contribute to the learners' behavioral intention to use the e-learning system.

The findings of this study are consistent with past research. For example, Hara and Kling (1999) found that when students perceived that instructors did not respond in a timely manner, they felt discouraged and hindered in their participation. Lack of timely feedback from instructor can result in learners' ambiguity about their performance in the Web-based course and can contribute to their frustration. The confirmation of the relationships in our research framework suggests that education institutions encountering e-learning usage problems could consider how to enhance interaction with peers or teachers and how to improve learners' cognitive adaptation in order to reduce users' cognitive efforts.

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USE OF EDUCATIONAL MATERIALS IN SLOVENIAN SECONDARY TECHNICAL EDUCATION: THE PERSPECTIVES OF TEACHERS AND STUDENTS

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Abstract

In this paper we present some general didactic definitions of educational materials and emphasize that in relation to the teachers planning and conducting classes educational materials are educational means, in relation to pupils they are educational sources. The second part of the article presents some empirical findings from the research on the use of educational materials by the teachers and pupils of three programmes of secondary technical education in Slovenia. One of the key findings shows a pronouncedly marginal position of workbooks in Slovene secondary technical education: teachers and pupils only very rarely use them.

Keywords: educational materials; textbooks; workbooks; secondary technical education; didactic transformation and reduction; usage of materials

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Introduction

Didactic or educational materials are undoubtedly one of the key factors which heavily influences the quality of any educational process, be it in elementary, secondary or tertiary education (cf. Ball & Cohen, 1996; House & Taylor, 2003; Chingos & Whitehurst, 2012; Kovač & Kovač Šebart, 2004). The reason for that is evident: among teachers, who play the most crucial role in every class, the transmission and gaining of knowledge significantly rely on educational media and textual media in particular. In didactic theory educational materials are mostly defined as the materials that teachers can use during educational process as *educational means*, whereas the pupils gaining or revising knowledge can use these materials as *educational sources*. In this manner, Oladejo, Ojosunde, Ojebisi & Isola (2011) emphasize that "instructional materials perform such functions as the extension of the range of experience available to learners, supplement and complement the teacher's verbal explanations thereby making learning experience richer and providing the teacher with interest into a wide variety of learning activities." (Ibid., p. 121) In addition, these are also the functions of instructional materials that encourage student's motivation for learning and their capabilities for self-regulated learning. According to Radovan, "students who self-regulate their learning have higher levels of self-efficacy, are confident in their abilities (positive attributions) and more internally motivated." (Radovan, 2011, p. 216)

In the first part of this paper we will briefly discuss what makes *educational* materials different from other printed, electronic, art and similar materials which do not have the "status" of educational materials. The second part of the article will present some conclusions based on the empirical research into the use and characteristics of educational materials carried out by the Institute of the Republic of Slovenia for Vocational Education and Training on the sample of 370 teachers and 552 pupils of three programmes of secondary technical education (the economic technician, the mechanical technician, the health care programme).

Between scientific and educational contents: the necessity of appropriate didactic transformation and reduction

The specific difference between *educational* materials and other materials is the very consequence of the process of the didactic transformation and reduction of scientific and specialized contents. This process occurs so as to make the materials appropriately structured, rewritten and simplified. That is of significant importance due to the fact that educational materials, particularly textbooks, "are the main link of connection not only between the teacher and student, but also between what is called the purpose and effect, as they seek to translate the principles of a proposed curriculum – which is a translation of more general goals of education and a vision of science and technology – in content and activities that can be assimilated by students." (Cardoso, Cristiano and Arent, 2009, p. 2)

According to Strmčnik, one of the most renowned Slovenian theorists in the field of general didactics, didactic transformation and reduction occurs at three levels: (1) at the level of goals and objectives, (2) at the level of the scientific system, and (3) at the levels of educational contents (Strmčnik, 2001, pp. 237–238). To a certain degree, this conclusion can be applied to the area of the preparation of educational materials as well. At the level of goals it has to be noted that science and the educational process do not share their intentions or goals. Science is primarily oriented towards new discoveries, facts, laws, etc. (in other words, the *production* of "the truth"). The main task of the school and the educational process, however, is *passing on* the already produced knowledge and *use* it to achieve educational goals.

Subsequently, *the didactic system is not a micro-model of the scientific system*, and *educational materials are likewise not micro-models of scientific studies*. The very transformation of the scientific system into the didactic one is the most sensitive, because it demands the so-called didactic reduction – i.e. the simplification, abridgement and selection of scientific contents, logic, terminology, methodology and suchlike. In other words, in spite of the demand for the didactic reduction and transformation, it remains necessary for educational contents to be structured and for pupils to see the logic of the relationships between ideas and concepts.

The didactically reduced and transformed scientific and professional contents in educational materials therefore have to avoid both traps: on the one hand, the trap of the automatic copying of the whole corpus of scientific and professional knowledge and structures into educational materials (e.g. textbooks), and on the other hand, the equally dangerous trap of inappropriate reduction, which could render educational materials as educational sources for pupils non-functional. To put it otherwise: the performance of the formative function of educational materials depends on their being properly "informative" (i.e. possessing contents quality and richness). This of course importantly affects the usefulness of educational materials and consequently the decisions made by teachers and students whether they will choose a particular educational material for instruction and learning or not.

Some results of empirical study: how often do teachers and pupils use various didactic materials and what do they think of their usefulness?

In the spring of 2010, a survey by the Institute of the Republic of Slovenia for Vocational Education and Training was carried out among the pupils and teachers of three selected educational programmes in order to find out (a) how often they use various educational materials, (b) what they think of their usefulness, (c) what their opinions are about the availability and accessibility of various educational materials, and (d) what they think of the structural and content characteristics of the educational materials they come across during the processes of teaching and learning.

This article will only look into a selection of empirical data and relate some key findings associated with point (a) above, i.e. the *frequency of the use* of various educational materials.

3.1 Methodology

The descriptive and causal non-experimental method was used for the research. The data were gathered with a questionnaire, which mainly consisted of opinion scales and evaluation scales. The data are shown in frequency and structural tables, and the hypotheses were tested with the $\chi 2$ test. In cases when the conditions for the $\chi 2$ test were not fulfilled, the Kullback test was used. Certain variables, although ordinal in nature, were treated as interval variables, and arithmetic means were calculated for them.

3.2 Sample

The questionnaire on the characteristics and use of educational materials was completed by 370 teachers (29.6 % men and 70.4 % women) and 552 pupils (50.4 % boys and 49.6 % girls).

The sample included teachers working in the programmes of *the mechanical technician* (37.5 % of those participating), of *health care* (32.3 %) and of *the economic technician* (30.2 %). The teachers surveyed had an average of 15.12 years of working experience; those with less than six years of experience amounted to 13.5 %, those with six to fifteen years of working experience totalled 42.1 %, and the rest had more than fifteen years of experience.

The *sample of pupils* also included the pupils from the aforementioned educational programmes (the majority, 40.8 %, attended the programme of *health care*, 32.2 % that of *the mechanical technician* and 27.0 % the programme of *the economic technician*). The majority of the pupils filling in the questionnaire (62.3 %) attended the third and fourth years of educational programmes, which can lead us to presume that they were quite experienced as regards secondary-school educational materials.

4. The use of didactic materials: teacher's and pupil's perspectives

The first question put to the teachers and pupils of the three programmes of secondary technical education by our survey was how often they really used various educational materials (textbooks, workbooks, collections of exercises, worksheets, e-materials available on digital media and online, their own notes, etc.). The teachers described how often[65] they used educational materials when planning and conducting classes, whereas the pupils answered the question of how often they used the materials for general education courses, for technical courses and for their independent learning at home.

The frequency of the use of materials is a piece of information that can help us draw not only a conclusion on the availability and accessibility of various materials on the market of educational materials, but also – at least indirectly – on their professional adequacy and quality. We do presuppose, namely, that teachers choose such materials during their preparation and teaching which they believe will substantially help them reach educational goals and knowledge standards. The same is supposedly true of the choices made by pupils for their independent learning activities.

4.1 When planning and conducting classes teachers most often rely on the didactic materials prepared by themselves

[65] On the four-point ordinal scale: *never – rarely – often – very often*.

The great majority of the teachers surveyed – i.e. over 80% – report often or very often using their own notes (85.2%), textbooks (81.7%) and worksheets/handouts prepared by themselves (80.5%). The average grade of the frequency of the use of these materials (Table 1) is over 3.0, which is relatively high for an average grade – given the scale ranges from one to four.

Table 1: The use of educational materials when planning and conducting classes

During classes I use:	M
My own notes	**3.29**
Textbooks	3.28
Worksheets/handouts prepared by myself	3.13
E-materials on digital media (e.g. USB, compact discs, memory discs)	2.44
Collections of exercises	2.41
Other	2.41
E-materials accessed online during classes	2.30
Workbooks	2.23

Topping the list are *teachers' own notes*, which is not particularly surprising: it is probably difficult to imagine a teacher whose notes (prepared on the basis of a variety of available sources) would not serve him/her as important material when planning and conducting classes. It is, however, worthwhile to note an interesting trend: the research shows that the frequency of the use of one's own notes statistically significantly depends on the years of one's working experience. Although we might be drawn to think the opposite, the data show that the less experience teachers have, the greater their share reporting often or very often using notes (see Table 2).

Table 2: The frequency of the use of one's own notes when planning and conducting classes, in relation to the length of teachers' working experience (2Î = 24.024, $\alpha = 0.004$)

Years of working experience	Frequency of the use of one's own notes								Total	
	Very often		Often		Rarely		Never			
	f	f%	f	f%	f	f%	f	f%	f	f%
Up to 5 years	25	52.1	18	37.5	4	8.3	1	2.1	**48**	**100,0**
From 6 to 15 years	82	55.4	46	31.1	19	12.8	1	0.7	**148**	**100,0**
From 16 to 25 years	38	36.9	51	49.5	11	10.7	3	2.9	**103**	**100,0**
From 26 to 36 years	19	39.6	16	33.3	7	14.6	6	12.5	**48**	**100,0**
Total	**164**	**47.3**	**131**	**37.8**	**41**	**11.8**	**11**	**3.2**	**347**	**100,0**

A possible explanation would be that the teachers with the most working experience – as opposed to their younger colleagues – no longer rely so heavily on their notes as they carry out their classes more routinely and do not feel they should prepare so thoroughly for each lesson. Hence, they do not really need their notes during classes anymore.

As for the use of textbooks, the high average grade does not really surprise. Teachers are expected they will regularly rely on textbooks made to match curricula and approved by the responsible council of experts, thus being a good orientation point for a lot of teachers when planning and carrying out their classes. Consequently, the percentage of those claiming to use textbooks rarely or not at all does seem relatively high (18.3 %). Statistically significant differences between the sexes should also not be overlooked: the data reveal that a substantially bigger share of male teachers say that they only rarely or even never use textbooks. The share of female teachers claiming this is 13.9 %, whereas the share of male teachers is almost 30 % (see Table 3).

Table 3: The frequency of the use of textbooks when planning and conducting classes, in relation to the teachers' sex ($\chi^2 = 28.571$; $\alpha = 0.000$)

Sex	Frequency of the use of textbooks								Total	
	Very often		Often		Rarely		Never			
	f	f%	f	f%	f	f%	f	f%	f	f%
Female	153	60.5	65	25.7	28	11.1	7	2.8	253	100,0
Male	32	30.5	43	41.0	21	20.0	9	8.6	105	100,0
Total	185	51.7	108	30.2	49	13.7	16	4.5	358	100,0

In other words, nearly every third male teacher working in the programmes of health care, the mechanical technician and the economic technician only rarely or even never uses textbooks when planning and conducting classes. It is difficult to speculate on the reasons for this without any further empirical data to provide us with the insights into the background of this phenomenon – possibly more male teachers teach the courses that do not have appropriate textbooks or maybe there are fewer available or perhaps, according to these teachers, they lack quality and so they use them less often.

A very large share of teachers (80.0 %) often or very often use worksheets/handouts prepared by themselves. On the one hand this is positive – if it shows that teachers employ their professional autonomy by preparing their own materials, which could mean that (remembering the well-known Apple's thesis) they do not agree to any separation between conceptualization and performance (cf. Apple, 2003). However, there is another, less encouraging interpretative possibility: perhaps there are not enough stimulating educational materials available beside textbooks that teachers could choose to use during classes; or if they do exist, teachers cannot make them obligatory for pupils – this is especially true of workbooks, collections of exercises and suchlike that teachers cannot really expect all pupils to bring to classes (these materials are not subject to approval by councils of experts and are thus equivalent to any other printed product on the market). One of the more surprising findings of the research is the fact that more than one third of the teachers surveyed (34.4 %) *never* use workbooks when planning and conducting classes. Together with those reporting a rare use of workbooks, the share reaches almost 60 %.

Table 4: The frequency of the use of workbooks when planning and conducting classes, in relation to the teachers' sex ($\chi^2 = 20.695$, $\alpha = 0.000$)

Sex	**Frequency of the use of workbooks**								**Total**	
	Very often		**Often**		**Rarely**		**Never**			
	f	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**
Female	53	21.9	63	26.0	49	20.2	77	31.8	**242**	**100,0**
Male	7	6.8	17	16.5	36	35.0	43	41.7	**103**	**100,0**
Total	**60**	**17.4**	**80**	**23.2**	**85**	**24.6**	**120**	**34.8**	**345**	**100,0**

One of the possible reasons for such a substantial share of teachers not using workbooks could simply be the non-existence of workbooks for the courses they teach. Namely, when teachers were asked what educational materials were lacking, a good 35 % said it was workbooks – the share being the same as the share of those never using workbooks. Nonetheless, we should not jump to conclusions: if there are too few workbooks (which is what 35 % of teachers claim), it does not mean that there are none. It can only mean that according to the teachers there are *not enough*. It is, nevertheless, obvious that almost two thirds of teachers remain unconvinced by the workbooks available on the market, and so they refuse to use them more often when planning and conducting classes. The reasons behind this seem quite important and should be analyzed in more depth.

In line with expectations, our research shows that teachers use electronic materials (in particular e-materials accessed online) less often. 39.6 % of the respondents said they often or very often use web materials, and 34.4 % of the teachers surveyed said they often or very often use e-materials available on digital media (CDs, memory disks, etc.). The lower frequency of the use is not really surprising here, and there are a couple of reasons that can explain it: e-materials are still not widely available (despite all the efforts channelled into them in recent years), but most of all the problem lies in insufficient technical equipment – not only all classrooms, but also most of (if not all) the desks in them should be properly equipped. If teachers were to be encouraged to use e-materials more frequently during classes, pupils should also have access to them, just as is the case with printed materials.

Pupils most often use their own notes and didactic materials, prepared by teachers

The pupils surveyed were asked a couple of questions about:

how often they use specific educational materials for general education courses (i.e. the courses that are by and large the same for all educational programmes and are not related to the specifics of the various professions or occupations they are being educated for; these include mathematics, Slovene, foreign languages, etc.),
how often they use specific educational materials for technical courses (specific to the educational programmes they attend), and
how often they use specific educational materials for independent learning at home.

Like teachers, pupils also used the four-point ordinal scale to answer the questions.[66] Their answers are shown in Tables 5, 6 and 7.

Table 5: The use of educational materials for general education courses (pupils' answers)

For general education courses we use:	**4**		**3**		**2**		**1**		**Total**	
	f	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**
Our own notes	**313**	**57.1**	123	22.4	76	13.9	36	6.6	548	100,0
Worksheets/handouts prepared by teachers	156	28.5	280	51.2	98	17.9	13	2.4	547	100,0
Textbooks	47	8.6	236	43.1	245	44.8	19	3.5	547	100,0
Collections of exercises	22	4.1	92	17.1	252	46.8	172	32.0	538	100,0
E-materials on digital media (e.g. CD-ROMs, memory discs)	17	3.1	103	18.9	227	41.6	199	36.4	546	100,0
E-materials accessed online during classes	13	2.4	52	9.6	242	44.6	**236**	**43.5**	543	100,0
Workbooks	12	2.2	89	16.2	306	55.8	141	25.7	548	100,0
Other	7	4.4	29	18.4	43	27.2	79	50.0	158	100,0

Table 6: The use of educational materials for technical courses (pupils' answers)

For technical courses we use:	**4**		**3**		**2**		**1**		**Total**	
	f	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**
Our own notes	**298**	**54.7**	129	23.7	77	14.1	41	7.5	545	100,0
Worksheets/handouts prepared by teachers	144	26.3	214	39.1	145	26.5	44	8.0	547	100,0
Textbooks	93	17.0	199	36.4	198	36.3	56	10.3	546	100,0
Collections of exercises	37	6.9	100	18.6	228	42.3	174	32.3	539	100,0
E-materials on digital media (e.g. CD-ROMs, memory discs)	31	5.7	115	21.1	176	32.2	224	41.0	546	100,0
E-materials accessed online during classes	26	4.8	74	13.5	214	39.1	**233**	**42.6**	547	100,0
Workbooks	14	2.6	78	14.3	230	42.3	222	40.8	544	100,0
Other	11	7.0	29	18.4	41	25.9	77	48.7	158	100,0

[66] When talking about the frequency of the use of educational materials for general education and technical courses, the values were given as the following variables: *for no course – for rare courses – for most courses – for all courses*. When giving answers about the frequency of the use of educational materials at home, the variables were *never – rarely – often – very often*.

Table 7: The use of educational materials for independent learning at home (pupils' answers)[67]

For independent learning at home I use:	4		3		2		1		Total	
	f	f%	f	f%	f	f%	f	f%	f	f%
My own notes	**394**	**71.9**	83	15.1	50	9.1	21	3.8	548	100,0
Worksheets/handouts prepared by teachers	171	31.1	231	42.1	108	19.7	39	7.1	549	100,0
Textbooks	78	14.2	153	27.9	231	42.1	87	15.8	549	100,0
Collections of exercises	64	11.8	145	26.7	176	32.4	158	29.1	543	100,0
E-materials accessed online during classes	53	9.7	108	19.7	170	31.0	217	39.6	548	100,0
E-materials on digital media (e.g. CD-ROMs, memory discs)	18	3.3	53	9.7	157	28.6	**321**	**58.5**	549	100,0
Other	18	11.1	28	17.3	29	17.9	87	53.7	162	100,0
Workbooks	14	2.6	64	11.7	238	43.4	232	42.3	548	100,0

When discussing the use of educational materials by pupils, pupils' own notes and the *worksheets/handouts prepared by teachers* stand out. The frequency of the use of worksheets increases in importance when compared to the frequency of the use of textbooks: 51.7 % report that the latter are used for all or most general education courses, 53.4 % claim the same as regards technical courses, whereas fewer than half of pupils (42.1 %) often or very often use textbooks when learning independently at home. These data unambiguously show the need to reconsider seriously how to encourage pupils to use textbooks as a source for independent learning more.

While our data still show a relatively frequent use of textbooks by pupils, the data on the use of workbooks turns out to be very discouraging: similarly to the answers given by teachers, pupils report only rarely or never using workbooks. 85.7 % said this when asked about the use of workbooks when learning independently at home – 43.4 % said that they rarely use workbooks, and 42.3 % that they never use them at all. Similar answers were given to the question of how many courses they use workbooks for. Over 80 % report using workbooks for rare or even no general education or technical courses. Acquiring quality knowledge requires an active and varied use of educational materials, which makes these data alarming. Pupils use e-materials and collections of exercises just as rarely as workbooks – the share of those reporting often or very often using these materials for most or all courses is – as a rule – around 20 %, only exceptionally is the share bigger. It should not be overlooked that pupils – both during classes and for independent learning at home – use collections of exercises significantly more often than workbooks.

Finally, we should point to an indicative trend related to the use of e-materials: when pupils were asked about the frequency of the use of e-materials on digital media and those available online during classes in general education and technical courses, we found out that it is more common to use e-materials on digital media during classes – approximately one quarter of pupils claim using such materials for most or all technical or general education courses. In opposition, only 12 % of pupils report the same use of e-materials accessible online for general education courses, and 18.6 % report such use for technical courses. The percentages are relatively low, especially since considerable efforts have gone into the so-called "informatisation" of schools in Slovenia since the mid-1990s. But when pupils are asked what e-materials they use more often when learning independently at home, the data demonstrate a reverse picture: almost one third say they often or very often use materials that can be accessed online, whereas only 13.0 % report the same regarding e-materials on digital media. In other words, pupils rely much more on online materials when learning independently, and they do not use preloaded applications on memory disks as much.

More frequent the use of a particular educational material is at school, the more often pupils will use the same material when learning independently at home

The research also asked how the use of various educational materials during classes in general education and in technical courses affects the frequency of the use of the same materials during pupils' independent learning at home. Crosstabulations undoubtedly reveal that the more frequent the use of a particular educational material is at school, the more often pupils will use the same material when learning independently at home (Table 8).

[67] Pupils graded the use with the grades from 1 to 4; 1 – I never use them, 2 – I rarely use them, 3 – I often use them, 4 – I very often use them.

Table 8: The use of workbooks for classes in technical courses and for independent learning at home (2Î = 109.578, $\alpha = 0.000$)

Use of workbooks for classes in technical courses	**Use of workbooks for independent learning at home**								**Total**	
	I very often use them		**I often use them**		**I rarely use them**		**I never use them**			
	f	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**
We use them for no technical course	4	1.8	12	5.4	61	27.6	144	65.2	**221**	**100,0**
We use them for rare technical courses	4	1.7	26	11.4	124	54.1	75	32.8	**229**	**100,0**
We use them for most technical courses	3	3.8	22	28.2	44	56.4	9	11.5	**78**	**100,0**
We use them for all technical courses	1	7.7	4	30.8	7	53.8	1	7.7	**13**	**100,0**
Total	**12**	**2.2**	**64**	**11.8**	**236**	**43.6**	**229**	**42.3**	**541**	**100,0**

Among the pupils saying they never use workbooks for any technical course at school, only 7.2 % say they often or very often use them at home. Among the pupils reporting the use of workbooks for all or most technical courses, on the other hand, as many as one third (33.0%) often or very often use workbooks at home.

The above-mentioned data lead to a trivial, but no less important conclusion. Having asked ourselves how to encourage a more frequent use of various educational materials with pupils, we have now come across an important part of the answer that is as clear as day: teachers should be encouraged to use them more frequently during classes in the first place. If teachers use a small variety of educational materials, pupils will use accordingly limited varieties at home as well. Or, to put it otherwise: a teacher relying exclusively on his/her own notes cannot really expect the majority of pupils to reach for other educational materials when learning at home, even if such materials are available and of good quality. At the level of providing appropriate technical and infrastructural solutions – which is the school's founder's responsibility – the figures convey a significant message: the frequency of the use of modern e-materials during independent learning at home is closely dependent on the frequency of their use during school classes.

Conclusion: the process of an effective implementation of educational materials in education is far from finished

This article presents some key findings from the research on the use of educational materials by the teachers and pupils of three programmes of secondary technical education in Slovenia. The data do point to some clear trends that cannot remain unnoticed. One of the key findings shows a pronouncedly marginal position of workbooks in Slovene secondary technical education: teachers and pupils only very rarely use them. The fact that teachers rarely or never use workbooks during classes has an important influence on pupils' use of them during independent learning at home – their use is just as limited as their teachers'. The use of e-materials is similarly limited, even though the reasons for it differ from those regarding workbooks. Both phenomena clearly show that the process of an effective implementation of educational materials in education is far from finished. At the systemic and professional levels, the enquiries into how to contribute to a better quality of pupils' knowledge through high-quality educational materials remain as relevant and necessary as ever.

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USING CONTENT-BASED HUMOROUS CARTOONS IN LEARNING MATERIALS TO IMPROVE STUDENTS' READING RATE, COMPREHENSION AND MOTIVATION: IT IS A WRONG TECHNIQUE?

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Abstract

Can content-based humorous cartoons be integrated in texts in teaching and learning materials to improve students' reading rate, comprehension and motivation? Previous studies have reported inconsistent results. To identify the effects of content-based humorous cartoons in reading materials, a between-subjects repeated-measures experimental study and a follow-up survey study were conducted. The majority of the students opined that the illustrations had positive impacts on their reading. Results of the experimental study indicate that the illustrations had significantly increased rate, comprehension and motivation of the students. The findings provide supportive evidences for the Dual Coding Theory and Relief Theory of Laughter.

Keywords**:** content-based, humorous cartoon; illustration; reading; comprehension; motivation

Introduction

A recent survey study has shown that student teachers in teaching colleges seldom read course materials (examples: course notes, modules, and handouts) provided during and after the attending teacher professional development courses and workshops. Chua, Tan, Lim & Jeswant (2007) reported that only nearly 24 percent read the course materials. More than half said they had read only less than 10 percent of the materials, and an additional 20 percent said they had read nothing. Teaching is less effective if students do not read the teaching and learning materials provided by the instructor because there are only two practical ways to get knowledge in words into the human brain: through the ear and through the eye. Therefore, besides listening to lectures, an effective way for students to learn new knowledge is through the eyes, that is, by reading (Trelease, 2007). Reading course materials is particular important to professional development courses or workshops participants because it helps the participants to understand the contents in details.

Chua et al. (2007) reported that most of the materials were printed in formal plain texts, and did not have the element of "reading is fun". The discovered that besides factors related to time, a main reason was the materials are hard to understand and failed to stimulate teachers' motivation to read them when they were free. From this perspective, they suggested that psychological elements and pedagogical technology should be introduced in developing professional development course materials to stimulate intrinsic motivation, self-efficacy and the willingness of participants to read the materials. Hence, this study examined the effects of integrating a kind of illustrations, that is, content-based humorous cartoon into course materials on reading rate, reading comprehension and reading motivation of a group of student teachers who were attending a teacher professional development course.

The issue: can content-based illustrations enhance students' reading rate, comprehension and motivation?

Illustration in this study was defined as visual or pictorial figures inserted into reading texts to enhance reading. Levie & Lentz (1982) have claimed that illustrations in reading materials have five major functions: (1) *Representation*: to repeat the text's content; (2) *Organization*: to enhance the text's coherence; (3) *Interpretation*: to provide the reader with more concrete information; (4) *Transformation*: to target critical information in the text and recode them in a more memorable form; and (5) *Decoration*: for aesthetic properties or to spark reader's interest in the text, and content-based illustration delivers all the above functions.

Can content-based illustrations enhance students' reading? Some researchers argued that content-based illustrations have a positive effect on reading because reading comprehension largely depends on the quality of the repetition effect. For example, Gyselinck & Tardieu (1999) argued that when the information from the text and from the illustration is well integrated, they "[act] as if the information was presented twice, thus enhancing performance" (p. 211). However, Liu (2004) conducted a study to examine the effect of comic strips (a series of humorous cartoons) on reading comprehension. The researcher reported that low-level proficiency secondary school students apparently did not need the illustrations to support reading simpler texts, and higher-level proficiency students likewise did not need the illustrations to support the more difficult text versions, and the illustrations were ineffective because students might have shifted their attention from the text to the accompanying comic strips when they realised that they did not fully comprehend the text. The findings were consistent with the finding of Khoii & Forouzesh (2010) that using reading passages with comic strips does not have any significant effect on the learners' progress in reading comprehension.

Besides that, Bryant, Comisky, Crane & Zillmann (1980) reported that humorous illustrations or pictures in textbooks have little effect on comprehension but have a negative impact on students' acceptance of the plausibility of the text, even though such illustration adds to a text's appeal. Some researchers explained the small or negative effect of humorous illustrations in texts by referring to the Cognitive Transformation Theory. For example, Kane, Suls & Tedeschi (1977) argued that humorous elements in illustrations signal to readers that the seriousness of the messages in the material they are reading should be downplayed. As a result, a cognitive transformation occurs, rendering the messages as less critical and less important. Therefore, it is difficult for the reader to make a connection between the messages of the text and his personal reading intention. The level of personal reading intention associated with the reading material is diminished. The cognitive transformation lessens reading comprehension and it indirectly redirects the focus of reading to the illustration and humour element.

However, other researchers have claimed that content-based illustrations have positive effects on reading comprehension. For example, Chik (2005) conducted an experimental study on the effect of the use humorous illustrations in English learning materials (humour was integrated into textbook) in Hong Kong elementary schools on students' reading motivation. Results of the study showed that the materials were statistically related to changes in students' intrinsic and extrinsic motivation in reading and were positively linked to student reading outcomes. The researcher reported that students who were intrinsically motivated were completely involved with the reading process, enjoying the reading experience and reading with excellent cognitive proficiency.

Some researchers explained the effects of humorous illustrations on reading from the perspective of the Relief Theory of Laughter (Meyer, 2006), which originated from Freud's theory. The theory states that humour releases emotional energy and tension. It acts as a positive motivation towards the reading process and enhances reading intention, and in turn increases reading rate. Hence, humorous illustration neutralises the boredom of students when they are reading highly structured academic materials and positively affects reading rate, comprehension and motivation (Berk & Popham, 1995). Other researchers explained the effect of visual illustrations on reading based on the Dual Coding Theory (Khoii & Forouzesh, 2010; Sadoski & Paivio, 2001). According to the theory, the human cognition consists of two subsystems that process information simultaneously. The verbal subsystem processes text information (words, sentences) while the imagery subsystem processes visual and pictorial information. The connections and interrelations of the two subsystems when a reader read text with visual illustration allow the dual coding of the information. The interconnectedness of the two systems permits cueing from one system to the other, which, in turn, facilitates the interpretation of information, and thus improves reading.

The inconsistent findings and theories on the effect of illustrations on reading indicate that the value of content-based humorous illustrations in reading academic texts is far from conclusion. It offers an area where much more research can still be done. Previous research has not directly investigated the effectiveness of content-based humorous cartoons on reading rate, reading comprehension and reading motivation in reading materials (Berk & Popham, 1995). This is of great importance since the number and type of illustrations in school textbooks keeps growing (Dienstbier, 1995).

Objectives of the study

This study was conducted to examine the effects of integrating content-based humorous cartoons into course materials on reading rate, comprehension and motivation of a group of student teachers who were attending a teacher professional development course. The study has two phases. Firstly, an experimental study was conducted to examine the effects of the content-based humorous cartoons on reading rate, comprehension and motivation of the participants of the course. Secondly, a follow-up survey study was conducted on the participants in the experimental group to identify their opinions on effectiveness of the illustrations on their reading.

Research design for the experimental study

The experimental study was conducted to examine the effects of the content-based humorous cartoons on reading comprehension and reading motivation. A between subjects pre-test and post-test experimental design was employed. A control group received a text-only version of the course material and a treatment group received a text with content-based humorous cartoons version for reading during the course. The two groups were measured (pre-tests and post-tests) for reading amount, comprehension and reading motivation.

4.1. Participants

Participants were 80 student teachers: 34 males (42.50%) and 46 females (57.50%) with an average age of 20.2 years. The participants were selected from a teacher training institute in Malaysia. Participants have the same educational history and background. They received the same educational training under the graduate teacher preparation programme. They passed the selection test and interview for their affective (personality, attitude, emotion, motivation and other aspects), cognitive (analytic and quantitative skills) and communication skills (verbal, written and reading). The participants were attending a three sessions' teacher professional development course, named "Survey Research in Educational Studies", the course was conducted for three consecutive days (each day three hours). Before the course started, they were assigned randomly into a control group (n=40) and a treatment group (n=40) by a simple random sampling procedure. The two groups attended the same course in two separate course rooms conducted by the same facilitator in two difference times in each day.

4.2. Instruments of the Study

Three instruments were used in the study to collect data from the participants. The instruments were (1) course material, (2) a reading comprehensions test, and (3) a reading motivation questionnaire.
Course Material - It contains notes with the title "Survey Research in Educational Studies". It has 18 pages with twelve sub-headings: (1) The concept of survey research, (2) The function of survey research, (3) Survey research ethics, (4) The survey research process, (5) Preparation of instruments for survey research: questionnaires and interviews, (6) The questionnaire method, (7) The interview method, (8) Sampling procedures, and (9) Analysis for survey data. There were 7,047 words in the text and nine content-based humorous cartoons were integrated into it (see examples in Figure 1). To identify whether the cartoons are humour, prior to the study, a pilot study was conducted, where a group of 30 student teachers rated each of the cartoons on a 4-point Likert-type scale; scale 1 was "not humorous at all" while scale 4 was "highly humorous". Adopting the rating criteria used by Whisonant (1998), cartoons with mean scores higher than 2.5 were considered humorous. Results of the pilot study indicated that the cartoons were rated between mean scores of 3.43 to 3.83. Therefore, all the cartoons were included in the material for this study. Two versions of the reading material were printed on A4 size papers: the text-only version and text with content-based humour cartoons version. Both versions delivered the same content and format.

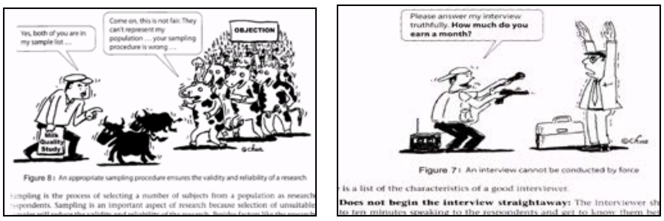

Fig.1. Two examples of content-based humorous cartoons in the course material

Reading Comprehensions Test - The reading comprehensions test is a 90 minutes test and there were 10 short essay questions in the test. Respondents were asked to write not more than 150 words for each question. The score for each question is 10, with a total score of 100. The questions in the test were: (1) Describe the aims the survey research? (2) List the codes of ethics in survey research. (3) Write the steps for selecting a systematic random sampling, (4) Elaborate how to determine the sample size for a quantitative survey research, (5) Describe four aspects that need to be considered when preparing a questionnaire, (6) List four differences between structured interview and non-structured interview, (7) Elaborate four characteristics of a poor interview question, (8) Describe the roles of an interviewer, (9) List four differences between face-to-face interview and non face-to-face interview, (10) Describe the process of data analysis for interview data.

Answers of the participants were scored based on an answer scheme. Three lecturers were asked to mark the answers based on the scheme. Inter-rater reliabilities (Kappa coefficients) for the scores given by the three lecturers on the participants' answers were high and acceptable ($k > .70$): $k = .73$ for lecturer 1-lecturer 2; $k = .78$

for lecturer 1-lecturer 3 and k = .84 for lecturer 2-lecturer 3. Therefore reading comprehension score for each respondent was calculated as the mean score for the scores given by the three lecturers.

Reading Motivation Questionnaire - The questionnaire was adapted from the Reading Motivation Questionnaire (RMQ) of Wigfield, Guthrie and McGough (1996). It consists of 54 items for four motivation components, i.e. self-efficacy motivation, intrinsic motivation, extrinsic motivation and social motivation. The components comprise eleven dimensions of motivation. Challenge and efficacy are categorised under self-efficacy motivation. Curiosity, involvement, importance and work avoidance are categorised under intrinsic motivation. Competition, recognition and grades are listed under extrinsic motivation, and finally social and compliance are the dimensions of social motivation. The RMQ items were developed in a five-point Likert scale to assess participants' motivation towards reading. The scales ranged from 1 (very different from me) to 5 (a lot like me). Most studies examining the RMQ have supported the four components (Parault and Williams 2009). The Cronbach's alpha internal consistency reliability coefficients of the four dimensions were .86 (self-efficacy motivation), .89 (intrinsic motivation), extrinsic motivation (.78) and social motivation (.81).

4.3. Procedures and Data analysis

At the beginning of the experiment, the two groups answered the reading comprehensions test and the reading motivation questionnaire (pre-tests). The groups were then given the reading material to read during the three days' course. The control group received the text only version, while the treatment groups got the text with content-based humorous cartoons version. They were encouraged to read the contents whenever they were free during the course, inside or outside the course rooms. At the end of the course, the participants answered the reading comprehension test and reading motivation questionnaire (post-tests). Through this process, pre-test and post-test scores for reading comprehension and reading motivation were collected. Besides that, they were also asked to indicate the amount of the materials they have read. The difference of reading rate between the two groups was analysed by a t-test.

Split-plot ANOVA tests were used to analyse the data for the effects of the illustrations on reading comprehension and motivation. A treatment effect is detected if a significant interaction effect occurs between the two repeated measures (pre-test and post-test) and the two groups (control and treatment). The dependent variables are reading motivation and reading comprehension, while the treatment is content-based humorous cartoons. The split-plot ANOVA test is one of the most powerful quantitative research statistics methods for experimental design because it compares the differences between control and treatment groups on their repeated measures in a single analysis (Yu & Ohlund, 2010).

4.4. Results

The result of the independent samples t-test on reading amount in percentage between the two groups was significant [t(78)=8.69, p< .05] (Table 1). The reading amount of the treatment group (test with the illustrations: mean = 83.23) out-performed the control group (text without the illustrations: mean = 65.31). It indicates that the illustrations had significantly increased reading rate of the student teachers.

Table 1: T-test results comparing reading amounts of the control and treatment groups

Course material	Control group	Treatment group	T-test		
	Mean (SD)	Mean (SD)	t	df	Sig.
Reading amount	65.31 (10.08)	83.23 (8.26)	8.69	78	.00

The results of the Split-Plot ANOVA test in Table 2 indicate that significant treatment effect occurred in reading comprehension with a positive and moderate effect size [F(1, 78) = 42.31, *p* < .01, effect size = .58]. This indicates that illustration had significantly increased reading comprehension of the participants.

As for reading motivation, the data in Table 2 shows that overall reading motivation [F(1, 78) = 45.78, *p* < .01, effect size = .60] and three of the four reading motivation components yielded significant results. The components were self-efficacy motivation [F(1, 78) = 51.39, *p* < .01, effect size = .63], intrinsic motivation [F(1, 78) = 63.33, *p* < .01, effect size = .76] and social motivation [F(1, 78) = 34.96, *p* < .05, effect size = .49].

As a whole, the results indicate that the content-based humorous cartoons in the reading material had increased reading rate, reading comprehension and reading motivation of the participants.

Table 2: Split-Plot ANOVA test results for effects of content-based humorous cartoons on reading comprehension and motivation

Subscale	Control		MD	Treatment		MD	Pillai's Trace Test		Effect size
	Pre-test	Post-test		Pre-test	Post-test		Treatment Effect		
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)		F-ratio value at df = 1,77	p	
Comprehension	54.5 (6.6)	58.2 (6.7)	3.6	53.2 (6.7)	63.3 (8.5)	10.1	42.31	.00**	.58
Overall Reading ion	116.3 (19.4)	120.7 (12.7)	4.4	126.6 (17.7)	154.4 (11.5)	27.7	45.78	.00**	.60
Self-efficacy Mot.	45.6 (4.5)	16.2 (4.3)	.5	19.7 (4.1)	28.1 (3.3)	8.3	51.39	.00**	.63

Efficacy	6.4 (2.0)	7.2 (1.7)	.7	8.5 (2.1)	13.5 (1.8)	5.0	42.71	.00**	.58
Challenge	9.2 (2.5)	8.9 (2.6)	-.2	11.2 (2.2)	14.5 (2.8)	3.3	21.32	.00**	.37
Intrinsic Motivation	43.6 (9.0)	44.9 (5.4)	1.3	50.9 (7.3)	63.3 (6.0)	12.3	65.33	.00**	.76
Curiosity	11.8 (2.5)	10.7 (3.0)	-1.1	12.4 (3.4)	19.4 (2.1)	7.0	58.21	.00**	.72
Importance	13.2 (3.5)	14.3 (3.1)	1.0	15.2 (3.2)	15.6 (3.1)	.3	.27	.75	.06
Involvement	11.2 (2.8)	12.4 (2.5)	1.2	13.9 (3.3)	17.8 (3.6)	3.8	16.57	.00**	.34
Work avoidance	7.3 (2.4)	7.4 (2.1)	.1	9.2 (3.3)	10.4 (3.4)	1.2	1.17	.33	.07
Extrinsic Motivation	33.1 (3.8)	33.9 (2.6)	.8	34.0 (4.3)	35.5 (3.1)	1.4	.02	2.12	.01
Competition	17.3 (1.2)	17.7 (1.2)	.4	16.8 (1.47)	16.9 (1.1)	.1	.35	1.59	.03
Recognition	7.2 (2.1)	7.3 (2.3)	.0	8.8 (2.9)	9.5 (3.2)	.7	1.17	.82	.07
Grades	8.5 (1.0)	8.9 (1.0)	.3	8.3 (1.4)	9.0 (1.1)	.6	.45	.51	.05
Social Motivation	30.8 (4.7)	31.6 (3.2)	.7	37.0 (4.7)	46.9 (3.1)	9.9	34.96	.01*	.49
Social	11.3 (2.4)	10.6 (3.3)	-.6	13.1 (2.58	18.7 (3.1)	5.5	27.39	.00**	.43
Compliance	19.4 (2.3)	20.9 (3.4)	1.4	23.9 (2.3)	28.2 (2.2)	4.3	16.91	.00**	.34

Note: $^{**}p < .01$; MD = Mean difference between pre-test and post-test scores

The Survey Study – Opinions of Students on the Content-Based Humorous Cartoons

The participants in the treatment groups of the experimental study who received the materials with content-based humorous cartoons (n= 40) were selected as the survey respondents.

Survey questionnaire

The survey questionnaire consisted of two sections. Section one contained four Likert scale items. The items were: (1) Are the illustrations suitable for inclusion in the reading material? (2) Do the illustrations facilitate your reading? (3) Does the inclusion of the illustrations make your reading more enjoyable? (4) Do you think the illustrations should be maintained in the material? Section two considers the opinions of the student teachers concerning the content-based humorous cartoons on their reading. It is an open-ended item, asking the respondents to list the impacts of illustrations in the course material on their reading. The responses collected from the readers were analyzed by a multiple response analysis. The results of the analysis are presented in frequency and percentage.

5.2. Results

Results of the survey items in section one indicate that the majority of the respondents strongly agreed that the content-based humorous cartoons are suitable for inclusion in the course material (82.42%), the illustrations facilitate reading (83.64%), the inclusion of the illustrations has make reading more enjoyable (82.42%), and illustrations should be maintained in the course material (86.06%).

For the survey item in section two, Table 3 depicts the opinions of the respondents for positive and negative responses on the use of content-based humorous cartoons in the course materials. The table show that 97.65% of the responses were positive while 2.35% of the responses were negative.

Table 3: Responses to the use of humorous cartoons in the course materials

Positive Response	Count	% of Responses	% of Cases
Make reading and learning fun	36	7.07	90.00
Have a positive impact on reading	35	6.88	87.50
Messages conveyed through the illustrations help to understand or digest the research concept in the reading material in a shorter time	35	6.88	87.50
Learning becomes more meaningful with the illustrations	33	6.48	82.50
Stimulate the participants' imagination and open his mind to accept the facts presented in the reading material	31	6.09	77.50
Reduce the intellectual gap between the course's facilitator and participants	31	6.09	77.50
Lighten the highly academic contents of the reading material	27	5.30	67.50
Reduce the pressure of reading	26	5.11	65.00
Release tension on academic elements especially statistics	24	4.72	60.00
Ease the tedium or boredom of reading	23	4.52	57.50
Increase reading resiliency	23	4.52	57.50
Enhance the participants' patience in reading	22	4.32	55.00
Increase my extrinsic reading motivation	21	4.13	52.50
Increase the participants' willingness to read the reading material	21	4.13	52.50
The content-based humorous cartoons are effective communication tools	21	4.13	52.50
Reduce feeling of satiation in relation to reading	15	2.95	37.50
Make the reading material user-friendly	15	2.95	37.50
Trigger the participants' minds to think about the topics under discussion	14	2.75	35.00
Enhance graciousness of the reading material	9	1.77	22.50
Arouse the participants' interest, leading participants to spend more time exploring the reading material's contents	8	1.57	20.00
Trigger the participants to put extra energy into the learning process	7	1.38	17.50
Improve the participants' ability to recall information from the reading material	7	1.38	17.50
Motivate the participants to read and reread the reading material	7	1.38	12.50

The illustrations are needed for any kind of academic reading materials	6	1.18	15.00
Total responses	497	97.65	1242.50
Negative Response	Count	% of Responses	% of Cases
The reading material becomes less formal	2	.39	6.00
Have negative impact on the participants' thinking	2	.39	5.67
The course material should be formally presented	2	..39	5.67
The cartoons might involve sensitive issues	2	.39	5.00
Inclusion of the illustrations in the reading material does not make much difference to its contents	2	.39	5.00
It may influence the participants' perspectives on the value of the reading material	1	.20	3.67
Reduce their thinking abilities – the participants might accept the information in the reading material without deliberation	1	.20	3.00
Total responses	12	2.35	30.00

The data in Table 3 indicate that the majority of the readers opined that the illustrations had made their reading and learning fun (90.0%), had a positive impact on their reading (87.5%), the messages conveyed through the illustrations helped them to understand or digest the research concept in a shorter time (87.5%), learning became more meaningful with the illustrations (82.5%), the illustrations reduce the intellectual gap between the course's facilitator and participants (77.5%), and the illustrations stimulated their imagination and opened their minds to facts presented in the reading material (77.5%). Nearly half of the participants indicated that the illustrations lightened the highly academic contents of the reading material (67.5%), reduced their pressure of reading (65.0%), released their reading tension on academic elements especially statistics (60.0%), eased the tedium or boredom of reading (57.5%), increased their reading resiliency (57.5%), enhanced their patience in reading (55.0%), and increased their extrinsic reading motivation (52.5%). Some readers commented that the inclusion of the illustrations in the reading material are effective communication tools (52.5%), they increased their willingness to read the materials (52.5%), reduced the feeling of satiation in relation to reading (37.5%), made the reading material user-friendly (37.5%), triggered the mind to think about the topics under discussion (35.0%), enhanced the graciousness of the reading material (22.5%), aroused their reading interest, leading them to spend more time exploring the reading material's contents (20.0%), triggered them to put extra energy into the learning process (17.5%), improved their ability to recall information from the course material (17.5%), and motivated them to read and reread the reading material (12.5%). They also opined that the content-based illustrations are needed for any kind of academic reading materials (15.0%).

As shown in Table 3, 2.35% or 12 out of a total of 509 responses had a negative view of the use of content-based humorous cartoons in the reading material. A small number of readers cautioned that the inclusion of the illustrations had made the reading material less formal (.39%). They felt that the illustrations had a negative impact on their thinking (.39%). According to these student teachers, the course material should be presented in a formal manner (.39%). They were also worried that some of the cartoons might involve sensitive issues (.39%). To these student teachers, there is really not much of a difference in the contents of the reading material with or without the illustrations (.39%) and the illustrations might influence course participants' perspectives on the value of the reading material (.20%). A student teacher added that the illustrations could reduce their thinking abilities – the course participants might accept the information in the reading material without deliberation (.20%).

Discussion

The results of the experimental study indicate that the content-based humorous cartoons in the course material had increased reading rate, comprehension and reading motivation of the student teachers. The findings show that the illustrations increased the student teachers' satisfaction from mastering complex ideas presented in the reading material and their willingness to learn difficult things through reading (challenge); strengthened their beliefs in their abilities to do well in reading and learning (efficacy); increased their desire to learn about the contents of reading material (curiosity); increased their willingness to participate in reading and learning the contents in the material (involvement). Besides that, the illustrations improved their desire to share the knowledge they have learned from reading the material with others (social), and increased their willingness to learn course material given to them (compliance). The findings reflect the ability of the content-based humorous cartoons to stimulate the participants to read the contents with higher concentration.

Why the illustrations were capable in increasing reading comprehension of the student teachers? A possible reason is the he repetition effect of the text and illustrations that influences the quality of understanding (Gyselinck & Tardieu, 1999). According to Kuzu, Akbulut & Sahin (2007), when the information from the text and from the illustration is well integrated, they act as if the information was presented twice, thus enhancing reading comprehension. It is consistent with the Dual Coding Theory (Khoii & Forouzesh, 2010; Sadoski & Paivio, 2001), that when the information from the text and from the illustration is well integrated, the interconnectedness of the two information processing subsystems facilitates the interpretation of information and thus improves reading comprehension.

Despite some people questioning the benefits of illustrations in reading texts, and identifying some negative effects of humor (Morreall, 2010), this study provides evidence of the function of content-based humorous cartoons. Furthermore, the student teachers felt that content-based humorous cartoons can be adopted in course materials to increase readability. Most of them opined that the illustrations have positive impacts on their reading motivation and its use in course materials can help enhance the concept that reading the materials can be a fun activity, although a few of them were worried that the inclusion of humorous cartoons in the reading material might create negative impacts. The survey-generated list of benefits of content-based humorous cartoons in the course materials include stimulate the participants' imagination; lighten the content of the reading material; reduce the pressure of reading; reduce intellectual gap; release tension of reading; ease the tedium or boredom of reading; enhance patience in reading; increase extrinsic reading motivation; increase the willingness to read the material; reduce feeling of satiation in relation to reading; trigger the mind to think about the topics under discussion; increase reading resiliency; enhance graciousness of the reading material; and improve the ability to recall information. This list of benefits is an emergent result that should be recognised because it provides useful information and references for future research concerning the impacts of content-based humorous cartoons in reading materials.

The results support recent research findings that humor heightens intrinsic motivation (Chik, 2005; Aboudan, 2009), strengthens memory and increases reading comprehension (Atir, 2010; Strick, Holland, van Baaren & van Knippenberg, 2010). The results further support the Relief Theory of Laughter (Meyer, 2006), that emotional energy is released by humorous illustration and it acts as a positive motivation towards the reading and learning process.

For the course material to be well-received by the participants, it must have strong points to attract course participants. As pointed out by the participants in the survey study and previous researchers, content-based humorous cartoon could be used in the reading material to reduce the intellectual gaps and blur the boundaries between the course facilitator and participants because it can foster virtues such as open-mindedness, patience, tolerance, graciousness, humanity, perseverance, and courage (Morreall, 2010); physiologically release tension, single out violations of a rationally learned pattern, and unite communicators (Meyer, 2006). Humorous illustrations may also help in long-term retention of information and in making the learning experience more pleasurable (Zillmann & Bryant 1983; Coleman, 1992). As indicated by the findings of this study, inserting content-based humorous cartoons in an course materials could be a good technique and strategy to heighten participants' self-efficacy, intrinsic and social motivation which will, in turn, increase reading rate, heighten reading comprehension and reading satisfaction.

This study did not examine the impacts or effects of humor and cartoon separately. Cartoon and humour are two different elements (Keogh & Naylor, 1999), and each of the elements could enhance reading motivation and skills (Dementrulis, 1982; Heintzmann, 1989). The question of "Which element contributes more towards improving reading motivation and reading comprehension? Cartoon or humour, or the combination of both?" is not the focus of this study. Further studies can be done and built on the design of this study to compare the effects of humor and cartoon on reading. The study also limited by small sample size of the survey study due to the nature setting of the study.

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USING VIDEO TECHNOLOGY TO DIAGNOSE EFL STUDENTS' COGNITIVE LEARNING DIFFICULTIES IN PUBLIC SPEAKING

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Abstract

This paper investigates EFL students' perceived learning difficulties in English public speaking by a novel approach to data analysis. Great speech footages were taken online and used as a means of introducing visual perceptions of 9 speaking skills defined as the student competence in English public speaking. 26 students studied these videos; AHP-weighted GRA method was then applied to analyze the data of students' perceptions of speech ability difficulties and sorted the data in order. Finally, GRA results were rearranged in an S-P chart format, which clearly represented the students' cognitive mapping of the speech difficulties in relation to their overall speech conceptualization.

Keywords: Public speaking; learning difficulties; video technology; improving classroom teaching; teaching/learning strategies; Grey Relational Analysis (GRA); Stuent-Problem chart (S-P chart)

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Introduction

Along with written communication, ability to manage others and effective team leadership, public speaking has been reported by former students as essential to further career development (Zekeri, 2004). Scholars agree that we are entering into a era where text based literacy is no longer the only measure of intelligence, nor is it the only channel of valuable communications and knowledge acquisition for today's media-centered youths (Kenny, 2011; Petit, 2007; Stephens, 1998). The increasing familiarity of students with many forms of information technology devices in everyday life and their improved computer literacy should facilitate greater use of these technologies in cultivating students' speech skills more effectively. With the advent of the Internet, audiovisual materials tap the resources beyond classroom. Obvious advantages of the use of advanced technology include ease of accessing vast pools of data, images, sound and text. These cultural and technological changes have deep implications in learning practices and instructional practices in public speaking. Indeed, audiovisual stimulations in various forms have been successfully incorporated to speech training (Friend, Adams, & Curry, 2011; Procopio, 2011; Shih, 2010). Specifically this research takes advantage of stimulation from video technology in course design to diagnose students' difficulty patterns in order to improve communication skills in English public speaking.

The implementation of great speech visual aids in EFL public speaking classes

As early as World War II, filmstrips were studied as a training tool for soldiers (Hovland, Lumsdaine, & Sheffield, 1949). Since then educators have recognized the power of audiovisual materials in educational settings to capture the attention of learners, increase their motivation and enhance their learning experience. According to a summary of research and educator survey, educational television and videos has many benefits such as:
Reinforce reading and lecture material
Aid in the development of a common base of knowledge among students
Enhance student comprehension and trigger important discussions
Provide greater accommodation of diverse learning styles
Increase student motivation and enthusiasm
Lastly, promote teacher effectiveness (Saltrick, Honey, & Pasnick, 2004)

When used at the right time and in the right place, audiovisual materials exert positive contributions to language learning. Katchen (2002) reported that carefully chosen films could be a useful and extremely motivational teaching tool for both practicing listening skills and stimulating speaking and writing. Similarly, the essence of great speeches imparted in videos accelerates the learning process in public speaking. Thanks to technology, EFL language learners no longer need to physically sit in the hall or even go abroad for a speech in order to be exposed to many styles of presentations. Filmed speeches overcome the restriction of time and space. Speech footage provides an access to those speakers who otherwise are not accessible to ordinary people. Students can even listen and watch a moving delivery of great speakers who deceased long before us. Moreover, great speeches have been an important part of language culture and hence the assets of human oratory history. By viewing a visual representation of a great speech, students are encouraged to recognize the potential for social significance emitted from a speech performance. For ESL students, videos and films demonstrate communicative language within a language environment and cultural context (Wood, 1995).

Another important goal of video implementation is to have students witness a speech aimed at a more diverse audience and with more real-world relevance rather than public speaking in a classroom environment aimed often at a rather narrow audience (Ahlfeldt, 2009). The fact that the messages in the videotaped performances are designed for a much larger audience of web viewers serves the purpose. Students need to practice English public speaking in different contexts and for more serious events: business presentation, conference presentation, teaching, foreign contexts, etc., and students need role models in these regards. Videos recreate authentic inputs of different contexts and demonstrate successful cases to students.

In terms of the speech theory to be learned, video can create a solid link between them and their practical application (Canning-Wilson, 2000). Observing presentations of great speakers can help students understand the embodiment of essential theoretical constructs of public speaking as well as to feel the impacts of a successful speech. The rhythmic hand and arm movements, head nods, head gestures, facial expression, dress, hand gestures, posture and details of the environment are all related to the structure of a speech message.

Especially, non-native speakers rely more heavily on visual clues to support their understanding and there is no doubt that video is an obvious medium for helping public speaking learners to interpret lectures of the speech theory effectively. Moreover, many non-native students tended more towards a static lecture style rather than toward dynamic and active participation on stage. Through video materials students are given an opportunity to discuss the speech delivery process, the merits of a speech performance, and analyze their own methods of performance. In this way, students become more aware of strategies that help them become better communicators.

Nevertheless, Canning-Wilson (2000) cautioned that if video was to be used in the classroom to improve listening comprehension, it should be shown in segments and not as a whole. In fact, constant visual stimuli may detract from the audiovisual component. Empirical evidence has shown that attention spans were lowered when watching videos that were used to teach foreign languages (Balatova, 1994). Denning (no date) also pointed out that one of the best ways of avoiding passive consumption of media was to exploit the ability of shown video in short, relevant segments, and to use segments from multiple programs. Hence, in this current study, we abided experts' advice by letting students control clips of good speeches supporting their observations in targeted skill trainings instead of showing the full online speech, while the instructor provided resources for course-related knowledge and skills.

Grey relational Analysis

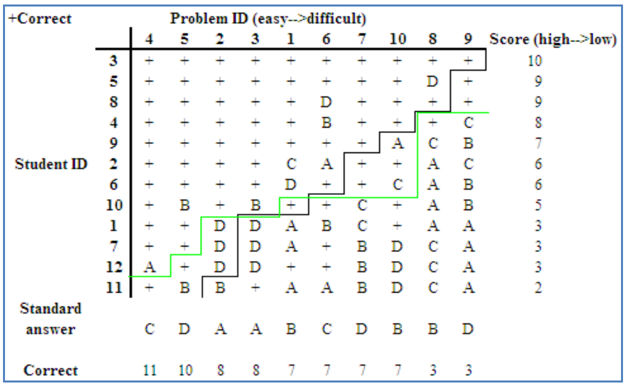
The Grey relational analysis (GRA) based on the grey system theory by Deng (1989) can be used to solve complicated inter-relationships among multiple performance characteristics effectively. Among the many analytical tools developed for grey system theory, GRA is one of the most effective experimental processes in terms of dealing uncertain, multi-dimensional, discrete, and incomplete data. Its main functions are to calculate discrete data and quantify the factors, and tthrough the ordinal process the information is translated. For example, the grey system theory has been proven useful for dealing with poor, incomplete, and unsure information (Huang & Liao, 2003). One of the beauties of grey relational analysis (GRA) is that the research does not need much data. Now GRA has been applied in a wide range of fields such as product design (Liang, Lee, & Liu, 2009; Liang, Lee, & Weng, 2010; Liang, Sheu, Wang, Tzeng, & Nagai, 2011; Liang, Wang, & Wang, 2011), market survey (Lee, Chen, Liang, Wu, & Kao, 2010), social science (Sheu, Wang, Liang, Tzeng, & Nagai, 2010; Wang, Sheu, Liang, Tzeng, & Nagai, 2012), system modeling (Wang, Wang, Wen, Nagai, & Liang, 2011), and material science (Lee, Liang, Chen, & Wu, 2010).

In this current study, the grey relational analysis model based on AHP weight was applied to scientifically evaluate learning difficulties of 26 students who enrolled in a public speaking course after they reflected their own speech performance.

S-P chart analysis

The Student-Problem chart analysis (S-P chart analysis) was originally proposed by Sato (1980). It does not require making any assumptions on the test subject group and uses a nonparametric statistical approach. It was suitable for the application on formative tests in the classroom and it provided teachers with a systematic method to diagnose the aberrant phenomena of students' response and analyze the suitability of test items. Many American and Japanese scholars joined the study of S-P chart analysis (Harnish & Linn, 1981; Tatsuoka & Tatsuoka, 1983) and it was promoted to be one of the modern test theories and an important assessment tool in primary and secondary schools (Sato, 1984). Since then, the S-P chart analysis theory has been used for diagnosing student learning conditions, instructive achievement, problem quality, and the abnormal performances held by students or problems. In addition, teachers are able to use the analyzed S-P chart data to draw up a performance profile curve. For example, by studying the performance profile curve, teachers can give proper remedial instruction and better guidance for learners who need it after the examination.

A typical S-P chart data sample with an S-curve and P-curve is shown in Figure 1. The vertical axis indicates the ID number of respondents. The sign + indicates the question item correctly answered. In the bottom row, the number indicates the number of students who answer this problem correctly. The right column indicates each student's score ranked from high to low. The S-curve shows how students agree with the problems, and the P-curve shows how the problems agree with the students. In an ideal situation these two curves should coincide, but in a practical situation these two curves will diversify (Sato, 1980).



+Correct	Problem ID (easy-->difficult)										
	4	5	2	3	1	6	7	10	8	9	Score (high-->low)
3	+	+	+	+	+	+	+	+	+	+	10
5	+	+	+	+	+	+	+	+	D	+	9
8	+	+	+	+	+	D	+	+	+	+	9
4	+	+	+	+	+	B	+	+	+	C	8
9	+	+	+	+	+	+	+	A	C	B	7
Student ID 2	+	+	+	+	C	A	+	+	A	C	6
6	+	+	+	+	D	+	+	C	A	B	6
10	+	B	+	B	+	+	C	+	A	B	5
1	+	+	D	D	A	B	C	+	A	A	3
7	+	+	D	D	A	+	B	D	C	A	3
12	A	+	D	D	+	+	B	D	C	A	3
11	+	B	B	+	A	A	B	D	C	A	2
Standard answer	C	D	A	A	B	C	D	B	B	D	
Correct	11	10	8	8	7	7	7	7	3	3	

Fig. 1. Example of an S-P chart (black line: S-curve, green line: P-curve)

SP Chart has produced a unique and powerful diagnosis tool that differs from the traditional process. However, The S-P score table proposed by Sato pays little attention to diagnose each student's individual ability of those who score the same. For example Student (5) and Student (8) score the same, i.e. 9, but S(5) was ranked in front of S(8). Therefore, prioritizing student performance and refining the difficulty level of evaluation items are still interesting to researchers to do further study. For example, by incorporating parameters like individual ability generated by GRA, we got an enhanced S-P model (Sheu, Wang, Liang, Tzeng, & Nagai, 2010; Wang, Sheu, Liang, Tzeng, & Nagai, 2012) to diagnose student performance information solving abilities associated with test items.

Methodology

Research design

To better find out their learning problems, the study designed a video-based project and identified a set of 9 evaluation items to decipher the students' cognitive learning difficulties. The 9 elements were adopted from the best-selling textbook in Taiwan according to a survey conducted among the largest EFL textbook dealers in Taiwan (Table 1). The best sold book title was *Speaking of Speech* (New/e) and the nine abilities were listed as P(A)-P(I) in Table 2.

Table 1. Bestsellers from top 5 EFL book dealers

Book dealer	No. 1 textbook title	Sales volume (2011)	Survey date
B(1)	Speech Communication Made Simple (3/e)	1327	2/27/2012
B(2)	Speaking of Speech	2000	1/4/2012
B(3)	Challenge of Effective Speaking (15/e)	437	1/5/2012
B(4)	Effective Presentation Skills	1000	2/27/2012
B(5)	Dynamic Presentations	0	1/7/2012

Table 2. The targeted abilities in *Speaking of Speech* (New/e)

Factor in the public speaking training	Training content of the factor
P(A) Posture	Maintain a good posture Stand tall Position the whole body
P(B) Eye contact	Look the audience in the eye
P(C) Gestures	Use gestures to emphasize important points & support the verbal message
P(D) Voice inflection	Tone and character of voice Use stress to emphasize key words Breathe correctly Adjust volume Adjust pace/rate Practice articulation Pauses effectively Stretch key words Vary intonation/pitch Avoid filler words
P(E) Preparing effective visual aids	Understand different types of visuals Learn different methods for displaying visuals

	Coordinate body language with visuals Use proper equipments Select explaining phrases for visuals' maximum output
P(F) Explaining visual aids	Explain visuals for their maximum output
P(G) Opening the speech	Use Openers techniques Engage the audience from the start Provide a preview Establish a compassion with the topic
P(H) Organizing & outlining the speech body	Choose a topic Analyze the audience Construct a thesis statement Learn the structure of an outline Organize main points Organize subpoints Provide evidence of the message Use transitions/signposts Connect the visuals into the message
P(I) Closing the speech	Provide a summary for the audience to remember Share personal experiences Call for action End as you started

A public speaking class of 26 student participants S(1)-S(26) enrolled this research. None of them had received intensive English presentation training before this study. They were senior EFL majors in a technological university who had studied public speaking for a semester, and were to be under the process of training for another semester. Throughout the semester, students received instructions of how to deliver English speech as well as practiced two types of speech (informative and persuasive). They already had some experience and learned some theory about speech making. The lectures familiarized them with the above 9 criteria such as voice, body languages, use of visual aids, and speech structure. Via computer searchers, students in small teams used Internet resources to find, evaluate and commented on segments of a recorded great speaker's speech. Students must prepare for using video segments by establishing clear 9 speech criteria for viewing and decided what segments would best support these criteria. Then they also use these 9 factors to reflect on their own public speech difficulties.

Data analysis

Next, Respondents were asked give a paired evaluation of the difficulty level between each two factors in an AHP matrix by 9 scales: 9, 7, 5, 3, 1, 1/3, 1/5, 1/7, 1/9. AHP procedure is then applied to determine the evaluated index weight in each student's data. The same procedure was repeated until the final respondent's, S(26) was reached. The total students' CI value could be consolidated. All the CI value < 0.1, which meant that the whole data set were consistent and clean (Table 3).

Table 3. Student S(1)-S(26) evaluation on difficulty in a GRA Matrix with CI values from AHP procedure

***S*(1)**	P(A)	P(B)	P(C)	P(D)	P(E)	P(F)	P(G)	P(H)	P(I)	LGRA (value)
Larger	**7**	**7**	**5**	**9**	**1**	**1**	**3**	**5**	**7**	
P(A)	1	3	1/3	3	1/5	1/7	1/5	1/3	3	0.1995
P(B)	1/3	1	1/3	3	1/7	1/7	1/5	1/5	3	0.1267
P(C)	3	3	1	5	1/5	1/5	1/3	1/3	3	0.329
P(D)	1/3	1/3	1/5	1	1/7	1/9	1/7	1/5	1	0
P(E)	5	7	5	7	1	1	3	3	7	0.7785
P(F)	7	7	5	9	1	1	3	5	7	1
P(G)	5	5	3	7	1/3	1/3	1	3	5	0.6564
P(H)	3	5	3	5	1/3	1/5	1/3	1	5	0.472
P(I)	1/3	1/3	1/3	1	1/7	1/7	1/5	1/5	1	0.0034
$C.I = 0.091986924 < 0.1$										

……..

S(26)	P(A)	P(B)	P(C)	P(D)	P(E)	P(F)	P(G)	P(H)	P(I)	LGRA (value)
Larger	**1**	**1**	**1**	**1**	**5**	**5**	**7**	**7**	**7**	
P(A)	1	1	1	1	5	5	7	7	7	1
P(B)	1	1	1	1	1	1	3	3	3	0.279
P(C)	1	1	1	1	1	1	3	3	3	0.279
P(D)	1	1	1	1	5	5	7	7	7	1
P(E)	1/5	1	1	1/5	1	1	3	3	1	0.1888
P(F)	1/5	1	1	1/5	1	1	3	3	3	0.2733
P(G)	1/7	1/3	1/3	1/7	1/3	1/3	1	1	1	0
P(H)	1/7	1/3	1/3	1/7	1/3	1/3	1	1	1	0
P(I)	1/7	1/3	1/3	1/7	1	1/3	1	1	1	0.0189
$C.I = 0.065605023 < 0.1$										

	P(A)	P(B)	P(C)	P(D)	P(E)	P(F)	P(G)	P(H)	P(I)	CI
Larger	**1**	**1**	**1**	**1**	**0.7785**	**1**	**1**	**1**	**1**	(value)
S(1)	0.1995	0.1267	0.329	0	0.7785	1	0.6564	0.472	0.0034	**0.091986924 < 0.1**
S(2)	0.3638	0.718	0.4361	1	0.0454	0.1192	0.0193	0.0249	0	**0.066108436 < 0.1**
S(3)	0.651	0.0179	0.6478	1	0.4282	0.2455	0	0.1714	0.0001	**0.035124465 < 0.1**
S(4)	0.0989	0.0989	0.4139	1	0.0839	0	0.0992	0.678	0.2942	**0.088531712 < 0.1**
S(5)	0.1352	1	0.5369	0.1334	0	0.5931	0.0561	0.3518	0.3333	**0.097019738 < 0.1**
S(6)	0.0001	0.6745	1	0.1504	0.3813	0.3813	0	0.8789	0.1504	**0.057905979 < 0.1**
S(7)	1	0	0.0127	0.7143	0.1899	0.0898	0.0106	0.0127	0.0096	**0.056432499 < 0.1**
S(8)	1	1	0.3243	0.1662	0	0.0039	0.5468	0.1021	0.0196	**0.099296238 < 0.1**
S(9)	0.1118	0	0.0403	1	0.3508	0.7663	0.6695	0.3743	0.1154	**0.055363028 < 0.1**
S(10)	0.2776	0	0.6092	0	0.2776	1	0	0.6092	0.1767	**0.054058201 < 0.1**
S(11)	0	0	1	1	0.4989	0.4989	0.1979	0.1979	0.1979	**0.02097988 < 0.1**
S(12)	0.0189	0.2275	0.2275	0.4149	0.1353	1	0	0.7724	0.5676	**0.04181418 < 0.1**
S(13)	0.4629	0.3193	1	0.6817	0.1562	0.1557	0	0.0008	0.0055	**0.099442388 < 0.1**
S(14)	0.7795	0	1	0.1101	0.5874	0.3996	0.2097	0.7201	0.1628	**0.0936768 < 0.1**
S(15)	0.7993	0.22	0.158	1	0.0051	0.2189	0	0.7993	0	**0.080289569 < 0.1**
S(16)	0.81	1	0.0237	0.0237	0.0237	0.3527	0.0718	0.4938	0	**0.067480195 < 0.1**
S(17)	1	0	0.0104	0.2791	0.259	0.2915	0.0293	0.4348	0.6128	**0.09537862 < 0.1**
S(18)	0.0803	1	0.2218	1	0.4042	0.7039	0	0.2862	0.0264	**0.085474349 < 0.1**
S(19)	0.1267	0.1995	0.3666	1	0	0.0008	0.6564	0.472	0.7785	**0.094828768 < 0.1**
S(20)	0.4721	0	0.2642	1	0.5799	0.6306	0.0634	1	0.1416	**0.095283686 < 0.1**
S(21)	0.2818	0	0	0	0.2818	0.6261	0	1	0	**0.020077101 < 0.1**
S(22)	0.0418	0.6195	0.534	1	0	0.2834	0.0981	0.1904	0.1133	**0.058241455 < 0.1**
S(23)	0	0	0	0	0.0499	0.0499	1	0.3654	1	**0.030335811 < 0.1**
S(24)	0.0615	0.0117	0.5172	0.4349	0.2514	0.1229	0	1	0.7283	**0.098726242 < 0.1**
S(25)	0.361	0.3082	0	1	0.169	0.1862	0.4957	0.7753	0.5697	**0.084348408 < 0.1**
S(26)	1	0.279	0.279	1	0.1888	0.2733	0	0	0.0189	**0.065605023 < 0.1**

After making sure the validity of the data, the AHP-revised GRA evaluation model was finalized to scientifically evaluate the data of students' learning difficulties. The GRA procedure generated the results shown in Table 4. The LGRA-Student values were further sorted out and showed the ranking of students (Table 5) from the one (S(7))who has the most different mindset regarding speech skill difficulty from the rest of his/her cohorts, to the student (S(25)) whose mindset of speech difficulty was the most representative of the respondents.

Table 4. GRA-S value

	P(A)	P(B)	P(C)	P(D)	P(E)	P(F)	P(G)	P(H)	P(I)
Larger	**1**	**1**	**1**	**1**	**0.7785**	**1**	**1**	**1**	**1**
S(1)	0.1995	0.1267	0.329	0	0.7785	1	0.6564	0.472	0.0034
S(2)	0.3638	0.718	0.4361	1	0.0454	0.1192	0.0193	0.0249	0
S(3)	0.651	0.0179	0.6478	1	0.4282	0.2455	0	0.1714	0.0001
S(4)	0.0989	0.0989	0.4139	1	0.0839	0	0.0992	0.678	0.2942
S(5)	0.1352	1	0.5369	0.1334	0	0.5931	0.0561	0.3518	0.3333
S(6)	0.0001	0.6745	1	0.1504	0.3813	0.3813	0	0.8789	0.1504
S(7)	1	0	0.0127	0.7143	0.1899	0.0898	0.0106	0.0127	0.0096
S(8)	1	1	0.3243	0.1662	0	0.0039	0.5468	0.1021	0.0196
S(9)	0.1118	0	0.0403	1	0.3508	0.7663	0.6695	0.3743	0.1154
S(10)	0.2776	0	0.6092	0	0.2776	1	0	0.6092	0.1767
S(11)	0	0	1	1	0.4989	0.4989	0.1979	0.1979	0.1979
S(12)	0.0189	0.2275	0.2275	0.4149	0.1353	1	0	0.7724	0.5676
S(13)	0.4629	0.3193	1	0.6817	0.1562	0.1557	0	0.0008	0.0055
S(14)	0.7795	0	1	0.1101	0.5874	0.3996	0.2097	0.7201	0.1628
S(15)	0.7993	0.22	0.158	1	0.0051	0.2189	0	0.7993	0
S(16)	0.81	1	0.0237	0.0237	0.0237	0.3527	0.0718	0.4938	0
S(17)	1	0	0.0104	0.2791	0.259	0.2915	0.0293	0.4348	0.6128
S(18)	0.0803	1	0.2218	1	0.4042	0.7039	0	0.2862	0.0264
S(19)	0.1267	0.1995	0.3666	1	0	0.0008	0.6564	0.472	0.7785
S(20)	0.4721	0	0.2642	1	0.5799	0.6306	0.0634	1	0.1416
S(21)	0.2818	0	0	0	0.2818	0.6261	0	1	0
S(22)	0.0418	0.6195	0.534	1	0	0.2834	0.0981	0.1904	0.1133
S(23)	0	0	0	0	0.0499	0.0499	1	0.3654	1
S(24)	0.0615	0.0117	0.5172	0.4349	0.2514	0.1229	0	1	0.7283
S(25)	0.361	0.3082	0	1	0.169	0.1862	0.4957	0.7753	0.5697
S(26)	1	0.279	0.279	1	0.1888	0.2733	0	0	0.0189

Table 5. GRA-S value and ranking

	LGRA (value)
S(1)	0.6649
S(2)	0.3784
S(3)	0.5359
S(4)	0.4366
S(5)	0.6661
S(6)	0.7184
S(7)	0
S(8)	0.487
S(9)	0.6699
S(10)	0.475
S(11)	0.6589
S(12)	0.7005
S(13)	0.4092
S(14)	0.9034
S(15)	0.5295
S(16)	0.3711
S(17)	0.5016
S(18)	0.706
S(19)	0.8167
S(20)	0.9164
S(21)	0.0843
S(22)	0.5117
S(23)	0.1057
S(24)	0.5571
S(25)	1
S(26)	0.4313

	LGRA (value)	**Student ranking**
S(7)	0	26
S(21)	0.0843	25
S(23)	0.1057	24
S(16)	0.3711	23
S(2)	0.3784	22
S(13)	0.4092	21
S(26)	0.4313	20
S(4)	0.4366	19
S(10)	0.475	18
S(8)	0.487	17
S(17)	0.5016	16
S(22)	0.5117	15
S(15)	0.5295	14
S(3)	0.5359	13
S(24)	0.5571	12
S(11)	0.6589	11
S(1)	0.6649	10
S(5)	0.6661	9
S(9)	0.6699	8
S(12)	0.7005	7
S(18)	0.706	6
S(6)	0.7184	5
S(19)	0.8167	4
S(14)	0.9034	3
S(20)	0.9164	2
S(25)	1	1

The same procedures were performed on the Ps, yielding the results in Table 6. The LGRA-Problem values were further sorted out and showed the ranking of difficulty (Table 7) from the easiest (P(G)) to the most difficult (P(D)).

Table 6. GRA-P value

	S(1)	S(2)	S(3)	S(4)	S(5)	S(6)	S(7)	S(8)	S(9)	S(10)	S(11)	S(12)	S(13)	S(14)	S(15)	S(16)	S(17)
Larger	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
P(A)	0.1995	0.3638	0.651	0.0989	0.1352	0.0001	1	1	0.1118	0.2776	0	0.0189	0.4629	0.7795	0.7993	0.81	1
P(B)	0.1267	0.718	0.0179	0.0989	1	0.6745	0	1	0	0	0	0.2275	0.3193	0	0.22	1	0
P(C)	0.329	0.4361	0.6478	0.4139	0.5369	1	0.0127	0.3243	0.0403	0.6092	1	0.2275	1	1	0.158	0.0237	0.0104
P(D)	0	1	1	1	0.1334	0.1504	0.7143	0.1662	1	0	1	0.4149	0.6817	0.1101	1	0.0237	0.2791
P(E)	0.7785	0.0454	0.4282	0.0839	0	0.3813	0.1899	0	0.3508	0.2776	0.4989	0.1353	0.1562	0.5874	0.0051	0.0237	0.259
P(F)	1	0.1192	0.2455	0	0.5931	0.3813	0.0898	0.0039	0.7663	1	0.4989	1	0.1557	0.3996	0.2189	0.3527	0.2915
P(G)	0.6564	0.0193	0	0.0992	0.0561	0	0.0106	0.5468	0.6695	0	0.1979	0	0	0.2097	0	0.0718	0.0293
P(H)	0.472	0.0249	0.1714	0.678	0.3518	0.8789	0.0127	0.1021	0.3743	0.6092	0.1979	0.7724	0.0008	0.7201	0.7993	0.4938	0.4348
P(I)	0.0034	0	0.0001	0.2942	0.3333	0.1504	0.0096	0.0196	0.1154	0.1767	0.1979	0.5676	0.0055	0.1628	0	0	0.6128

(Table 6 continued)

	S(18)	S(19)	S(20)	S(21)	S(22)	S(23)	S(24)	S(25)	S(26)
Larger	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
P(A)	0.1995	0.1267	0.329	0	0.7785	1	0.6564	0.472	0.0034
P(B)	0.3638	0.718	0.4361	1	0.0454	0.1192	0.0193	0.0249	0
P(C)	0.651	0.0179	0.6478	1	0.4282	0.2455	0	0.1714	0.0001
P(D)	0.0989	0.0989	0.4139	1	0.0839	0	0.0992	0.678	0.2942
P(E)	0.651	0.0179	0.6478	1	0.4282	0.2455	0	0.1714	0.0001
P(F)	0.0001	0.6745	1	0.1504	0.3813	0.3813	0	0.8789	0.1504
P(G)	1	0	0.0127	0.7143	0.1899	0.0898	0.0106	0.0127	0.0096
P(H)	1	1	0.3243	0.1662	0	0.0039	0.5468	0.1021	0.0196
P(I)	0.1118	0	0.0403	1	0.3508	0.7663	0.6695	0.3743	0.1154

Table 7. GRA-P value and ranking

	LGRA (value)
P(A)	0.5789
P(B)	0.2721
P(C)	0.6115
P(D)	1
P(E)	0.2547
P(F)	0.6484
P(G)	0
P(H)	0.9053
P(I)	0.1519

	LGRA (value)	**Problem ranking**
P(G)	0	9
P(I)	0.1519	8
P(E)	0.2547	7
P(B)	0.2721	6
P(A)	0.5789	5
P(C)	0.6115	4
P(F)	0.6484	3
P(H)	0.9053	2
P(D)	1	1

Combining Table 5 and Table 7, we got a chart that functions like an S-P Chart, only more precise (Table 8). To conform to the scheme of a typical S-P chart, LGRA-S value ranking serves as the vertical axis and LGRA-P value ranking serves as the horizontal axis. According to the S-P chart, the most difficult ability to acquire is located on the far right of the vertical axis, while the easiest speaking technique for students is located on the far left. In the respondents' cognition, it was *P(D) voice variation →P (H) Organizing & outlining the speech body→ P(F) Explaining visual aids → P(C) Gestures → P(A) Posture→ P(B) Eye contact → P(E) Preparing effective visual aids → P (I) Closing the speech → P(G) Opening the speech.*

As to students' mindset, S (25) located on the bottom of the chart represented the consensus of what most respondents felt toward the difficulty levels of the nine skills, while S(7) located on the top shared the least consensus with other fellow students, meaning that S(7) thought very differently from others.

Table 8. GRA values in the scheme of S-P chart

	P(G)	***P(I)***	***P(E)***	***P(B)***	***P(A)***	***P(C)***	***P(F)***	***P(H)***	***P(D)***	
	0	**0.1519**	**0.2547**	**0.2721**	**0.5789**	**0.6115**	**0.6484**	**0.9053**	**1**	**LGRA (value)**
S(7)	0.0106	0.0096	0.1899	0	1	0.0127	0.0898	0.0127	0.7143	**0**
S(21)	0	0	0.2818	0	0.2818	0	0.6261	1	0	**0.0843**
S(23)	1	1	0.0499	0	0	0	0.0499	0.3654	0	**0.1057**
S(16)	0.0718	0	0.0237	1	0.81	0.0237	0.3527	0.4938	0.0237	**0.3711**
S(2)	0.0193	0	0.0454	0.718	0.3638	0.4361	0.1192	0.0249	1	**0.3784**
S(13)	0	0.0055	0.1562	0.3193	0.4629	1	0.1557	0.0008	0.6817	**0.4092**
S(26)	0	0.0189	0.1888	0.279	1	0.279	0.2733	0	1	**0.4313**
S(4)	0.0992	0.2942	0.0839	0.0989	0.0989	0.4139	0	0.678	1	**0.4366**
S(10)	0	0.1767	0.2776	0	0.2776	0.6092	1	0.6092	0	**0.475**
S(8)	0.5468	0.0196	0	1	1	0.3243	0.0039	0.1021	0.1662	**0.487**
S(17)	0.0293	0.6128	0.259	0	1	0.0104	0.2915	0.4348	0.2791	**0.5016**
S(22)	0.0981	0.1133	0	0.6195	0.0418	0.534	0.2834	0.1904	1	**0.5117**
S(15)	0	0	0.0051	0.22	0.7993	0.158	0.2189	0.7993	1	**0.5295**
S(3)	0	0.0001	0.4282	0.0179	0.651	0.6478	0.2455	0.1714	1	**0.5359**
S(24)	0	0.7283	0.2514	0.0117	0.0615	0.5172	0.1229	1	0.4349	**0.5571**
S(11)	0.1979	0.1979	0.4989	0	0	1	0.4989	0.1979	1	**0.6589**
S(1)	0.6564	0.0034	0.7785	0.1267	0.1995	0.329	1	0.472	0	**0.6649**
S(5)	0.0561	0.3333	0	1	0.1352	0.5369	0.5931	0.3518	0.1334	**0.6661**
S(9)	0.6695	0.1154	0.3508	0	0.1118	0.0403	0.7663	0.3743	1	**0.6699**
S(12)	0	0.5676	0.1353	0.2275	0.0189	0.2275	1	0.7724	0.4149	**0.7005**
S(18)	0	0.0264	0.4042	1	0.0803	0.2218	0.7039	0.2862	1	**0.706**
S(6)	0	0.1504	0.3813	0.6745	0.0001	1	0.3813	0.8789	0.1504	**0.7184**
S(19)	0.6564	0.7785	0	0.1995	0.1267	0.3666	0.0008	0.472	1	**0.8167**
S(14)	0.2097	0.1628	0.5874	0	0.7795	1	0.3996	0.7201	0.1101	**0.9034**
S(20)	0.0634	0.1416	0.5799	0	0.4721	0.2642	0.6306	1	1	**0.9164**
S(25)	0.4957	0.5697	0.169	0.3082	0.361	0	0.1862	0.7753	1	**1**

Conclusion

The paper details an innovative methodology to investigate the difficulties which EFL students encounter in English public speaking by combining visual materials and a novel approach to data. Speech footages in English are taken from the Internet and used as a means of introducing visual perceptions of speaking skills, in which 9 speech abilities are further identified to define the student competence in English public speaking. 26 students study and reflect on these inspiring videos. Afterward, the data of perceptions of speech ability difficulties are obtained from the students. The AHP and GRA methods are then applied to analyze students' perceived difficulties and sort the data in order. Finally, GRA results are set up in the scheme of an S-P Chart. By analyzing the students' response patterns, a traditional S-P chart method is a good way to obtain diagnostic information and used as guidance to give students additional training in certain speech skills. However, the research in this paper validates an improved evaluation model of a Grey-based S-P chart as precise, simple and feasible in synthetic evaluating student learning difficulties in English speech delivery. It clearly represented the students' cognitive mapping of the speech difficulties in relation to their overall speech conceptualization, i.e. the most difficult *P(D) voice variation* → *P (H) Organizing & outlining the speech body* → *P(F) Explaining visual aids* → *P(C) Gestures* → *P(A) Posture* → *P(B) Eye contact* → *P(E) Preparing effective visual aids* → *P (I) Closing the speech* → the easiest *P(G) Opening the speech*. The result of the study offers a valuable reference for improving course design in EFL public speaking class. It can improve classroom teaching because instructors hereby develop better teaching strategies with more focused course design. It also help the students adjust learning strategies to acquire the public speaking skills more effectively.

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UZAKTAN EĞİTİMDE ÖĞRETİM KİŞİSELLEŞTİRİLMESİ VE EŞİTLİK KURAMI

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ÖZET

Geleneksel olarak uzaktan eğitim, çeşitli nedenlerle örgün eğilim olanaklarından yararlanamayan bireylere, eğilim hizmeti alabilme yollarım açan bir seçenek olarak ortaya çıkmıştır. Uzaktan eğitim sistemlerinin en temel özelliği, bütün bu faktörlere rağmen, hizmetten yararlanma yollarını açık tutmalarıdır. Eşitlik kuramı, "Uzaktan eğitim öğrencilerinin öğrenme deneyimleri, yüz yüze öğrenen öğrencilerin öğrenme deneyimlerine ne kadar eşit olursa, öğrenme sonuçları da o kadar eşit olur" varsayımına dayandığını ifade etmektedirler. Başka bir söyleyişle, eğer öğrencilere eşit öğrenme deneyimleri sunulabilirse, onların öğrendikleri de birbirine eşit olur. Kişiselleştirilmiş öğretim ise öğrenci ile otantik düzeyde ve kişi olarak ilgilenilmesini zorunlu kılan bir öğretim anlayışıdır; böyle bir anlayışta öğretimin de, değerlendirmenin de otantik olması zorunludur. Kişisel öğretim aslında bu özelliklere kendisinden başlamak üzere onun içinde yaşadığı gerçek dünyanın bileşenleri olarak araba, ev, oyuncak, yiyecek gibi nesnelerini; yer, zaman, yaş, renk, favori takım gibi fenomenlerini ve arkadaş, hayvan, ebeveyn, kardeş, öğretmen gibi aktörlerini de katmayı gerektirir.

Anahtar Kelimeler*: Uzaktan Eğitim, Kişiselleştirme, Eşitlik*

SUMARRY

Traditionally, distance education, for various reasons, individuals can not benefit from the formal possibilities of normal education; distance education has emerged as an option that many ways of getting services. The main feature of distance education systems, despite all these factors, it keeps open the ways of getting service. Equity theory, "Distance education students 'learning experiences and normal students' learning experiences, are equal at high rate it means that is equal to the learning outcomes" based on the assumption that state that. In other words, if students can service their learning experiences will be equal. Level of personalized teaching and the student as a person dealt with the authentic teaching approach which is a compelling need, such an understanding in the teaching, the assessment must also be authentic. Personal training requires to add actually the real world they live in these properties as components of his starting his car, home, toys, objects such as food, space, time, age, color, phenomena such as your favorite team, and friends, pets, parents, siblings, teachers at the actors.

Keywords: Distance Education, Personalization, Equality.

Kişiselleştirme fikir olarak daha eski kaynaklarda ve öğretim yaklaşımlarında da yer almış olsa da, sistematik şekilde tanımlanmış bir kavram olarak ilk defa 1962 yılında, “The University of Brasilia” da çalışan Fred Keller ve arkadaşları tarafından geliştirilen Kişiselleştirilmiş Öğretim Sistemi (Personalized System of Instruction, PSI) bağlamında kullanılmıştır. PSI’ın uygulamaya aktarılması için çeşitli planlar da geliştirilmiştir. Yükseköğretim öğrencileri için geliştirilen Keller Planı ve K-12 öğrencileri için geliştirilen Winnetka Planı bunların en tanınmış olanlarıdır

Kişiselleştirilmiş Öğretim Sistemi bir bütün olarak okul uygulamalarının ve okulda gerçekleştirilen bütün etkinlikler anlamında eğitim programının tümüyle kişiselleştirilmesini öngören bir sistemdir. Bu sisteme uygun olarak sürdürülen bir öğretim uygulamasına kişiselleştirilmiş öğretim (personalized instruction) denir. Bununla birlikte sadece öğretim içeriğinin kişiselleştirilmesi de mümkündür ve bu tür bir uygulama PSI’a dayalı olmakla birlikte, sistemin öngördüğü kapsamdan yoksun, kısmi bir kişiselleştirmedir.

Kişiselleştirilmiş öğretim öğrenci ile otantik düzeyde ve kişi olarak ilgilenilmesini zorunlu kılan bir öğretim anlayışıdır; böyle bir anlayışta öğretimin de, değerlendirmenin de otantik olması zorunludur. Kişiselleştirilmiş öğretim bireysel (ferdi) ve kişisel (şahsi) öğretimi içine alır. Bireysel öğretim daha çok öğrencinin öğrenme hızı, kapasitesi, ihtiyacı, stili, yaklaşımı gibi karakteristik özelliklerini temel alırken; kişisel öğretim aslında bu özelliklere kendisinden başlamak üzere onun içinde yaşadığı gerçek dünyanın bileşenleri olarak araba, ev, oyuncak, yiyecek gibi nesnelerini; yer, zaman, yaş, renk, favori takım gibi fenomenlerini ve arkadaş, hayvan, ebeveyn, kardeş, öğretmen gibi aktörlerini de katmayı gerektirir.

Jonassen ve Grabowski (1993) öğretimde kişiselliği, bireyin çevresiyle ve özellikle diğer insanlarla etkileşimi olarak tanımlamıştır. Öğretimin kişiselleştirilmesi, öğretimin öğrenci merkezli olması yani öğrencinin kişisel ihtiyaçlarına göre şekillendirilmesiyle sağlanır (Diack, 2004). Kişiselleştirilmiş öğretim, öğrencinin kendini kavrama adapte etmeye çalıştığı geleneksel öğretim sisteminin aksine, öğrenilen kavramın bireye adapte edilmesi gerektiğini savunmaktadır (Karagiannidis ve diğerleri, 2001).

Bireysel öğretim (individual instruction) ve özel ders yaklaşımları ile iç içe girmiş olması, kişiselleştirilmiş öğretimin onlarla özdeş olduğu anlamına gelmez. Örneğin teke-tek öğretim öğretmen başına düşen öğrenci oranı ile ilgili daha çok matematiksel bir yaklaşımdır. Keza bireysel öğretim öğrenci ile kişi (şahıs) olması değil, birey (fert) olması açısından ilgilenir. Oysa bireysel öğretimde öğrencinin bireysel ilgi, ihtiyaç, önbilgi gibi öğrenme karakteristikleri ile ilgilenilmediği sürece bir okulda her öğrenciye bir öğretmen tahsis edilmesinin hiçbir anlamı yoktur. Keza bireysel öğretim mantığı içinde ama hiç de otantik olmayan bir tarzda sadece öğrenme karakteristikleri ile ilgilenmek de öğretimin kişiselleştirildiği anlamına gelmez.

Kişiselleştirilmiş öğretim öğrencilerin ihtiyaç ve ilgilerine daha fazla odaklanmıştır, hedef ve stratejilerde daha gerçeksidir (otantiktir). Kişiselleştirilmiş öğretimin temel vurgularından birisi de birey olarak öğrencinin benzersizliğidir (uniqueness). Bu yüzden kişiselleştirilmiş bir okulda yatay ve dikey okul organizasyonu klasik normlara uygun değildir (Keefe, 2007).

Öğretim İçeriğinin Kişiselleştirilmesi

Keefe ve Jenkis kişiselleştirilmiş öğretimin kültür ve içeriğini oluşturan bileşenleri tanımlamışlardır. Buna göre kültürel bileşenler ikil öğretmen rolü (danışmanlık ve kolaylaştırıcılık), öğrencinin öğrenme karakteristikleri ve okul kültürüdür. İçerik bileşenleri ise etkileşimli öğrenme ortamı, esnek uygulama takvimi ve gerçeksi (otantik) değerlendirmedir (Keefe, 2007).

Gerçeksilik, okulda öğrencinin karşı karşıya kaldığı materyal ve içeriğin, öğrencinin gerçek yaşamını temsil edici tam ya da temsili (senaryo ya da benzetim gibi) kişi, olay, bilgi ve sorunlarla karşı karşıya getirilmesini gerektirir. Başka bir söyleyişle PSI'da kişiselleştirmenin aracı sadece öğrencinin kişisel hızına göre ilerlemesini sağlamak değildir; öğretim içeriğinin de, öğrencinin içinde yaşadığı gerçek dünyadan kesitler içermesi gerekir. Bu bir tür, gerçek dünya ile öğretim içeriğinin birbirine yaklaştırılmasıdır. Bunun yolu öğrenciye verilen bilgilerin ya da karşı karşıya bırakıldığı sorunların onun gerçek dünyasından seçilmesidir; buna öğretim içeriğinin kişiselleştirilmesi (personalized of instructional content) denilmektedir.

Öğretim içeriğinin kişiselleştirilmesi için çeşitli yaklaşımlar vardır. Lopez ve Sullivan (1992), Lopez (1989), Herndon (1988) gibi çalışmalarda Anand ve Ross tarafından lanse edilen iki düzeyli kişiselleştirme kullanılmıştır: Bireysel kişiselleştirme ve grupsal kişiselleştirme. Raporun daha önceki bölümünde de ifade edildiği gibi bireysel kişiselleştirmede öğretim içeriği oluşturulurken öğrencinin yakın çevresinden kişi, olay, obje ve favoriler seçilerek, içerik içine gömülmektedir. Grupsal kişiselleştirmede ise bütün bu ögeler öğrenciler için ortak olabileceklerden seçilmekte ve içerik içine yerleştirilmektedir.

Öğretim içeriğinin kişiselleştirilmesi sadece içeriğe öğrencinin kişisel alanından seçilmiş ögeler yerleştirmekten ibaret değildir; Ross, McCormick ve Krisak'ın (1985) çalışmalarında olduğu, öğrenciye, bir dizi içerik içinden, öğrenmek istediğini seçme özgürlüğü de verilebilir. Burada öğrenci öğrenmek istediği içeriği, başka bir söyleyişle dersi seçmektedir.

Alan yazında rastlanmamış olsa da, kişiselleştirmenin temel felsefesi ile tutarlı olarak, üzerinde durulabilecek bir başka kişiselleştirme türü de temel kavram ve kuralların (formül, teori, prensip gibi) hangi alana uyarlanacağı konusunda da öğrenciye serbestlik tanımaktır. Örneğin; oran-orantı gibi bir matematik konusu işlenirken bu konu ile ilgili örneklerin hangi alana uygulanacağını belirlemede kontrol öğrenciye bırakılabilir; isteyen öğrenci oran ve orantı ile ilgili kuralları ekonomi, tarih, fizik ya da coğrafya alanlarından birisine uygulamayı tercih edebilir.

Basılı Materyaller artık kişiselleştirilmiş öğrenme ortamı için tercih edilmiyor. Bunu yerin zengin öğrenme ortamları sunan bilgisayar veya internet tabanlı modüller kullanılmaktadır. Öğrenciler bilgisayar vasıtasıyla daha fazla bilgiye ve daha zengin kaynaklara ulaşabiliyor.

Bilgi teknolojilerindeki gelişmeler ve özellikle bilgisayar teknolojisi öğretim içeriğinin kişiselleştirilmesi konusunda zengin olanaklar sunabilecek durumdadır. Örneğin öğrencilerin kişisel verilerinin bilgisayar ortamında derlenip, bir veri tabanında saklanması ve ihtiyaç duyuldukça, öğretim materyallerine ya da sınav sorularına aktarılması kolaylıkla yapılabilecek işlerdendir. Oysa daha eski, bu tür uygulamaları gerçekleştirmek görece daha zor ve zaman alıcıdır. Bilgi teknolojilerinin kullanımı, kişiselleştirme uygulamalarının yaygınlaştırılabilmesi için önemli bir fırsat olarak görülebilir.

EŞİTLİK KURAMI

Geleneksel olarak uzaktan eğitim, çeşitli nedenlerle örgün eğilim olanaklarından yararlanamayan bireylere, eğilim hizmeti alabilme yollarım açan bir seçenek olarak ortaya çıkmıştır. Hemen her ülkede örgün eğilim sistemlerinin sunduğu hizmetlerin yaygınlığı yaş zaman, maliyet, yerleşim, bireysel sınırlılıklar, coğrafi özellikler gibi birtakım faktörler tarafından sınırlanır. Örgün eğitim sistemleri bu faktörlerden kaynaklanan sınırlamalara açıktır. Aslında yadırganacak bir şekilde örgün eğitim sistemleri, bu faktörleri bir anlamda istisna olarak kabul ederler ve bunlardan etkilenen bireylere, çeşitli giriş sınavları ya da sınıfta hazır bulunma zorunluluğu gibi engellemelerle kapılarını kapatırlar. Uzaktan eğitim sistemlerinin en temel özelliği, bütün bu faktörlere rağmen, hizmetten yararlanma yollarını açık tutmalarıdır.

Öğretim teknolojilerindeki yeni gelişmeler, uzaktaki Öğrenciler ile öğretmenlerin eş zamanlı, ses ve görüntü paylaşımlı bir iletişim içinde öğrenmelerine olanak tanıyabilecek bir noktaya gelmiş bulunuyor. Sanal sınıf denilen uygulama ile geleneksel sınıflarla karşılaştırılamayacak kadar geniş kapsamlı, ancak işleyiş tarzı acısından sınıfa benzeyen öğrenme ortamları oluşturulabilmektedir. Üstelik bu yolla uluslararası eğitim uygulamalarına da girişmek mümkündür. Bu tür uygulamalar online (çevrimiçi) sınıf, eğitim ağları ya da İnternete dayalı uzaktan eğitim gibi adlarla her geçen gün hızla yaygınlaşmaktadır.

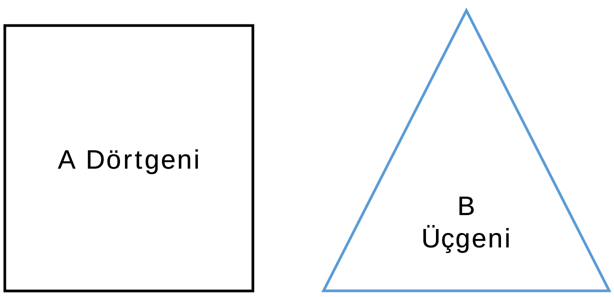
Uzaktan eğitimin tarihine bakıldığında; Rudolf Manfred Delling (1994) kurumsal uzaktan eğitimin 100 yıldan beri var olmasına rağmen, uzaktan öğretim uygulamalarında "kuram" olarak uzaktan eğitime güvenilmeye 1960'ların ikinci yarısında başlandığını ifade etmektedir (Akt. Keegan, 1996). 1960'larda Peters'ın uzaktan eğitimin ortaya çıktığı koşullara dikkat çekmeye dönük olarak geliştirdiği kuram, endüstri kavramına dayanır (Keegan, 1996). Keegan (1996), Holmberg (1989) ve Moore (1973)'un uzaktan eğitimi, birbirinden zaman ve mekan açısından ayrı, öğretmen ve öğrenciler arasında gerçekleşen bir eğitim uygulaması olarak tanımladıklarını ifade etmektedir. Peratton'un yaklaşımı ise daha çok, uzaktan eğitim sistemlerinin özgünlüğünü vurgulamaya yöneliktir (Simonson, Schlosser ve Hanson, 1999). Oysa, 1990'ların ikinci yarısından sonra teknolojik gelişimlerin günlük yaşantıdaki ağırlığı arttıkça, kuramcıların uzaktan eğitime bakış açısı farklılaşmaya başlamış, bu da tanımlara yansımıştır. Bu farklı yaklaşımlardan en önemlilerinden biri de "eşitlik kuramı – equivalency theory"dır. Simonson ve arkadaşları (1999), eşitlilik kuramının, "Uzaktan eğitim öğrencilerinin öğrenme deneyimleri, yüz yüze öğrenen öğrencilerin öğrenme deneyimlerine ne kadar eşit olursa, öğrenme sonuçları da o kadar eşit olur" varsayımına dayandığını ifade etmektedirler. Başka bir söyleyişle, eğer öğrencilere eşit öğrenme deneyimleri sunulabilirse, onların öğrendikleri de birbirine eşit olur. Uzaktan eğitim sistemleri öyle düzenlenmelidir ki bu düzenleme ile öğrenciler klasik okul sınıflarındaki öğrencilere eşit öğrenme deneyimleri kazanabilmelidir.

Eşitlik kuramı dışındaki yaklaşımlar; uzaktan eğitim uygulamasında öğretmen ve öğrencinin hem fiziksel hem de zamansal özerkliğini kaçınılmaz görmektedirler. Buna karşılık eşitlik kuramı, özellikle zamansal özerklikten, kısmen ödün vermek gerekebileceğini vurgulamaktadır. Bunun nedeni olarak da, yüz yüze öğrenme deneyimlerine eşit deneyimler sağlayabilmek için, zaman paylaşımlı (eşzamanlı) uygulamaların eğitsel potansiyeline başvurma gerekliliğini öne sürmektedir (Verduin ve Clark, 1994).

Eşitlik kuramına göre uzaktan eğitim; birbirinden uzaktaki öğrenci ve öğretmenler arasında ki etkileşimin, ileri iletişim teknolojileri ile gerçekleştiği resmi ve kurumsal bir öğrenme sistemidir. Öğrenme deneyimlerinin eşitliği, basit bir örnekle açıklanmaktadır:

Farklı geometrik şekiller olmalarına karşın, bir üçgen ve bir dikdörtgenin alanları ya da hacimleri nasıl birbirine eşit olabilirse; benzer şekilde uzaktan ve yüz yüze öğrenen öğrencilerin deneyimleri de nitelik ve sonuçları itibariyle birbirine eşit sayılabilir (Simonson, 1999). Uzaktan eğitimde, öğretimi planlamanın amacı, her öğrenci için deneyimlerin toplamını eşitleyecek bir yaklaşım geliştirme olarak öngörülmektedir (Simonson, Schlosser ve Hanson, 1999).

Horton (2000), ağ ortamında sağlanabilecek çok sayıda öğrenme etkinliği tanımlamaktadır. Bu tanımlamalar, yüz yüze öğrenme deneyimlerine eşit uzaktan öğrenme deneyimleri sağlanabileceği konusunda cesaret vericidir. Tanımlanan etkinlikler incelendiğinde görülmektedir ki, yüz yüze öğretim ortamında kullanılan hemen her türden öğrenme etkinliğinin ağ ortamında, uzaktan eğitim amacıyla kullanılabilecek biçimleri de vardır. Ağ ortamında sunum, tartışma, gösterim, soru-cevap, beyin fırtınası, durum çalışması, bilgi avcılığı, işbirlikli öğrenme, problem merkezli öğrenme gibi çok sayıda öğretim yöntemi uygulanabilir. Bu yolla öğrenenlerin okuma, yazma, gözleme, dinleme, yapma türü deneyimler kazanması mümkündür (Şimşek, 2002a).



Eşitlik kuramı anahtar elemanları:
Eşitlik, uzaktan ve yüz yüze öğrenen öğrencilerin deneyimlerinin nitelik ve sonuç olarak birbirine eşit olması olarak algılanmaktadır.
Uygun uygulama kavramı, öğrenme deneyimlerinin birey olarak öğrencinin ihtiyaçlarına uygun olduğu ve öğrenme durumunun müsait olduğu ve öğrenme deneyimlerinin doğru dürüst ve zamanında oluştuğu anlamına gelmektedir.
Öğrenciler ise, kurumsal öğrenme etkinliğinin gerçekleştiği bir derse ya da bir öğretim ünitesine katılan kişilerdir.
Öğrenme sonucu, öğrenme deneyimleri sonunda, öğrenci davranışlarında meydana gelen açık, ölçülebilir ve kalıcı değişimlerdir.
Öğrencinin gözleyerek, hissederek, duyarak ya da yaparak öğrenmesini artırdığı her şey bir öğrenme deneyimidir

Moore ve Kearsley (1996), uzaktan eğitimde bir araya gelme ve etkileşimde bulunmanın, öğrenmenin etkililiğine önemli ölçüde katkı getireceği görüşünü savunmaktadır. Yüz yüze öğretim boyutu hem öğrencilerin sosyal olma ihtiyaçlarını (462 N. Eşgi Güz 2006, Cilt 4, Sayı 4) gideren, hem de sistem içerisinde öğrencilerin sorma fırsatı bulamadıkları soruların yanıtlarını verebilecek önemli bir uygulama olarak karşımıza çıkmaktadır.

İyi tasarlanmış bir uzaktan eğitim uygulamasının öğrencilerin fiziksel mekân ve bireysel ihtiyaç farklılıklarını en aza indirgemesi beklenmektedir. Yüz yüze öğretim boyutu uzaktan eğitim uygulamalarında eşitlik yaklaşımının gerçekleştirilmesine yardım edecek bir unsur olarak göz önüne alınmalıdır. Eşitlik yaklaşımı, uzaktan eğitim gören öğrencilerin örgün eğitim gören öğrencilerin edindikleri öğrenme deneyimlerine eşitlenmesi, uzaklığın bir anlamda alt edilmesi ve eşit eğitimsel tecrübelerin sunulmasını kapsamaktadır. Bunun sağlanması için de tasarımcılar yüz yüze öğretimin öğrencilerin dikkatlerini arttıracak avantajlarını dikkate almalıdırlar (Soefijanto, 2004).

Kaynaklar:

http://www.edtech.vt.edu/edtech/id/models/powerpoint/psi.pdf

Özarslan Yasin, Kişiselleştirilmiş Öğrenme Ortamı Olarak İPTV

Çakır Özlem, Bilgisayar ve Sınıf Ortamında Kişiselleştirilmiş Sözel Matematik Problemleri kullanmanın Öğrenci Başarısına Etkisi(Ankara,2008)

http://www.bto305.hacettepe.edu.tr/2003guz/ue_kuramlar/esitlik_kurami.htm

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http://www.c3l.uni-oldenburg.de/cde/found/simons99.htm

Karataş Serçin,GÜ, Gazi Eğitim Fakültesi Dergisi, Cilt 26, Sayı 3(2006)

WEB-BASED SIMULATION LEARNING FRAMEWORK TO ENHANCE STUDENTS' CRITICAL THINKING SKILLS

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Abstract

The purpose of this research is to develop a web-based simulation learning framework that enhances students' critical thinking based on iterative simulation features social constructivist theory by Honebein (1996), and critical thinking skills. To evaluate the effectiveness of the framework towards enhancing students' critical thinking skills, several web-based simulations were developed for learning Communication and Networking in Education subject and delivered through an interactive web-based learning environment. A case study involved 21 university students has been conducted to investigate the impact of the simulations on their critical thinking skills and the results showed that the implemented web-based simulation learning framework has positive impact on students' critical thinking skills.

Keywords: Web-based simulation, Social Constructivist theory and Critical thinking

Introduction

The Internet has played a significant role in the process of teaching and learning in universities, especially in developed countries like the United States, Britain and Europe [1]. There is an increasing growth of web-based learning usage in higher learning institutions with a chance of implementing principles of active pedagogy where students can be self-collaborative [2]. Pastore [3] conducted a survey among the teachers in the United States and found that the Internet can improve the quality of education as an important tool to obtain new information and almost all teachers use the Internet in classes.

Web-based learning resources are essential to maintain competitive learning opportunities in the global education market. On that basis and significance, the university has been working to provide additional materials in the form of web-based learning to students, teachers or lecturers. Learning materials computers (Computer Aided Instruction), known as CAI is suitable for use in teaching and learning process, and this includes a simulation to support active learning [4].

Web-based learning approach has the advantage in maintaining interest and learning instructions can be presented regardless the learning platform that the students use. A study conducted by Tallent-Runnels et al. [5] stated that the main purpose of online learning is to give students the opportunity to interact with each other. Garrison and Cleveland-Innes [6] added that with the capability of reflection and collaboration techniques, online learning can thus, increased critical thinking. Therefore, the used of web-based instruction in teaching and learning is worth to be explored.

Statement of problem

Changing nature of work will directly impact human capital development. Knowledgeable workers (k-workers) are often the employers' preference to advance their businesses along the economic growth. The impact of global developments in the industry and employment sector reflects the increasing demand not only the employees of qualified academic and having technical skills but also employable employees [7]. Flexible employees, having technical and generic skills such as creative, innovative, and analytical are those that the employer would prefer.

There remained many graduates who do not have the critical thinking skills [8]. Employers will tend to choose potential graduates who are skilful in information technology, innovative and creative. The education system must be able to produce graduates who can meet the market demand. The technique and method of delivery in education at the university level has to be changed, including in the study of computer network and communications. According to Fornaro [9] Telecommunications and Network learning involves the technical factor which is one of the important elements in studying telecommunications. Therefore, students should be exposed to generic skills (soft skills) such as professionalism, values, attitudes, behaviour and ethics, accountability and social concerns, communication skills, information management and lifelong learning, entrepreneurship, and organizational skills including critical thinking and critical methods of teaching and learning. Critical thinking is not only useful for the learning process but it is even more important in daily [10]. Arend [11] stated that problems in critical skills among the students are a common world-wide issue.

The effectiveness of web-based simulation cannot be denied in improving critical thinking skills, where there are many studies conducted by researchers. Therefore, the focus of this study is to see how web-based simulations can influence and enhance the critical thinking among students through supports of existing social sites. Additionally, the study also would like to know the students' achievement through web-based simulation learning. According to Lefoe [12], constructivism learning through the web is beneficial and it is one of the research branches that require research continuity.

Theoretical framework

3.1 Critical thinking

Critical thinking is purposeful, self regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. Critical thinking is a liberating force in education and a powerful resource in one's personal and civic life [13]. From his study, he came up with a list of cognitive skills those are at the core of critical thinking**:** interpretation, analysis, evaluation, inference, explanation, and self regulation.

Critical thinking is a liberating force in education and a powerful resource in one's personal and civic life [14]. There is more to critical thinking than just the above mentioned six elements of critical thinking but the focus on this study will be, to discuss about the six elements of critical thinking. Good critical thinkers always monitor their own cognitive abilities and at the same time they are maintaining their disposition as a critical thinker.

3.2 Simulation

Simulation through web was first introduced in 1980s by Jack Thorpe and Defense Division, known as Simulator Networking (SIMNET), using a computer system to play a simulation program to train soldiers in military operations. In this system, each computer acts as a simulator that allows users to experience war in a safe and at minimal expenses. Alessi and Trollip [15] categorized four simulations; physical, iterative, procedural, and situational; where iterative allow the learner to run scenarios multiple times, the learner is able to change variables in order to see what happen. Iterative simulation software allows students to engage in real-life situations without ~~a~~ variety of concerns.

According to Erkes et al., [16], based on their experience providing engineering services, the demand for designing and production of web-based was overwhelming and they advised people to think of ways to create web-based learning tool for teaching a large group of students. Fishwick [17] stated that the web will be the future getaway to convey and share information for the sake of knowledge. Rajaei and Barnes [18] also stated that the used of web as a medium of communication will enable the creation of a virtual training environment (Virtual Training Environment (VTE). Web-based simulation can also save a lot of maintaining simulation time compared to maintaining the traditional simulation thus maintaining task can be completed or performed in real time [19].

3.3 Social Constructivist Theory

Koohang and Harman [20] stated that e-learning is the education channel of the other various electronic media and stated that the appropriate instructional design consists of learning theories and principles so that e-learning can be successful. Thus, one of the theories that can be applied to improve the effectiveness of e-learning and critical thinking skills through social interaction over the Internet is the theory being put forward by Honebein [21]. This theory emphasized on seven major steps in providing the experience, understanding, motivation, learning, and indirect means they mix and exchange ideas and knowledge online. According to constructivism experts', learning is an active process and all knowledge is unique to every individual, whether the knowledge was obtained from teachers and books or through experiences. All learning is closely related to the experience and the experience acquired; no matter how or where the learning takes place [22].

4. The proposed framework for WBS

In this study, a framework of WBS that integrates Alessi and Trollip [15] iterative simulation elements, Social Constructivist Theory [21], and Critical Thinking Elements by Facione [13] was proposed as in Figure 1.

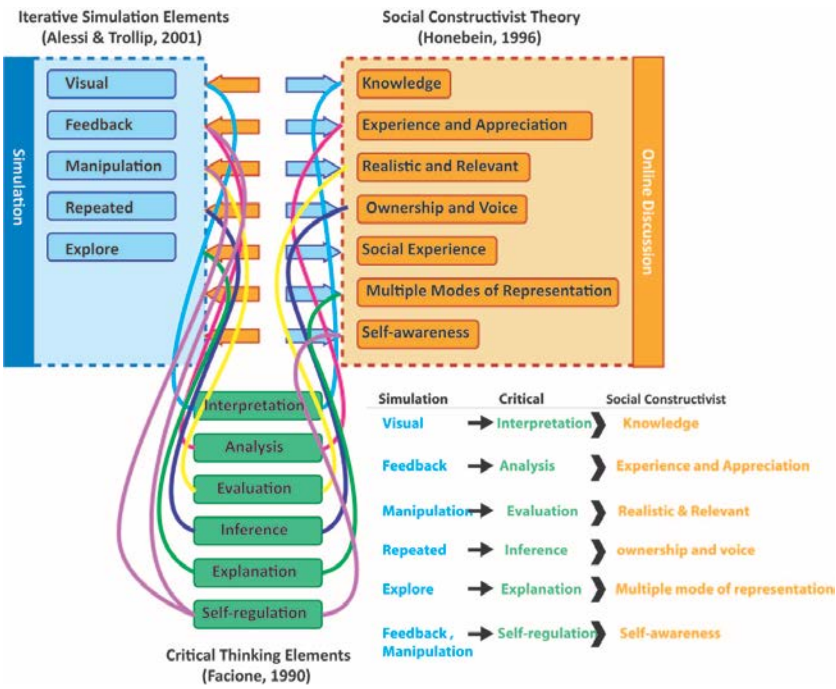

Fig. 1: WBS's Framework for improving critical thinking skills

The framework in Figure 1 shows how web-based simulations was developed to continue helping students to improve their critical thinking skills in the Telecommunications and Networking subject. In the following discussions, we will be able to find out how each component or element in the iterative simulations, and the interrelated theoretical thinking critical thinking and social constructivism can improve students' critical thinking skills.

Visual, Interpretation and Knowledge

Visual is the first feature in interactive simulations and the simulation was developed containing a visual connection. When a person views something, visual interpretation of the visual will take place. Students' visual interpretation can be observed from the knowledge that they developed from the visual. Visuals promote students' ability to organize and process information. Visuals can also be utilized to challenge students to think on levels that require higher order thinking skills [23]. Form of visual material has been widely used in websites for the purpose of learning [24].

Response, analysis and experience and appreciation

Simulations allow interactivity. Thus, students learning with simulations will have to interact by doing activities such as entering variables or giving responses to the simulations. Accordingly, responses from the simulation system will be analyzed by the students, and this type of analysis will provide experiences and therefore students will be learning through experiences. Learning through experiences will initiate the students to relate with their past experiences, and reflect focus on the experience and thus creating new experiences, where the students are now experiencing continuous learning. At the individual level, it was derived from the learners' previous life experiences, engaged the whole person and stimulated reflection on experiences and openness towards new experience and, hence, continuous learning. At the social level it emphasises critical social action and a stance embodying moral accountability and socio-political responsibility [25].

Manipulation, realistic and relevant assessment

Students who used the simulation can manipulate the simulation to obtain the desired results, where while manipulating, students make judgment about the results. The assessment was made realistic and relevant. Recent advances in technology have positioned simulations as a powerful tool for creating more realistic, experiential learning environments and thereby helping organizations meet these emerging training challenges [26].

Repeatedly, inference and involvement

The simulation can be used repeatedly, meaning that, students can use it to obtain certain results or any other results being simulated. From the mixed of results, students can create inferences. Indirectly, students will be engaged in using simulations and getting results as well. Yahr [27] reported that his students believed they had learned the materials through simulation as well as in courses that did not include simulation application, while Gosenpud and Washbush [28] found that students exposed to simulation had better test score gains than those who were only exposed to cases and strategic theory. Simulation can also enhance the critical skills when they involved the same students to explore the micro-digital world [29].

Exploration, description, and various

Other than the capability for manipulation and repetition simulations allow the students to explain their results obtained from the simulations to their peers and the lecturer with various forms of representation such as using graphics. This is further enhanced by Rose and Meyer [30] who stated that every student bring different needs and skills to the learning task so the learning environment should be designed to both accommodate and make use of these differences. They also identified presentation must be presented in multiple formats and multiple media. Learning environment that utilized the presentation of various technologies such as animation, simulation, or video [31] will provide the opportunity for the students to exchange information and building knowledge.

Social experiences

Social experiences only occur when the students log on for the purpose of discussing social or exchanging opinions among the students or students with the lecturers. It was proven by a study conducted by Robinson and Kakela [32] among the environmental students at Michigan State University, where students learned from each other in their comfortable social environment and increased their critical skills in understanding and solving problems. Koory [33] found that some students are more successful when using online materials. Results from interviews showed that the students were more focused, independent, task-oriented and interested in solving problems. Wickersham and Dooly [34] found that the students who studied or discussed in small groups will have levels of critical thinking those are better than the larger groups. Similarly, Chang [35] found that online learning supports and enhances critical thinking.

Reaction, manipulation and self-discipline

Simulations can be manipulated to shape students' reactions or disciplines. Therefore, students will be more alarmed whenever giving responses to their peers while solving problems. This is consistent with the findings of the study by Warren et al. [36] who stated that the level of students' critical thinking increased when they compared, distinguished and evaluated various views of their colleagues. This allows students to understand more about a subject.

5. Application of web-based simulation: Method of study

The study was conducted in 14 weeks (1 semester) where in the first week students were introduced to Telecommunications and Networking subject through face-to-face meeting. There were 21 students participated in this study. In the second week, the students answered pre-performance test before they used the first simulation which is 'Basics of Computer Network'. The first simulation was used by the students in the third week. In the fifth week, students used the second simulation and in the seventh week, students were exposed to the third and the following simulations accordingly. During the final week (week thirteen), students used the last simulation and post-achievement test were conducted to investigate students' achievement when they used simulation and carried out discussion through the social networking site. In the twelfth week, students used the six web-based simulations (simulation 1 to 6) and discussed them through the social networking site, which is the Facebook.

6. Findings and discussions

Developing a system is a complex process, time consuming and requires high cost and it also needs high level of commitment. Since the performance of the system is the main concern of this research, it is necessary to test the effect size and the statistical power of the implemented simulation system to see to what extent the system affects the students' learning. Table 1 displays the results of the paired-sample *t*-test for pre and post test.

Table 1. Analysis of the mean paired t test for pre and post test

No.	Test	Mean	Standard Deviation, SD	*p*	Effect size, *d*	Actual power
1.	Before	17.8571	4.32765	0.00	1.789886	0.9656
2.	After	30.2381	6.49542			

α=0.05

The statistical test showed significant results that WBS has an impact on students critical thinking. In the present research, the effect size measures the extent of differences between the mean strength tests before (pre test) and after (post test). According to Cohen [37] effect size equal to or above 0.8 be considered as high which suggests that the statistical power value of 0.9656 was also indicated as high. Power measurements performed by using Gpower, where the sample size used was 21, found that the effect size is 1.789886, while the power is 0.9656. This value is significant at $\alpha = 0.05$ level as shown in Table 1. Based on the analysis performed, the minimum number of samples is 20, while the number of samples in the study were 21 people by that the sample size is sufficient. The analysis clearly shows that the level of student critical thinking increased after using WBS.

The *p* value in Table 1, shows that there is a significant difference between the mean scores of pre and post test at $\alpha = 0.05$. Based on the findings, this study found ~~a~~ positive impact on students' critical thinking skills upon using the simulation with integration of web-based social networking.

According to Facione [14], the very core of critical thinking elements are: interpretation, analysis, evaluation, inference, explanation, and self-regulation. Therefore, the details of which element of critical thinking was greatly enhanced, paired-sample *t*-test analysis was carried out as shown in Table 2. The lowest effect size values were at the 'interpretation' and 'analysis' levels with *d* value is 0.4485 and 0.3627 respectively. 'Evaluation', 'inference', 'explanation' and 'self-regulation' levels (the high level of critical thinking) were beyond the value of 0.8. Therefore, it can be concluded that students' critical thinking skills improved after using WBS especially at high level.

Table 2. Paired *t*-test analysis of the respondents according to the elements of critical thinking skills

	Level	Test	Mean	SD	*p*	*d*
1.	Interpretation	Pre	4.90	1.30	0.053	0.4485
		Post	5.71	1.23		
2.	Analysis	Pre	2.43	1.54	0.111	0.3627
		Post	3.19	1.12		
3.	Evaluation	Pre	3.00	1.30	0.001	0.8481
		Post	4.38	1.63		
4.	Inference	Pre	3.19	1.47	0.000	1.7089
		Post	6.90	2.10		
5.	Explanation	Pre	2.67	1.62	0.000	1.4011
		Post	6.38	2.50		
6.	Self-regulation	Pre	1.67	1.53	0.001	0.8234
		Post	3.67	2.01		

7. Conclusion

Current model of education is categorized by the freedom to interact and communicate, technology, computer application development, design-based computer application tasks and activities to create a more student-focused critical thinking and constructive knowledge [38]. The main focus of the designed framework is to build up students' skills and ability of creative thinking, solving problems in the system, decision-making, gathering and disseminating meaningful information at any time and any where through computer simulations as well as for the purpose of sharing information [39, 40]. Therefore the expected framework could be used as a guide in designing teaching materials in e-learning, especially taking into account the advantages of the facilities available in social networking site in combination with the simulation web-based and constructivist learning theory

Acknowledgement

The authors would like to thank the Universiti Teknologi Malaysia (UTM) and Ministry of Higher Education (MoHE) Malaysia for their support in making this project possible. This work was supported by the Research University Grant [Q.J130000.7131.00H17] initiated by UTM and MoHE.

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WXMAXIMA COMPUTER SOFTWARE AS AN AID TO THE STUDY OF CALCULUS BY STUDENTS WITH DIFFERENT LEARNING APPROACHES

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Abstract

This study examined the effectiveness of teaching and learning calculus with the aid of the *WxMaxima* computer programme, as compared with the traditional method. In a quasi-experimental study, two classes of Malaysian secondary school Form Four students were randomly assigned to the control group (30 students) and the *WxMaxima* group (32 students). A Study Process Questionnaire (SPQ) was initially used to identify students with deep and surface approaches to learning. The findings indicated that students who were taught using the *WxMaxima* software performed significantly better than those in the traditional learning group. Further analysis showed that students with the deep learning approach in the experimental group achieved significantly higher post-test scores compared with students in the traditional learning group. However, there was no significant difference between the scores of the control and experimental groups who adopted the surface learning approach. This study implies that the use of *WxMaxima* could help students learn calculus more effectively, this being especially true among students who use the deep study approach.

Keywords : *WxMaxima,* Deep approach, Surface approach, Calculus, Computer Assisted *Instruction*

Introduction

The use of computers can be helpful in the teaching and learning of mathematics. The computer is viewed as a key component in the future of education because of its ability to help promote the development of learning and to create a more attractive and effective learning environment (Mohd Ayub, Mokhtar, Su Luan & Tarmizi, 2010). In Malaysia, the computer has been used primarily to support current methods of teaching, especially in the teaching of science and mathematics (Abu Bakar, Mohd Ayub, Su Luan & Ahmad Tarmizi, 2010). Mathematical softwares such as *Geometer's Sketchpad, Derive, Cabri, Matlab, Autograph* and others have been used widely in schools all over the world. However, their use in the classroom comes with a cost because these are commercial proprietary products.

Open source software offers school teachers the opportunity to integrate the use of computers into classroom teaching and learning. Softwares such as *SAGE, GeoGebra, WxMaxima* and others can be downloaded free of charge for use in the mathematics class. The use of such mathematical programmes has created a big impact on students' understanding in mathematics and in their subsequent performance in the subject. The softwares help students to visualize mathematical concepts and make their learning more meaningful. Tarmizi, Ayub, Abu Bakar, and Md.Yunus (2008) showed that students who learnt mathematics with computer technology integrated were more enthusiastic in their lessons and enjoyed them better than their counterparts who were taught using the traditional approach. Baharvand (2001) found that students using the Geometer Sketchpad software performed significantly better than students who learned mathematics conventionally. The students in the former group also showed a more positive attitude towards the subject. Tiwari (2007) who studied the use of mathematical software *Mathematica* in teaching and learning mathematics found that students introduced to the software achieved significantly higher test marks compared with those in the control group. In addition, the software also helped students to visualise abstract mathematical concepts. In an experimental study on the usefulness of the *GeoGebra* software, Abdul Saha, Mohd Ayub and Ahmad Tarmizi (2010) reported that students exposed to *GeoGebra* outperformed students in the traditional teaching-learning strategy group in coordinate geometry.

Identifying the learning approach of a student is important since it helps teachers choose the appropriate teaching methods for different students. Generally, students make a greater attempt to understand topics that

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capture their interest or if they see the relevance of what they have studied to their daily lives or future careers (Kember, Charlesworth, Davies, McKay, & Stott, 1997). According to the Biggs teaching-learning model (1993), a student's approach towards the learning process is a combination of his motivation and the strategy adopted during the learning process.

In this study, students' learning strategies are classified as either deep or surface approaches using the Study Process Questionnaire (SPQ) by Biggs, Kember and Young (2001). The deep approach refers to students' ability to relate new information to previously acquired knowledge. It also means that students search for relevant meanings as they relate what they have learnt to their daily lives and personal experiences. In other words, students using this approach are able to view learning materials from different aspects to obtain the entire picture. Other characteristics of students with deep approach strategies are their tendency to use meta cognitive skills, and develop learning materials that could form a basis for new ideas, offer other solutions from an inquisitive-critical perspective, and search and discover their 'inner self' (Beishuizen & Stoutjesdijk, 1999; Biggs, 1993). These students often become high achievers academically (Brown & Nelson, 1983; Bruch, Pearl, & Giordane, 1986). In contrast, students using the surface learning approach have a tendency to choose the quickest way to accomplish a task. Using this strategy, students acquire learning materials without asking in-depth questions, study the material in a linear manner, are able to relate to minimal aspects of the material or to a problem without showing interest, and learn by rote by relying on memory; they are concerned with the time needed to fulfil the learning task (Biggs, 1993). Students with this learning approach would focus on memorizing the main elements, using minimal meta-cognitive skills.

A study by Sii Ching Hii and Soon Fook Fong (2010) to investigate the effects of two modes of multimedia presentation among students with different learning approaches found positive effects of using multiple channel presentation (text + graphics, pictures + redundancy audio, video and animation) among deep and surface approaches learners. However, deep approach learners showed significantly higher achievement and motivational scores than surface approach learners. Another study by Van Melle and Tomalty (2000) on how computer technology (specifically the use of a multimedia CD-ROM) could foster the learning of microbiology found that computer technology facilitated the deep approach to learning.

Objectives of the study

This study was undertaken with the following objectives:

To identify the differences in post-test scores in calculus between students using *WxMaxima* and those given conventional instruction

To identify differences in post-test scores in calculus between students using *WxMaxima* and those given conventional instruction in relation to the students' learning approaches

The research hypotheses of this study are:

There is a significant difference in mid-term test scores between students in the *WxMaxima* group and students in the control group.

There is a significant difference in post-test scores between students in the *WxMaxima* group and students in the control group.

Among students using the deep approach strategy, there is a significant difference in post-test scores between those in the *WxMaxima* group and those in the control group.

Among students using the surface approach learning strategy, there is a significant difference in post-test scores between those in the *WxMaxima* group and those in the control group.

Research Methodology

The target population of this study were Form four students from a national secondary school in Malaysia. A quasi-experimental study with a non-equivalent control group post-test was used for this study. Students were randomly assigned to the control group (32 students) and the *WxMaxima* group (34 students). The students from each group were categorized into two types of learning styles, *viz.* deep learning and surface learning. The learning approach among the students was based on the result from the Study Process Questionnaire (SPQ) by Biggs, Kember and Young (2001), a paper and pencil test containing 20 items. The SPQ test was administered three weeks before the actual experimental study.

For the purpose of this research, a module on Calculus based on the Form Four Additional Mathematics syllabus to be completed within eight weeks was prepared by the researcher. Three main topics on Calculus were selected for this study, *viz.* limits, differentiation and integration. The lesson content of this learning activity module was distributed to the students to use as a guide throughout the instructional process for both groups. Before the actual experiment test started, the treatment group was first introduced to the *WxMaxima* software. During this phase, the students explored and familiarized themselves with *WxMaxima* and its functions. The experiment started with all students being taught using the constructivist approach during the teaching and learning process based on the module given to students in both groups. The whole experimental process took eight weeks, with three classes per week (160 min/week). After all the students in both groups had completed the module, they were given a 40 minute post-test.

Findings

Based on the results of the Process Questionnaire, 23 of the students from the control group were classified as adopting a deep approach in learning whereas seven students tended towards a surface approach in learning. Among the *WxMaxima* group, 20 students practised the deep approach as compared with 12 who used the surface approach in learning.

Table 1 : Factorial design

	Deep Approach	Surface approach	Total
Control	23	7	30
WxMaxima	20	12	32

Performance Scores for Mid-term Tests

Results from the mid-term test conducted prior to the experiment were used to test the homogeneity of both groups. An independent sample t-test showed that there was no significant difference ($t(60) = 1.88$, $p= 0.065 > 0.05$) between the control group (M=58.20, SD= 24.70) and *WxMaxima* group (M=47.22, SD= 21.25). This showed that students in the study population was homogenous and had the same level of mathematics achievement.

Table 2: Independent sample t-test comparing the Mid-term test results between the control group and the *WxMaxima* group

	N	Mean	SD	T	Df	Significance
Control	30	58.20	24.70	1.88	60	.065
WxMaxima	32	47.22	21.25			

Performance Scores for Post-tests

The next hypothesis concerned the effect of using *WxMaxima* in the students' performance. The independent sample t test comparing the post-test results of the two groups showed that there was a significant difference between mean performance scores of the control group (M=36.00, SD= 16.89) and *WxMaxima* group (M=59.06, SD= 18.77; $t(60) = 5.074$, $p= 0.000 < 0.05$). This finding indicated that students who had learned calculus using *WxMaxima* performed significantly better in their post-test as compared with students who underwent the traditional learning.

Table 3: Independent-t test comparing the Post-test results between the control group and the *WxMaxima* group

	N	Mean	SD	T	Df	Significance
Control	30	36.00	16.89	5.074	60	.000
WxMaxima	32	59.06	18.77			

Differences in the Post-test scores of students utilizing *WxMaxima* and conventional instruction among the group employing the deep study approach

The third hypothesis was tested by comparing the post-test performance among students using the deep approach learning strategy. The independent-t test showed that the *WxMaxima* group (M=62.75, SD= 19.63) performed better than the control group (M=36.09, SD= 16.44). This significant difference (t(41) = 4.84; P = 0.000 < 0.05) indicated that students using the deep approach learning style benefited from *WxMaxima* having been introduced into the teaching and learning of calculus.

Table 4: Independent-t test comparing the post-test results between students utilizing *WxMaxima* and conventional instruction among the group using the deep study strategy

	N	Mean	SD	T	Df	Significant
Control Group	23	36.09	16.44	4.84	41	.000
Wx Maxima	20	62.75	19.63			

Differences in post-test scores of students utilizing *WxMaxima* and conventional instruction among the group employing the surface study approach

A similar analysis was conducted on students who used the surface learning approach. The test analysis showed that there was no significant difference between students in the control group (M=35.71, SD= 19.67) and those in the *WxMaxima* group (M=52.92, SD= 16.16) The t-test result (t(17) = 2.07; P = 0.54 > 0.05) showed that students who adopted the surface learning approach did not show a statistically significant gain from the use of the *WxMaxima* programme when answering questions related to the calculus topics pertaining to limit, differentiation and integration.

Table 5: Independent sample t-test comparing the post-test results between students utilizing *WxMaxima* and conventional instruction among the group using the surface study strategy

	N	Mean	SD	T	Df	Significant
Control Group	7	35.71	19.67	2.07	17	.054
Wx Maxima	12	52.92	16.16			

Conclusion

Mathematics teaching and learning processes in school have gone through changes in terms of pedagogy and teaching aids. The use of teaching aids such as mathematical computer software can help students improve their understanding of complex mathematical concepts. The integration of mathematical software in teaching and learning could also help students to perform calculations more quickly and help them visualize difficult mathematical concepts. Nevertheless, the intended adoption of commercially available mathematical software may be limited by financial constraints. A significant barrier in implementing technology in teaching and learning is the willingness of teachers and students to purchase such commercial software for their own use. Open source mathematical software goes a long way towards easing this restriction. There are many mathematical programmes that can be downloaded free from various sites on the Internet but the adequacy and effectiveness of such materials have yet to be fully explored and evaluated.

This study sought to investigate the effectiveness of using *WxMaxima*, an open source software, in teaching and learning calculus. In agreement with the previous studies of Baharvand (2001), Tiwari (2007) and Abdul Saha, Mohd Ayub and Ahmad Tarmizi (2010), this study found that students benefited from *WxMaxima* in learning calculus. Further analysis also showed that students with deep surface learning styles performed better than those with the same learning style who were taught conventionally. On the other hand, students with a surface learning approach did not show a significant difference in their test results. Nevertheless, the improvement in test performance attributed to *WxMaxima* was substantial, but lay just outside the threshold of significance (P=0.054). Statistical significance could have been attained had the sample size been larger. The findings from this study suggest that *WxMaxima* is also capable of helping students visualize abstract mathematic concepts, and to relate new knowledge to what they have learned previously. This is especially true among students who adopt the deep learning strategy.

This study also suggests that by systematic planning and using an appropriate pedagogical approach, open source mathematical softwares such as *WxMaxima* could serve as useful aids in the teaching of mathematics at the Malaysia secondary school level.

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中小學學生親身體驗生醫工程科技學習成效評估研究

Abstract

本研究藉由中小學學生親身體驗生醫工程科技進行學習成效評估，並且探討學生學習特質，了解不同學齡的學生參與科學探究的理解差異。本研究發現高中生表現較國中生好，需提供動畫設計輔助四種實驗模組以助於學習理解。
The purpose of this study is to evaluate middle and high school students' learning performance when they participate in the Experiments of Firsthand Experience of Bio-medical Engineering Technology. Their learning style is also examined in order to discuss how their learning comprehension ability at their ages can be different when doing the experiments. As a result, this study found that the high school students perform better than the middle school students. This study finally confirms the necessity of providing animated learning materials for four experimental modules.

關鍵詞：成效評估、學習特質、動畫學習教材

1. 前言

每年台灣國家動物實驗中心皆舉辦科普教育、暑期實習、基礎操作技術課程、參訪等活動，因此期待在執行「中小學學生親身體驗生醫工程科技」的研究計畫時，能同時協助進行學習成效評估，也期待藉此培養中小學生對未來從事科學實驗相關研究工作的興趣。

2. 文獻探討

國內外許多中小學科學相關課程，已轉變成具有探索性、體驗性的實驗課，因此，非正式的教育機會和工作坊，提供許多助於教師專業成長的課程，這些課程甚至讓中小學生也能輕鬆理解科學知識(Greenberg, 2009; Schank, Wise, Stanford and Rosenquist, 2009; Tomasik, Jin, Hamers and Moore, 2009)。在台灣，國立科學工藝博物館已發展了一套有關微奈米科技動畫，提供各年齡層的學習者到網站上學習(http://nano.nstm.gov.tw/)，也有研究指出動畫的效果有助於增加學習者對科學知識內容的理解(Hsieh and Dwyer, 2009)，亦即動畫可以讓學習者掌握更多科學概念。具吸引力的動畫比純文字或靜態圖像更能增進學習者學習動機與成效(徐照麗，2003; Mayrath, Sanchez, Traphagan, Heikes & Trivedi, 2007)。此外，多媒體工具的有效使用可以將圖像、聲音、文字加以妥善組合，教學媒體可以將知識有系統地甚至非線性地依學習者需求呈現，對於學習品質、樂趣與滿足感皆有提升，更重要的是能提昇學習成效(陳玟仰，2007)。許多研究證實，使用多媒體的融入教學，可以幫學習者得到更有效的學習，也幫助學習者瞭解到更多知識細節的內容，讓學習者使用更有邏輯、更有效的方法學習，並提高學習的樂趣 (吳雅仙、張淑萍、徐正賢；2009；李宗薇，1998；陳玟仰，2007；張瑞觀和趙美惠，2007)。

3. 研究方法

為達到本研究目的，本研究邀請國高中生，參與此研究計畫逐步發展的生醫工程科技的實驗模組，實驗模組專門為中小學學生所設計，部份模組無法有效以紙本、投影片、圖示或錄影資料呈現，因此在實驗進行前本研究先取得不同學齡學生的學習特質之量化分析資料，在學生進行分組實驗操作前後，讓學生完成本研究所製作的實驗前後測驗卷，也鼓勵學生以數位筆在實驗進行的過程中隨時提供學習心得、感想，整個實驗過程中也有攝影機全程觀察學生的學習歷程。待所有學習成效的評估完成後，量化與質性資料的分析結果，有助於科學教師了解課程模組的修正方向，也能給予實驗模組適當的修正，在此得知某些實驗模組的教材需要加上2D動畫，才能讓學生真正親身體驗生醫工程科技，也能提昇學生對實驗內容的理解，同時提高其學習興趣。

本研究總計有44個實驗模組，測驗卷共設計41道是非題(註：有些模組有相同概念則使用同一道題目)，前後測問卷題目相同，僅在後測增加調查性問題，以了解學生對於實驗的滿意度、認為實驗與日常生活連結性、對實驗的感想，以及學生認為仍然難以理解的部份，最後詢問學生未來從事科學相關工作的意願，這些皆有助於修正實驗的課程教材。學生填寫的前後測回答以SPSS 17.0軟體進行描述性統計、t-檢定，以了解學習成效是否有顯著以及學生對於實驗的滿意度、生活連結程度的平均分數及未來有意願進行科學相關工作百分比。

學生學習特質在此採用Kolb Learning Style Inventory (Kolb, 1976, 1984)，這是教育界及企業界作為組織行為、教育及訓練最常使用的量表。此量表將學習者的「經驗學習」歷程分為四個階段，從具體經驗(concrete experience, CE)、觀察和反思(reflective observation, RO)、形成抽象概念(abstract conceptualization, AC)，最後行動產生新經驗等行為表現(active experimentation, AE)，此學習活動為一個循環，分為四個循環週期。Kolb (1985)更將此四個循環週期，分為：(1)資訊認知情形(AC-CE)、(2)資訊處理方式(RO-AE)兩個不同的構面，並且提出四種學習者：Converger (聚斂者，AE & AC)、Diverger (發散者，CE & RO)、Assimilator (同化者，RO & AC)、Accomodator (適應者，CE & AE)。

4. 結果與討論

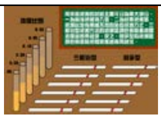
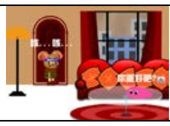
將所有初步設計完成的課程模組，先邀請32位台南一中學生參與所有課程與實驗，學生在課程前填寫前測測驗(是非題20題、選擇題14題)，結果學生後測的分數明顯提昇(t = 3.363, p = 0.002)。然而，學生在後測回答問卷調查題時，發現學生對於未來對從事科學相關研究的興趣，僅有約一半的學生(53.1%)學生回答「願意」。分析學生在實驗過程中使用數位筆的學習心得，有學生寫到「真是特別的體驗」、「體驗到很不一樣的東西」。從後測的問卷式測驗結果得知，學生對所有實驗的滿意度很高，尤其是兩個實驗模組(隔空捏鋁罐、神奇寶貝「球」)　。然而，學生對於真的老鼠出現在實驗現場出現負面的想法，擔心細菌對自己的影響，期待實驗空間能更完備。而整理學生回答較難理解的部份，有些與其提供的學習心得相互呼應，例如：抗原?抗體?螢光反應等。此外，在錄影觀察學生學習歷程發現，科學教師在解釋複雜概念時，無法讓學生有效理解，也因此在提示學生應注意測驗題目內容，學生仍無法掌握重點，專注力也因此降低。

接著，本研究分別邀請布袋國中，及南科實驗中學的學生前來參與課程實驗，結果發現國中學生後測成績顯著退步(t = -3.502, p = 0.001)，雖然學習心得得到學生正面的回饋，問卷調查回答也對於四個實驗模組有很高的滿意度，卻發現僅有2.1%的學生願意在未來從事與科學實驗相關的工作。反之，南科中學的學生後測成績顯著進步(t = 6.659, p = 0.000)表現卻很好，學生對實驗滿意度都很高，尤其是「魔術試紙」。從學生的心得可知，雖然有些概念對他們仍難以理解(表5)，這些學生對於未來從事科學相關的實驗工作很有興趣，有91.7%的學生回答「願意」，僅有8.3%回答「不願意」。因此，本研究繼續探討該學生的學習特質、學習過程的錄影觀察等記錄，其中也需要確認學生在沒有進行老鼠相關實驗，是否都會很有興趣參與。

學習特質相似的是同樣高中學生：台南一中、南科實驗中學，然而台南一中學生的學習特質比較偏向「適應者」(Accomodator)，也就是比較喜歡具體經驗(CE)、進行主動實驗(AE)，此學習特質從其他台南一中學生之前進行的學習特質評估結果是一致的；而南科實驗中學的學生較著重在具體經驗(CE)，也因此本研究提供的親身體驗課程與實驗模組引起學生很大的興趣。然而，之前量化分析結果(學生前後測表現)可知，布袋國中的學生表現較差，也對未來從事科學實驗相關工作有很低的興趣，從分析學生的學習過程，可知太多學生參與而降低了學習成效，其學習特質也與高中學生不同，比較著重進行主動實驗(AE)。此外，從錄影帶觀察中，可得知為何台南一中不如南科實驗中學很願意在未來從事科學相關的實驗工作：(1)課程與模組內容不同；(2)課程與模組數量不同；(3)整個教學情境不同的變項會對學生的回答有影響；南科實驗中學的學生僅需要將六個實驗模組學習完成即可，參與實驗的人數為小班制，分組及實驗過程相當順利。

由以上研究結果可知，台南一中學生的整體表現在測驗分數有顯著進步，卻在情意上的表現讓本研究人員很意外，布袋國中學生對於未來從事實驗相關的工作意願很低，再加上台南一中以及南科實驗中學的學生提到較難理解的部份有相同之處。因此，經由與授課的教師(負責執行計畫的助理)討論，發現有以下課程模組在講解過程中需要設計2D動畫(如表1所示)：

表1 動畫設計需求表

課程模組	魔術試紙	指紋的故事	小米的五星級飯店	眼見不為憑
動畫截圖				

誌謝

在此感謝國家科學委員會補助此研究計畫進行(NSC 100-2515-S-006 -006 -MY2)。

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BİLGİSAYAR DESTEKLİ EĞİTİMDE ETİK

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ÖZET

Çağımızda takip edilemeyecek hızla ilerlemekte olan bilişim teknolojilerinde meydana gelen gelişmeler bir takım sorunları da beraberinde getirmiştir. 21.yüzyılın mimarisi olan internet üzerinde etik olmayan davranışlar sergilenmektedir. Bu çalışma ile bilgisayar destekli öğrenme ortamlarında meydana gelebilecek etik problemlerin neler olduğunun açıklanması amaçlanmıştır.

Anahtar Kelimeler: Bilgisayar destekli eğitim, etik.

GİRİŞ

Eğitim, en genel tanımıyla, insanları belli amaçlarına göre yetiştirme sürecidir. (Fidan, 2012). Bilgisayar destekli eğitim; Aşkar ve Erden'e göre "Bilgisayarın öğrenme-öğretme sürecinde yardımcı araç olarak kullanılma ya da öğretim sürecine sistem tamamlayıcısı, sistem güçlendirici bir araç olarak girmesidir" (Akt: Varol, 1997). Eğitimde, bilişim teknolojilerinin etkin ve etkili bir şekilde kullanılmasıyla daha kalıcı öğrenmeler meydana gelmektedir. Ancak bu kalıcı öğrenmelerin yanı sıra eğitimde Bilişim teknolojilerinin kullanılmasına ilişkin sürekliliğin devam etmesi de eğitimde etik kavramına bağlılıkla mümkün olacaktır.

Eğitim etiği eğitimde erişilmek istenen doğru yolu gösteren ilke ve değerler bütünüdür (Marşap, 2006). Etik bir çalışma faaliyetinde bulunan insanların ahlak ilkelerini, davranış biçimlerini, görevlerini ve zorunluluklarını belirleyen kurallar zinciri olarak tanımlanabilir (Akt: Ruacan, 2009).

Çalışlar'a göre (1983), bir felsefe dalı olarak etik, insanların töresel ya da ahlaksal ilişkilerini, davranış biçimlerini ve görüşlerini araştıran bir bilim dalıdır (Akt: Aydın, 2001).

İnsanların gelişimine olanak tanımak, dürüstlük, sorumluluk, sözünün eri olmak, elinden geleni yapmak, sadakat, hakkaniyet ve toplumsal sorumluluktur. Örgütlerde etik standardın yüksekliği, kamuoyu önünde prestijinin artmasını sağlar. Bir organizasyonda etik kurallar, organizasyonun İK’na etik bakımdan neyin doğru veya neyin yanlış olduğuna karar vermede yol gösterir ve koyduğu kurallara uyulmaması halinde yaptırım gücü olan resmi bir dökümandır (Raiborn, 1997). Etik, doğru/yanlış ve iyi /kötüyü belirterek neyin yapılması neyin yapılmamasını belirler (Beauchamp, 1983). Etik erdemin felsefi incelenmesidir. Etik araştırma alanına verilen isimdir; ahlaklılık veya erdem ise araştırmanın nesnesinin/konusunun ismidir . ‘Etik’, meslek etikleri ve evrensel etik konularında yapılan tartışmaların gösterdiği gibi, bugün en yaygın olan anlamıdır (Kuçuradi, 2003).

Aristo, etiği, insanın günlük hayatında yararlı olacak davranışların keşfi olarak tanımlarken, bugün bazı yazarlarca etik, insan hareketlerinin ahlaki uygulamalara doğrultusunda düşünülmesi şeklinde açıklanabilmektedir (Kılınç, 2000). E-eğitimde etik davranışın temel kuralları sürekli gelişim içindedir. Bu süreçte etik davranışın temel kuralları şöyledir. İnsanların gelişimine olanak tanımak, dürüstlük, sorumluluk, sözünün eri olmak, elinden geleni yapmak, sadakat, hakkaniyet ve toplumsal sorumluluktur (Marşap, 2006). Örgütlerde var olan etik standardın yüksek oluşu, kamuoyu önündeki prestijinin artmasını sağlar.

Etik, doğru/yanlış ve iyi /kötüyü belirterek neyin yapılması neyin yapılmamasını belirler. Etik, birey kararlarını alırken belirli durumları dikkate alır. Doğruyu, yanlışı, iyiyi, kötüyü tanımlamaya çalışan bir felsefe olan etik de altın kural “Kendine yapılmasını istemediğini başkasına yapma” olarak tanımlanabilir (Oğuzertem, 2002). Bir değer yargısını diğerine tercih eder. Seçtiği kuralın uygulanmaması bir başkası tarafından engellenemez. Bu nedenle etikte tek taraflılık vardır. Aldığı kararın sorumlusu, bireyin kendisidir (Akt: Marşap, 2006).

Bilişim Teknolojileri ve Eğitimdeki Uygulamaları

Bilgisayarların öğrenme ve öğretme faaliyetlerinde kullanılması sonucu pek çok tanımın ortaya çıktığı görülmektedir. Bu alan yeni bir alan olması nedeniyle kullanılan terminoloji tartışmaya açıktır. Bu alanda en sık kullanılan terimler ise şunlardır (Cotton, 1991).

1. Bilgisayara Dayalı Eğitim ve Bilgisayara Dayalı Öğretim (Computer Based Education-CBE and Computer Based Instruction-CBI): CBE ve CBI terimleri eğitimsel uygulamalarda bilgisayar kullanım türlerinin neredeyse hepsini kapsayan çok geniş bir terimdir. Bu türler, eğitimsel

uygulamalar, alıştırma-uygulama, özel ders, simülasyonlar, öğretim yönetimi, ek alıştırmalar, programlama, veri tabanı geliştirme, kelime işlem programları ve diğer uygulama yazılımlarını içerir.

2. Bilgisayar Destekli Öğretim (Computer Assisted Instruction- CAI): Daha sınırlı bir terimdir ve öğretimde bilgisayarın kullanımını kapsar. Bu kullanım türleri, alıştırma-uygulama, özel ders ve simülasyon faaliyetlerini kapsar.

3. Bilgisayar Yönetimli Öğretim (Computer Managed Instruction- CMI): Bilgisayarların, öğretimi planlama, düzenleme ve programlama, öğrenmeleri ölçme ve öğrencilerle ilgili bu verileri saklama, saklanan veriler üzerinde analiz yapma gibi etkinliklerin yönetilmesinde kullanılmasıdır.

4. Bilgisayarla Zenginleştirilmiş Öğretim (Computer Enriched Instruction-CEI): Bilgisayarlı öğrenme faaliyetleri olarak tanımlanır. Bu faaliyetler, sosyal ve fiziksel gerçekleri model alan ve bu modeller içindeki ilişkililerin örneklerle açıklanabilmesi için öğrencilerin isteğine göre verilerin oluşturulması, öğrenciler tarafından geliştirilen programların yürütülmesi, öğrencileri güdüleyici ve öğrenmeye istekli hale getirici alıştırmaların tasarlanması gibi faaliyetleri içerir (Erdem, 2008).

Etik kavramının bilgisayar destekli ortamlara yansıması

Moor (1985, s.267)'a göre bilgisayar etiği; sürekli gelişen bilgisayar teknolojileri ile ilişkili olarak gerçekler, kavramsallaştırmalar, politikalar ve değerler arasındaki ilişkileri ele alan dinamik ve karmaşık bir çalışma alanıdır (Akt: Kuzu & Uysal, 2007). Alan yazında bu alt başlıkların; bireysel sorumluluklar, fikri mülkiyet, bilgiye erişim, bilginin doğruluğu, sistem kalitesi, risk ve güvenirlik, bütünleşme, mesleki sorumluluklar, yaşam kalitesi, gizlilik, güç kullanımı, bilgisayar suçları, bilgisayarlarla ilgili ekonomik sorunlar vb. olduğu görülebilir (Uysal ve Odabaşı, 2006).

Bilişim toplumunda teknolojinin sağladığı olanaklarla fikir eserleri kolaylıkla kopyalanıp, dağıtılabilmekte; bu durum sonunda fikir eserleri üretmek için emek ve zamanlarını veren hak sahipleri harcadıkları emek ve zamanın karşılığını alamamakta. Bir taraftan yaşamını bu isi yaparak devam ettiren kişiler çalışmaları karşılığında hak ettiği bedeli alamamakta, öte yandan ise adalet erdemi zedelenmektedir. (Dedeoğlu, 2006).

Farklı araçların kullanımıyla yaygınlaşan elektronik bilgi kullanımı, hukuki ve etik anlamda yaşanan mülkiyet haklarının korunmasıyla ilgili sorunların ortaya çıkmasına sebep olmuştur. Özellikle de, bilişim teknolojilerini kullanarak bilginin yayılımında öncülük eden yazılımcılar bu konuda büyük sıkıntı yasamaktadırlar. Hukuki açıdan yeterince kanıt bulamayan yazılımcılar, kendilerince farklı yazılım yöntemleri geliştirerek bu haklarını korumaya çalışmaktadırlar (Erdem, 2008).

Mason (1986) tarafından, bilgi çağında göz önüne alınması gereken dört sorun üzerinde durmuştur. Bunlar Fikri Mülkiyet, Doğruluk, Gizlilik ve Erişim sorunlarıdır. Mason (1986) Fikri Mülkiyet kavramını açıklamaya "Bilgi kime aittir?", "Bilginin değişimi için gereken ücret nedir?", "Bilgi iletişiminin sağlandığı kanallar kime aittir?", "Ayrılan bu kaynaklara nasıl erişilebilir?" sorularını sorarak başlamıştır (s.5). Dikkat edilirse soruların yanıtları sahiplik ile ilgilidir (Akt: Kuzu & Uysal, 2007).

Bynum ve Rogerson (2004) sahipliği, başkalarının bu mülkiyeti nasıl kullanması gerektiğini belirlemekle birlikte, mülkiyetin kontrol haklarına sahip olunması olarak tanımlamıştır (s.279). Örnek olarak, bir bilgisayar programı yazan kişi bu programı istediği insanların kullanmasına izin verebilir, istediklerine vermeyebilir. Ayrıca isterse bu programa başkalarının nasıl sahip olabileceği ile ilgili şartları da belirleyebilir. Örneğin; belli bir ücret karşılığında satın alarak, belirli bir organizasyona üye olarak veya açık kodlu yazılmış programlar gibi ücretsiz olarak dağıtarak (Uysal ve Odabaşı, 2007).

Fikri mülkiyet hakları sorunu, bilgisayar etiği sorunları içerisinde en çok karşılaşılan ve en karmaşık konudur (Akt: Kuzu & Uysal, 2007).

Mason (1986) bilginin doğruluğunun önemini, "Bilginin doğruluğundan, güvenilirliğinden ve gerçekliğinden kim sorumludur?", "Bilgi içerisindeki hatalar için kim sorumlu tutulacak ve yaralı taraflar nasıl bütünleştirilecektir?" sorularıyla ifade etmiştir (Akt: Kuzu & Uysal, 2007).

Mason (1986) gizliliğin önemini, "Bir kişi veya bir birlik hakkındaki hangi bilgi, hangi koşullar altında diğerlerine açıklar?", "İnsanlar kendi aralarında hangi bilgileri saklar ve hangi bilgileri baskı altında kalmadan diğerine açıklar?" sorularıyla dile getirmiştir (Akt: Kuzu & Uysal, 2007).

Anadolu Üniversitesi de örgün öğrenci programı için oldukça güvenli bir yöntem kullanmaktadır. Bu yönteme göre kullanıcılar kullanıcı isimleri birlikte kendileri tarafında belirledikleri şifreyi sisteme girerler. Bu güvenlik önlemi kullanıcı ismi ve parolasının elde edilmesiyle aşılabilir. Bu nedenle “Digipass” olarak tanımlanan cihaz tarafından üretilen altı dijitli sayının da güvenlik kodu olarak sisteme girilmesi gereklidir. Bu sayı kullanıcının da ilk defa gördüğü bir numaradır. Sistemle eş zamanlı olarak üretilen bu güvenlik kodu ile öğrencilere ve öğretim elemanlarına ait bilgilerin gizliliği korunmaktadır (Uysal & Odabaşı, 2007).

Erişim, bireylerin bilgisayarlardaki bilgilere ulaşmaları ile ilgilidir. Bu bilgiler, bir Word belgesi, veri tabanındaki bilgiler, bir web sitesi gibi bilgisayar ortamındaki her türlü veri olabilir. Erişim aynı zamanda şahsi ve gizli verilere yetkisiz erişimi engellemek için geliştirilen önlemleri de içerir (Mollavelioğlu, 2003, s.21).

Her toplumsal yenilik ve teknolojiyle birlikte gelen değişimler beraberinde bir takım kültürel problemleri de getirmektedir. Kişilerin doğruyu yanlışı ayırt edememesi problemi bilgisayar ve internet bağlamında ele alınması gereken durumları ortaya çıkarmıştır.

Bu bağlamda bilgisayar destekli eğitim ve eğitimde bilgisayar ve internet kullananların bazı sorunlarını şu şekilde sıralamak mümkündür (Oğuzertem, 2002).

- İnternetin yetkili/ehil olmayan kişilerce kullanımı
- Yazılım çalınması
- İnternetin sahtekârlık ve yolsuzluk amacıyla kullanılması
- İnternete izinsiz girilerek veri çalınması
- Virüs sabotajları
- Sunulan bilginin doğruluğu, güvenirliliği ve sorumluluğu
- Sunulan bilginin tahribatı
- İnternetten alınan bilgilerin kaynağına kredi verilmeden benimsenmesi ve kullanımı

Benzer şekilde internetin kullanımı ile ilgili etik kurallar aşağıda verilmiştir:

1. İnternet insanlara zarar vermek için kullanılmamalıdır.
2. Başkalarının internette yaptığı çalışmalara engel olunmamalıdır.
3. Başkalarının gizli ve kişisel dosyalarına girilmemelidir.
4. Internet yoluyla başkalarının bilgileri çalınmamalıdır.

5. İnternet yalancı bir şahit olarak kullanılmamalıdır.
6. Parası ödenmeyen yazılımlar kopyalanıp kendi malıymış gibi kullanılmamalıdır.
7. Başkalarının elektronik iletişim kaynakları izinsiz kullanılmamalıdır.
8. Başkalarının entellektüel ürünleri kendi malınmış gibi sunulmamalıdır.
9. Tasarımladığın programların doğuracağı toplumsal sonuçları önceden düşünülmelidir.
10. Elektronik iletişim ortamı başkalarının haklarına saygı gösterilerek kullanılmalıdır.

Ayrıca internette "netiquette" dediğimiz görgü kurallarını da bilgisayar destekli eğitim ortamlarının tasarımında dikkate almamız gerekmektedir.

- ♦ Elektronik posta ya da **almak** dediğimiz mesajları mesajı gönderdiğiniz kişiye hitaben yazıp kendi adinizi yazarak bitirmeniz,
- ♦ Hitaba ettiğiniz âlicinin kimliğine Gore bir dil ve ifade tonu seçmeniz
- ♦ Konu hanesine mutlak uygun bir baslık koymanız
- ♦ Mesajınızı kısa ve özlü yazmanız
- ♦ Gelen mesajları cevaplamadan önce dikkatle okumanız
- ♦ Esprili veya alaycı dil kullanımında dikkatli olmanız
- ♦ Kişiye değil konuya cevap vermeniz
- ♦ Sinirleneceğiniz bir mesaj aldığınızda cevaplamadan önce kendinize zaman tanımanız
- ♦ Mesajınızda göndereceğiniz her turlu bilgi ve ifadenin saklanabilir olduğunu ve ertesi günkü gazetelerde bas sayfaya haber olabileceğini hiç unutmamanız,
- ♦ Mesajlarda kotu niyetin değil yanlış anlamaların daha fazla meydana geldiğini bilmeniz
- ♦ Elektronik iletişimde uygun nazik bir ifade kullanmanın sağduyunun gereği olduğunu hatırlamanız gerekmektedir (Sharp, 2005).

Etik kuralların Bilgisayar Destekli Eğitimde Kullanılması

Eğitimciler öğrenme-öğretme faaliyetlerinde bilgisayarı etkin bir şekilde kullanırken dikkat etmesi gereken hususlar söz konusudur. Çünkü bilgisayar destekli eğitimde geçen konuşmalar , telefonla yapılan konuşmalara benzese de yazılı anlatım olması karşıdaki kişide kalıcı kırgınlığa sebep olabilir.

SONUÇ

Bilişim toplumu etik açıdan gelecek odaklı evrensel etik ilke ve bilinç olgunluğu gerektirir. Yaşam kalitesinde e-eğitimde bilişsel ve duyusal olgunluk ve davranış terbiyesi içerir. E-eğitim danışman ve önderlerinin mesleğe ve topluma yönelik sorumlulukları şöyledir. E-eğitim danışmanı;

1.E-eğiticiliği mesleğinin değer, ahlak kural ve misyonunu göz önünde tutar,

2.Bilişim aktivitelerinde mesleğe yakışır, dürüst, doğru, saygılı ve adilcedir,

3.Mesleki yaşamla ilgili hukuk kurallarına tam olarak uyar,

4. Bilişimle ilgili bütün mesleki sırlara saygı duyar,

5.Mesleğin çıkarları kişisel çıkarlardan üstündür, mesleğin saygınlığını gözetir,

6. Mesleki eğitim programı içinde uzmanlık gelişimini sürdürür.

7.Bilişim toplumunun e-eğitim gereksinimini belirleyerek karşılamaya çalışır.

8. Bilişim toplumu etkileşimine açıktır.

9.Doğru bilgilendirme sorumluluğu.

10. İnsan haklarına saygı ve ayırımcılık yapmama.

E-eğitim ile ilgili etik kurallar;

1. Eğitim programlarının oluşturulması,
2. Eğitimde doğruluk ve nesnellik,
3. Öğrenciyi kişisel bilgilerini açıklamaya zorlamamak,
4. Danışmanın e-eğitim konusunda onaylanmış uzmanlığı,
5. Grup eğitim süreçleri ve e-eğitimin kesintiye uğramasının önlenmesi,

6. E-eğitimde güvenirliği ve geçerliği sınanmış değerlenme araçlarının kullanımı,

7. E-eğitimci değerlendirme testlerini uygular, puanlar, yorumlar (Marşap, 2006).

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