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Message from the Editor-in-Chief

Dear Colleagues,

Today, technology is developing very fast around the world. This technological development (hardware and software) affects our life. There is a relationship among technology, society, culture, organization, machines, technical operation, and technical phenomenon. Educators should know this relationship because technology begins to affect teaching and learning facilities. For this reason educators are increasingly using technology in all aspects of their profession (e.g., creating curricula, classroom instruction, work assignments) This trend can be enhanced by educating the educator about cultural and cognitive aspects of technology and technikos, as well as the associated advantages and disadvantages related to educational and human development goals. This trend can be enhanced by educating the educator about cultural and cognitive aspects of technology and technikos, as well as the associated advantages and disadvantages related to educational and human development goals.

Definition and analysis of technology, it's history as well as its role in human life… to us that there is a relationship among technology, society, culture, organization, machines, technical operation, and technical phenomenon.

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Since the Renaissance, modern everyday attitudes tend to freely accept and use new technologies. Technology is usually comprehended in terms of hardware and the end experiences it produces (good or bad) or its material benefits (profitable or unprofitable), rather than understanding deeper relationships between technology, human nature, and culture. What produces technology—cultural organization, human values, research and development, and so on—is less obvious and less interesting than experiencing it's products and benefits.

The guest editors of this issue are Prof.Dr. Cengiz Hakan AYDIN, Anadolu University, Turkey and Prof.Dr. Saedah Siraj, University of Malaya, Malaysia. We greatly appreciate the valuable contributions of the editorial board who have acted as reviewers for one or more submissions of this issue. TOJET's reviewers are drawn quite widely from all over the world with a concentration for this issue on the USA, Malaysia, Spain, Canada, Taiwan, Turkey, and others.

TOJET is interested in academic articles on the issues of educational technology. The articles should talk about using educational technology in classroom, how educational technology impacts learning, and the perspectives of students, teachers, school administrators and communities on educational technology. These articles will help researchers to increase the quality of both theory and practice in the field of educational technology.

TOJET, Sakarya University-Turkey and University of Malaya-Malaysia will organize the 13th International Educational Technology Conference (IETC 2013) between May 13-15, 2013 at University of Malaya in Kuala Lumpur, Malaysia. The web page of IETC is "www.iet-c.net". TOJET, Sakarya University and Kyonggi University will organize e-learning conference between July 15-17, 2013 in Korea. The web address is "http://www.id-ec.net". TASET (www.taset.net) and Sunny at Korea University will organize international science and technology conference ISTEC-2013 (www.iste-c.net) in South Korea.

Call for Papers
TOJET invites article contributions. Submitted articles should be about all aspects of educational technology and may address assessment, attitudes, beliefs, curriculum, equity, research, translating research into practice, learning theory, alternative conceptions, socio-cultural issues, special populations, and integration of subjects. The articles should also discuss the perspectives of students, teachers, school administrators and communities. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET. All authors can submit their manuscripts to tojet.editor@gmail.com for the next issues.

April 01, 2013
Editor

Prof. Dr. Aytekin İŞMAN
Sakarya University

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3D GAME-BASED LEARNING SYSTEM FOR IMPROVING LEARNING ACHIEVEMENT IN SOFTWARE ENGINEERING CURRICULUM

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ABSTRACT
The advancement of game-based learning has encouraged many related studies, such that students could better learn curriculum by 3-dimension virtual reality. To enhance software engineering learning, this paper develops a 3D game-based learning system to assist teaching and assess the students' motivation, satisfaction and learning achievement. A quasi-experimental design is based on the ARCS Theory (Attention, Relevance, Confidence, and Satisfaction) to investigate the effectiveness of game-based learning strategy in 3-dimension virtual reality scenario. The students are randomly assigned into two groups for quasi-experimental design. In game-based learning, the curriculum content is mapped into the game to provide a scenario learning environment. After implementation of quasi-experimental design, the pre-test and post-test results shown that 3D game-based learning system with software engineering curriculum could achieve a better learning achievement and motivation than using traditional instruction. The statistical test displayed that learning motivations of students have significant impact on learning achievement, and learning achievements of students with game-based learning are better than those who use traditional face-to-face teaching. After re-checked the questionnaire, this paper finds that game-based learning challenging and attractiveness can lead to learners' curiosity and immersion in learning activity. And the results show that 80% students are satisfaction, and 83% students are confidence for the course learning after use the game-based learning system. Lastly, the research results could provide to related educators as references.
Keywords: Game-based learning; ARCS Model; software engineering curriculum

INTRODUCTION
Internet is a rich source of information, and more and more people make information available online. One day, the knowledge from internet will be more than teachers alone can provide. Obviously, the traditional teaching and unilateral knowledge acquisition has not attracted the attention of young people, and cannot fulfill the needs of the information society. Because the convenience of network and interactivity results in increasing time and location flexibility, e-learning has become the development trend of education and learning.

Since the global economic downturn 2012, revenues of all industries have been declining. People cut their expenses and the economy is in recession. This time, the game industry has launched a leisure and entertainment of free or lower consumption, creating another business opportunity. As the players spend more money on virtual goods, the game industry is unaffected by the economic downturn and keeps growing. Online games seem to gain more and more popularity.

Today the internet has become an indispensable element of the business community. Due to its prevalence, the network provides quick information technology access to various industries. Information systems improve the effectiveness and save time, becoming an important tool for business management, decision-making, competition and development.

Regardless whether the economy is flourishing or weak, the company gives the Information Technology (IT) budget priority and has high expectations in the systems. Information Technology has become the number one key to successful business.

Therefore, the system developer, who the business needs, must have some knowledge and skill understand the concept of the system development, and be proficient in information system analysis, design, maintenance and management, in order to develop high-quality information systems. System analysis through a systematic collection, analysis and comparison, proposes an effective solution approach. On the other hand, system analysis is the process of effective problem solving, which makes "system analysis" become an important task.

Systems analysis is a combination of many academic disciplines with a certain expertise which needs to be practiced to be familiar with implementation procedures. But now most learning approaches of system analysis are in accordance with the traditional face-to-face way, and textbooks often seem esoteric with their many steps, theories and case studies, but lack practical exercise. Students only learn "what to do", but they cannot really understand "how to do". This study shows that the opportunities of practical exercise, interest and achievement of students can be improved by using game-based learning combined with high interaction and high feedback.

There are some reasons for introducing the game presented in this study: From the educational point of view, John (1938) proposes “Learning by Doing”. The learning pace and way of each student is different, and with the traditional face-to-face teaching approach it is difficult for teachers to give different directions to each student. The game-based learning has abundant characteristics, such as Representation, Fun, Play, Goals, Outcomes and feedback, Win states, Competition/Challenge, Problem solving, Task, Story and so on (Felix & Johnson, 1993; Prensky, 2001), to increase the learning motivation of student. Games are used to improve the dull and hard curriculum, where curriculum content corresponds to game levels, making the knowledge and skill of the curriculum teaching available through game-based learning. In summary, there are original different purpose between learning and game, but there are some problems in the traditional teaching curriculum, along with the prevalence of the On-line game, and the development of the e-learning, we expect, via the digital game-based learning system most people love, that using system analysis unit of software engineering curriculum as activity content, lets students through “Learning by Doing” achieve personalized learning, bring the entertainment of game, fun, interactive into education, achieving the purpose of edutainment. The purposes of this research are the following: Firstly, we use a scenario-based learning system to improve traditional education in order to make students learn better. Secondly, we evaluate satisfaction of game-based learning system. Thirdly, we would like to understand the relationship between learning motivation and learning achievement.

LITERATURE REVIEW

Game-based learning

Computer games meet the actual needs and interests of children, and are becoming the most popular computer activity and provide a new mode of interaction. Some of the advantages of games are that they are attractive, novel, provide a better atmosphere and help keep the learner focused on the task (Heinich, Molenda, Russell, & Smaldino, 2002), therefore suggesting games as valuable educational tools. Kids like all humans love to learn when it is not forced upon them. Modern computer and video games provide learning opportunities every second or fraction thereof (Prensky, 2003). Gee (2003) argues that “the real importance of good computer and video games is that they allow people to recreate themselves in new worlds and achieve recreation and deep learning at the same time”. Therefore, the approaches and technologies of game design should be applied to design educational software, which can be used in school.

Some educators consider game-based learning to be a powerful instructional approach (Von Wangenheim & Shull, 2009). Chang et al. (2009) also indicate game-based learning is an evident and popular direction, which keeps the educational purpose and improves the ability of player that is utilized to real life. The educational game makes the learner become the center of learning, which allows the learning process to be easier, more interesting and more effective.

The related research in game-based learning such as applied in medicine (Beale, Kato, Marin-Bowling, Guthrie & Cole, 2007; Salajan et al., 2009), nature (Huang, Lin & Cheng, 2009), language (Liu & Chu, 2010; Barendregt & Bekker, 2011) and some area has considerably progressed. There are some research applications developed to aid the teaching, but the teachers are unable to customize an appropriate game, and the game may not completely fit the curriculum content and purpose of research. In literature (Papastergiou,2009; Thomas, Thomas, Mark & Elizabeth, 2011; Miller, Chang, Wang, Beier & Klisch, 2011), there are some developed systems by aims of research, and the game-based learning had been shown more effective than traditional teaching in learning achievement and motivation. However, these systems do not have a theoretical basis in teaching assessment.

ARCS model

The ARCS model is a problem solving approach to designing the motivational aspects of learning environments to stimulate and sustain students’ motivation to learn (Keller, 1983). There are two major parts to the model. The first is a set of categories representing the components of motivation. The second part of the model is a systematic design process that assists in creating motivational enhancements that are appropriate for a given set of learners. To accurately measure the change in learner motivation, Karoulis and Demetriadis (2005) indicated that the ARCS model (Keller, 1987) can be the standard of how much the learning motivation is increased by the game. The four dimensions of ARCS are the following: Attention- attention which increases the learner's curiosity, Relevance- establishment of the relevance of the learning content to learners, Confidence- feedback to the learner, through the effort and the learning process of self-control, Satisfaction- the satisfaction or reward the learner can gain.

RETIAN model
The Relevance Embedding Translation Adaptation Immersion & Naturalization (RETAIN) model was founded on an appropriate combination of these elements (Gunter, Kenny & Vick, 2007) to conduct developing and evaluation a successful educational game. There are two major features in RETAIN model:(1) assess how well games based learning contains and incorporates learning content,(2)support game based learning design. The RETAIN model includes six dimensions: (i) Relevance: presenting and ensuring the learning content are relevant to learners' previous learning experience, (ii) Embedding: assessing how closely the learning content is coupled with the fantasy/story content, (iii) Translation: how the player can use previous knowledge and apply it in other domain, (iv) Adaptation: a change in learning activity as a consequence of transfer, (v) Immersion: the player intellectually invests in the context of the game, and (vi) Naturalization: the development of habitual and spontaneous use of information derive within the game. RETAIN model can be directly correlated into game design and can also serve as a measurable and objective checklist for educational game developers. Meanwhile, several researches suggest that good game design model will allow the curriculum to be successfully embedded within the scenario of the game.

METHODOLOGY

This section introduces research concept, research framework, quasi-experimental design, design questionnaire and curriculum design.

Research concept
This study not only uses the game-based learning to coordinate the practice of curriculum, it also applies the ARCS model to analyze the learning motivations of students. When teaching the curriculum, all students can play games to get curriculum knowledge. After the students play the game, a questionnaire test is employed to obtain the student's impression for system interface and curriculum content. Then the proposed hypotheses are verified by data analysis and statistical tests to shown the learning achievements in a quasi-experimental design. The detailed research process shown in Figure 1 and is separated into the following two research phases.

(1) System development phase: In developed game, uses the ARCS model to construct the research theory fundamental, and make the game-based learning system that cooperates with curriculum based on the content of system analysis for experiment. In design game questionnaire, questionnaire design is justified by experts and modified as the formal questionnaire by experts' opinions and literature.

(2) Achievement assessment phase: In order to evaluate the effectiveness of their learning and how they feel about game-based learning system. After the teaching experiment, the students are asked to test curriculum contents and complete the ARCS questionnaire, the questionnaire items include game contents, interface, system feedback and user perspective. In the collected questionnaire data, we test the reliability and validity of the questionnaire. Then, employ ANOVA, T-test and Regression analysis to analyze whether the Achievement of the game-based learning system have achieved.

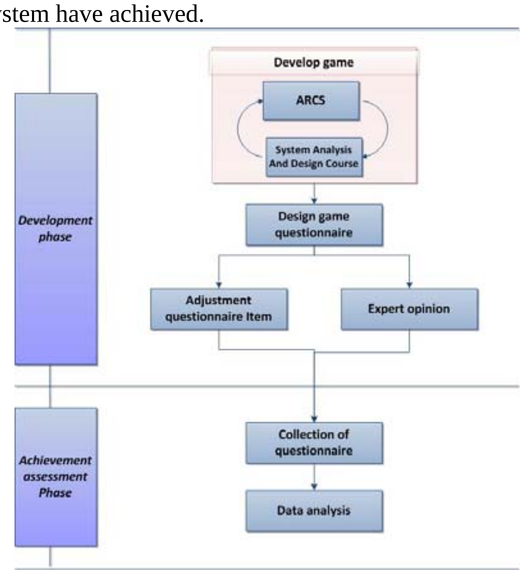

Figure 1 Research process

Quasi-experimental design and hypothesis

This study analyzes the learning achievements of experimental and control group in the pre-test and post-test by the system analysis unit of software engineering curriculum, to check if there is significant difference between the learning achievements of two groups. This study analyzes the important demographic variables in experimental students whether impacts the learning achievement and motivation. From the collected ARCS questionnaire, we can understand the viewpoint of students on game-based learning system and their willingness for re-using the system. The proposed research framework is shown in Figure 2.

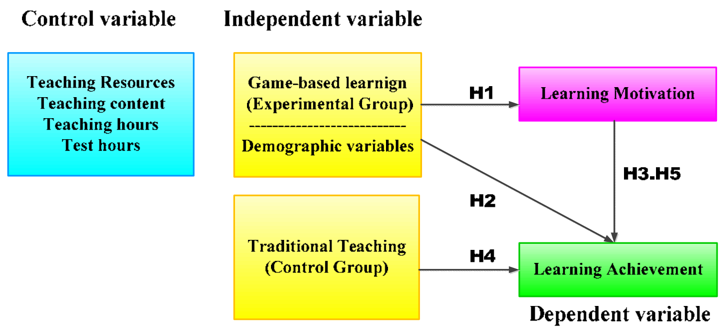

Figure 2 Research framework

According to the motivation and objective of this study, we formulate the following null hypotheses:
H1: The student's background variables do not affect the learning motivation.
H2: The demographic variables do not affect the learning achievement.
H3: The learning motivation does not affect the learning achievement.
H4: There is no difference between traditional learning and game-based learning.
H5: ARCS factors cannot predict learning achievement.

The independent variables are the different groups that are subject to different teaching strategies. The experimental group uses "game-based learning", and the control group uses the "traditional face-to-face learning". Figure 3 to show the experiment design for comparing the Game-based learning and the traditional face to face learning approach. Both of two groups are taught the same system analysis unit of software engineering curriculum. Experimental group: There are 33 students playing the online learning game, and completed the questionnaire and individual information afterwards. The demographic variables in individual information include gender, major, and the computer usage. Control group: There are 30 students doing traditional learning. After the different teaching strategies, In order to avoid influence from other factors, except from independent variance, the control Variables of this study are as following: (1) Teaching resources: The experimental group is given a lesson in a computer class, the control group in regular class, while the teachers are the same. (2) Teaching content: During the study experiment, the experimental and control group have the same teaching content. (3) Teaching hours: The experimental and control group have one lesson per week for 150 minutes (Min), and total experimental teaching time has 8 weeks. 4. Test hours: The experimental and control group are given the same time (100 minutes) to do the tests in pre-test and post-test phases.

This study develops a 3D game-based learning environment, with system analysis unit of software engineering curriculum as its basis, and cooperates with the teacher who has the teaching background of the information curriculum. The students study the system analysis unit of software engineering curriculum, and all students have the same learning content and resource, one group uses game-based learning, the other takes the traditional face-to-face teaching. After the class ends, all students must take the test and complete the questionnaire. We then compare the difference of the test results and questionnaire analysis of game-based learning, and look at the discrepancy of the learning results between the game-based learning and traditional face-to-face teaching approaches.

This study randomly selected students with a background related to information technology as system testers, where the students were all enrolled in the third-year undergraduate level. All students who study the system analysis unit of software engineering curriculum, based on their information and technology background, can quickly familiarize with the learning environment, although they have never used the newly developed system before. During the research process, the class tests and the related data are collected for analysis. The test scores serve as a comparison of the learning outcomes between game-based learning and face-to-face teaching, and the questionnaire content includes the feedback about the game-based learning content, interface etc., which reflects the students' perception. This study uses a quasi-experimental design. The study analyses the grades achieved in the pre-test and post-test, to check whether there are significance differences between the experimental group and control group. Eventually, according to the questionnaire results of game-based learning students, we obtain an integrated view of the game and teaching approach.

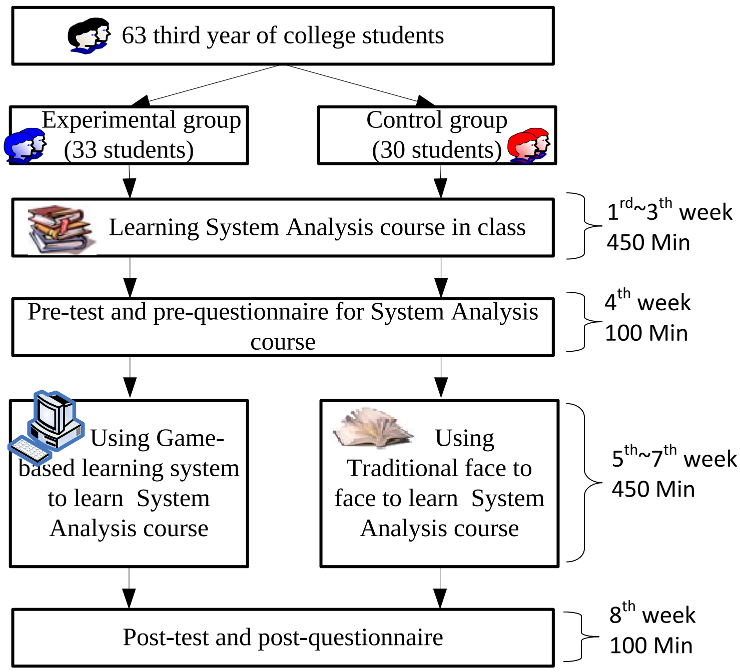

Figure 3 Experiment design for comparing the Game-based learning and the traditional face to face learning.

Questionnaire design

This study practically collects questionnaire data about the effectiveness of implementation of game-based learning, and the procedure of questionnaire forming: The definition of measuring aspect and the items is based on literature and expert opinion, which are used to create a formal questionnaire.

The designed questionnaire integrates the questionnaires of Su, Yang, Hwang, Zhang (2010) and Liu and Chu (2010). These two questionnaires have fairly high reliability, as all questions have been revised by experts, and therefore fit the needs of this study. The proposed questionnaire is based on Keller's ARCS motivation model with its four dimensions attention (Dimension A), relevance (Dimension R), confidence (Dimension C) and satisfaction (Dimension S) with a total of 17 questions. Responses to all questions were on a five point Likert questionnaire: “5:totally agree” means absolute agreement with the given formulation; “4:agree” means general agreement with the formulation.;“3:average ” stands for 50% agreement with the narration; “2:do not agree” represents general disagreement; “1:totally do not agree” represents absolute disagreement with the narration of this question.

The narration of the questionnaire is as follows: this study uses a game-based learning system to improve the learning effect of system analysis unit, after the end of experiment, let the students participate the system test and complete the questionnaire, to understand the degree of students’ acceptance for this system. There are four parts: in the first part (Dimension A), students evaluate whether there is attraction in game content; in the second part (Dimension R), students assess whether the game content is helpful and worth learning; in the third part (Dimension C), students evaluate whether the game gave them self-control over the learning process and whether it was able to build confidence in students to finish whole activities; in the fourth part (Dimension S), students assess the their overall degree of satisfaction and acceptance for the system.

The ARCS questionnaire has 17 items, and the effective samples are 64. The total average of the item is 3.81 points which shows the learning motivation is positive; the ARCS-C and ARCS-S are 4.12 and 4.01, all items are also higher than 3 points as shown in Table 1, which shows the learning approach and content design can be much better. The reliability is the credibility and stability of the questionnaire result which stands for there are consistencies among every question. This study uses Cronbach’s alpha value to verify the reliability standard of the questionnaire. Carmines & Zeller (1979) also consider the excellent educational test that the Cronbach’s alpha value is higher than .80, The Cronbach's alpha values of four dimension are all higher than .80, and the entire questionnaire is α=.95 which indicate the questionnaire is reliable. Table 1 lists the Cronbach's alpha of ARCS questionnaire.

Table 1 Cronbach's alpha of questionnaire

Item	Number of Item	Mean	Cronbach α
ARCS-A (Attention)	5	3.43	0.93
ARCS-R (Relevance)	4	3.69	0.89
ARCS-C (Confidence)	4	4.12	0.98
ARCS-S (Satisfaction)	4	4.01	0.87

Content mapping to game

The game of this study is designed to provide students a self-learning environment, and the curriculum content is based on the procedure of system analysis, which allows students to gain real-world experience. Furthermore, the game should provide challenge, repeated self-learning and attraction, which can increase the learning motivation of students.

The game story is set in a company office environment. To develop a new system, the player's task is to perform a series of system analysis processes. As there are different staff who participate the process of system analysis, the learner can take on different roles and freely choose to act which character, such as project manager, system analyst and programming staff, where different roles corresponds to different scenes in the game. The role exerts characteristic to play the game, which is aimed at finishing all level tasks, learning the work of each role in the process of system analysis unit.

Game-based learning system

This study develops a scenario game with learning goal under the self-learning environment for system analysis, and makes students execute tasks according to story situation, and learn system analysis process via different characters corresponding to different situation. This section mainly explains the detailed steps of game system design and construction.

This development work integrates the suggestion of teachers, the RETIAN model (Gunter, Kenny & Vick, 2007), to develop the game-based learning system; RETIAN model combines successful game theory, instructional design and educational learning, to allow the curriculum contents to be successfully embedded within the stories and scenario of the game.

This study uses a 3D scenario game based on ARCS, and learning strategy to develop a game-based learning system for students to learn the "waterfall development model ".The game-based learning process is shown in Figure 4 and divided into three layers: course content layer is the content of game design curriculum; learning process layer is the process of the learning with ARCS model, game process layer present the game interface design and game function implementation. Further description of the three layers is given in the following.

Course content layer: Waterfall Model System Development Life Cycle (SDLC) is applied to this course. Such a method presents the following features. (1) It is suitable for projects with definite demands and Domain Know How being easily accessed. (2) It emphasizes the management control of complete planning, analysis, design, test, and documentation in the development process. (3) A stage is entered after completing the previous one, and each stage is cycled for merely once. (4) It does not require certain stages to be divided, but documents are output at each stage. There are five phases in this layer: **Phase 1** Definition and Planning, **Phase 2** System Analysis, **Phase 3** System Design, **Phase 4** System Development and Evaluation, **Phase 5** System maintenances. Various working roles, such as project managers, system analysts, system development engineers, system test and maintenance personnel, and service personnel, are included in the five process of Waterfall Model SDLC to complete all software project works which covered in the stages, containing System Feasibility, Requirements Analysis, High level and Detailed Design, Coding, testing and system instillation, and final product delivery and maintenances. The integration of the instruction with Waterfall Model SDLC and learning process could enhance and collect learning data.

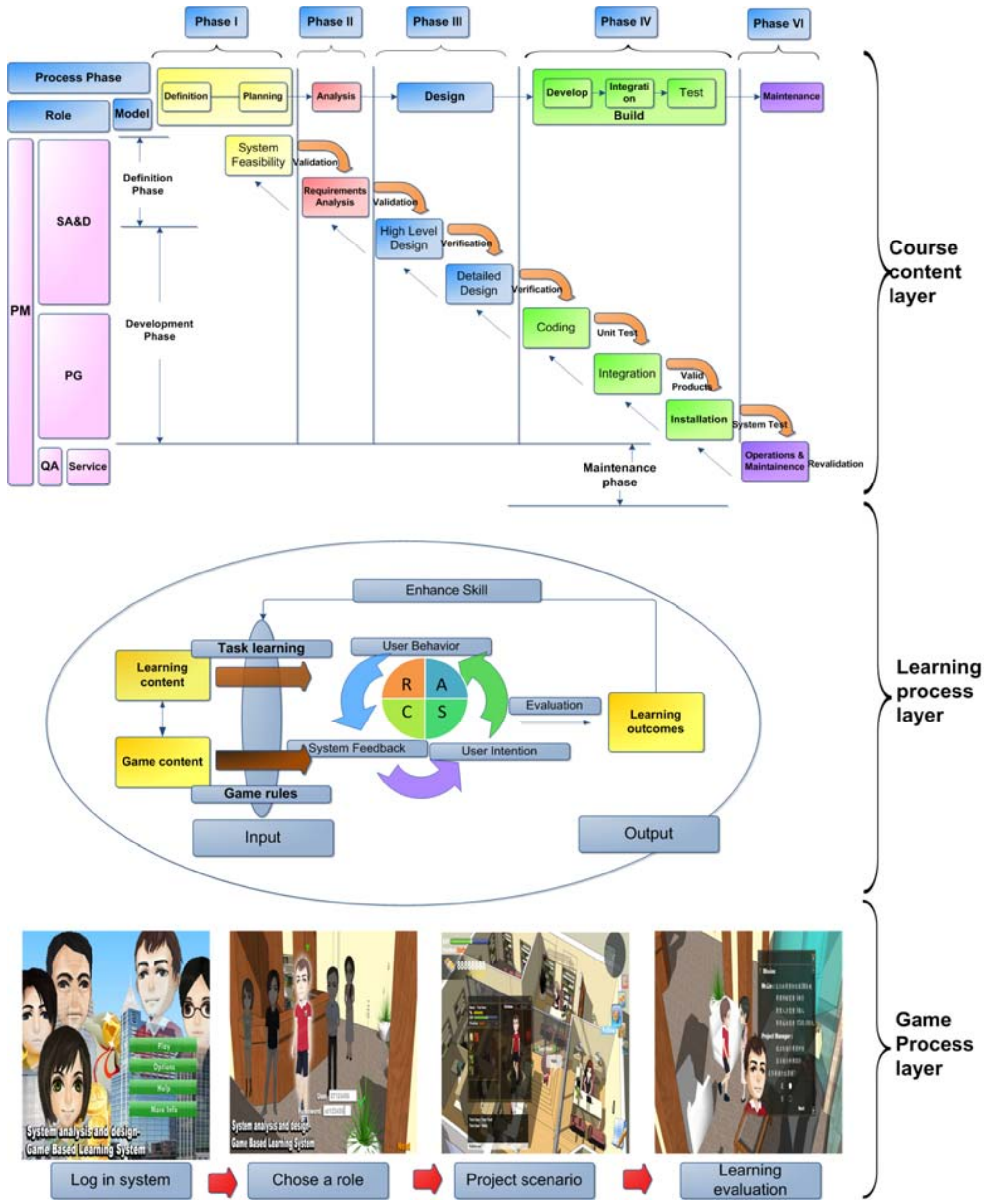

Figure 4 Game-based learning process of system analysis unit of software engineering curriculum

Learning process layer: there are three processes in this layer, 1. Input: By mapping teaching content into the game content, and through the game skill, task learning, reward institution and the interesting gameplay, the learners blend into the game situation. 2. Process: Explanation with internal ARCS; Attention (A): through the characteristics of the game, such as challenge, diversification and uncertainty, to inspire the curious of players and catch their attention, which influence user intention; Relevance (R): allowing user to learn new skills in different ways , to define the learning goal and raise learning motivation and to relate to familiar things, which impact user behavior; Confidence (C): Using the feedback of the game, such as grades and treasure, to make the user believe that his/her effort will directly cause achievement, helping students understand the possibility of success and prevent him/ her from thinking it is impossible to achieve the goal; Satisfaction (S): when the new skills which the user learned during the game are useful and can be applied to other game tasks, the player will want to solve increasingly harder tasks which gives him a positive feeling of success. The various tasks and skills given by system attract the attention of student, and further raise the learning motivation, increase the abilities of student progressively, and keep cycling on user intention, user behavior, system feedback and ARCS and reach the ultimate learning goal. 3. Output: The Output phase, which includes directed goal achievement evaluation and repeated practice, monitors the progress and Achievement of students and provides the results to teachers for improvement of their teaching.

Game process layer: Four steps are implemented, the user logs in system and then selects an avatar for the game to play with software develop project scenario. When learner finishes a game, he/she will be ask some question for learning achievement evaluation.

System Architecture

During the system implementation, the number of concurrent users and the accessed data will be within reasonable limits so system overloading is not a problem. Therefore, this system uses a cloud-based (Three-Tier) architecture show in Figure 5. On the server side, the database includes two parts: the evaluation database which records the content of the game level(game stage) access, including game skills, level information, tasks and testing; the member database records the role, time, experience, level, learning portfolio and so on for player. The game-based learning services includes 5 services which are Filter Service(FS)-to filter player's portfolio and provide suitable game-based learning content, Score Service(CS)-analysis learner's learning Achievement, Evaluation Service(ES)-provide a testing after the learning, Personal Portfolios Service(PPS)-personal learning portfolios content, Game Content Service(GCS)- Content mapping to game. The player plays the game via a 3D game interface to access the game-based learning system, and to access the level information of two databases and the player information. At the end of the game, you can see the score that you get from the game. The teacher can understand the learning abilities and effects on students in each level by using a special interface to observe all the game results and scores of students.

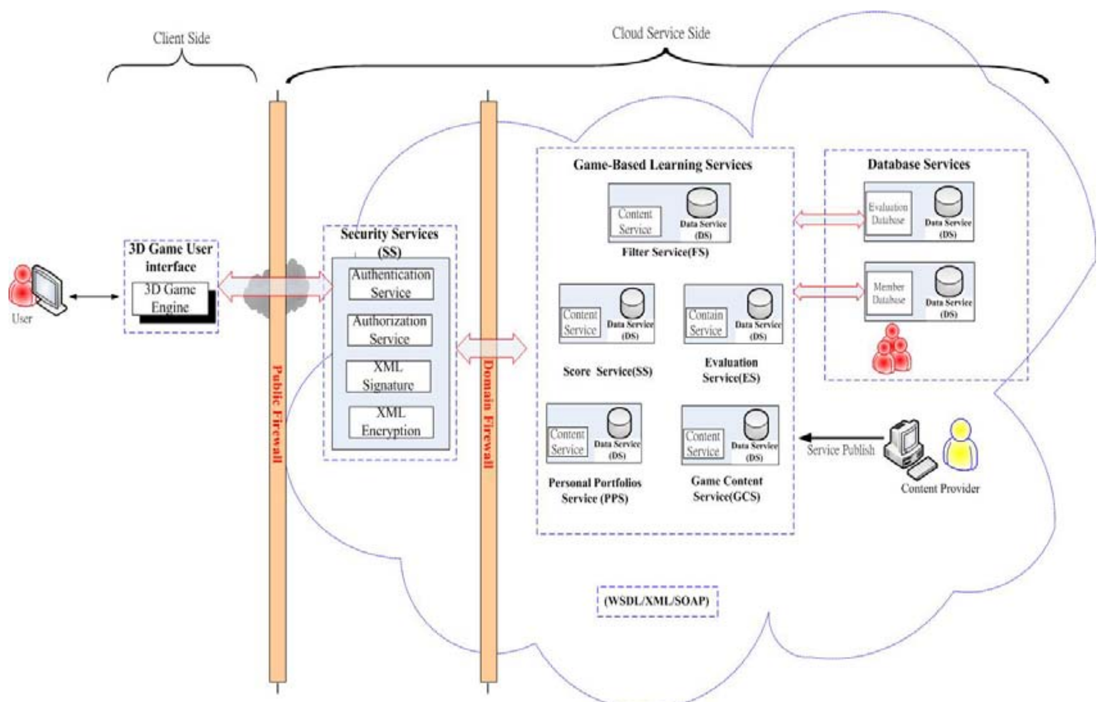

Figure 5 Game-based learning system architecture

The process of game-based learning is introduced in Figure 6. After the player logs in to the game, the player must choose one role according to which he will enter a different game scene. There are different non-player characters (NPC) and tasks in each game scene. The player must talk with NPC to take the specified task from the game-based learning system, and enter the next level after completing all tasks; in other words, if the player doesn't finish the specified task, the game will not end. After receiving the task, player must find various tools and solutions in the game, to complete the task. Once all tasks are completed, the learning of curriculum content is over, and the system will show the player's game score, letting the player know the result of self-learning.

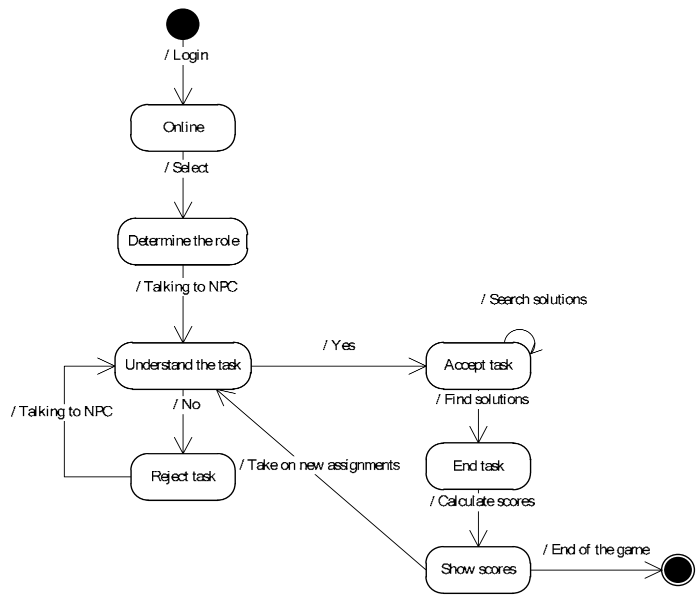

Figure 6 Activity Diagram of Game-based learning system

System interface and system function

According to the system planning mentioned, this study develops a role-play game which functions as follows: (1) The game situation- The construction of the game, besides the design of the game screen, also includes the drama and character design. The story is set in a computer and internet service company whose clients and complicated equipment are getting more and more. This company therefore wants to develop systems that can answer questions of clients and increase the efficiency. The player must help the company evaluate and develop software, act as different roles in the developing process and complete different tasks as different roles to complete the software development. (2) The interface design- The game this study develops takes the story background, environment and age of players into consideration, in order to increase the authenticity of the game, uses the office model as scene, the Q-office worker as people and the 3Ds Max to complete the actual interface that is interaction with players in the system.

The game provides five different roles to be chosen. The Figure 7-1 shows to select a role fore the game task and Figure 7-2 show that every role corresponds to different situations and tasks, and the player can go through the different roles to learn all different tasks of various positions. In the requirements analysis, this study uses the maze game, which will show the problem sign and player position. When passing a problem sign, the character must stop, and the player must solve the current problem in order to keep going forward. In this task, the multiple choice questions are designed by the meeting record from the game. Besides solving all problems in the maze, The Figure 8-1 show that the player must find a way out in order to increase his interest and keep the player's attention on game-based learning. In this task, the player must distinguish the requirements into functional and non-functional. The screen includes a countdown, health points and scores. If the answer is wrong the health points will decrease by one and the question will reappear and the countdown will be reset, in order to give the player the chance to correct the mistake. The player must answer in limited time, to increase the challenge of the game. At the end of the learning phase, shows in Figure 8-2, the player have to take an evaluation then he will get the score which will provided to the teacher for reference.

DATA ANALYSIS AND RESULTS

The goal of this study is to discuss the effect of different teaching methodologies on learning motivation and achievement in a system analysis unit of software engineering curriculum. For the learning system designed by this study, the ARCS questionnaire and system analysis test are used to collect data which is then analyzed with SPSS 17 for Windows. The participants in this study are randomly selected college students, who are separated into two groups, the experimental and control group, to study the effect on the learning achievement from the different teaching approaches, traditional curriculum and game-based learning. There are totally 63 students participating in this study, of which 47 are male and 16 female, with the average age of 20-21 years. There are 30 students (20 males and 10 females) in control group, using the traditional face-to-face teaching approach; there are 33 students (27 males and 6 females) in experimental group, using the game-based teaching approach.

Figure 7-1 Select a role in the game

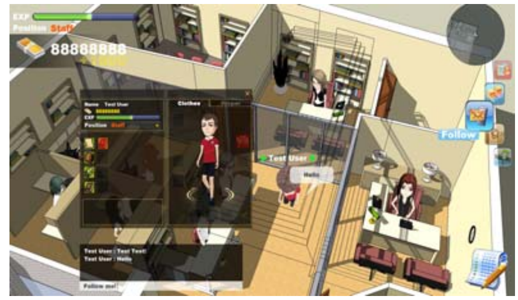

Figure 7-2 Role information in the game

Figure 8-1 identify the requirements

Figure 8-2 System evaluation test for a role

ARCS Data analysis

The hypothesis H1 to H5 states with a significant impact on the learning motivation which is shown in Table 2.The hypothesis H4 states that the achievement when using game-based learning is higher than with traditional face-to-face teaching strategy. The hypothesis H5 states that the learning achievements of students are significantly related to the learning motivation. In pre-test comparison, t-test shows no difference in learning achievement between group A and group B as shown in Table 3. However, the post-test comparison has a significant difference, Table 3 shows the average scores of students in Group A who use the game-based learning are Mean=80.24 and SD=9.327, which are higher than who use the traditional face to face learning (Mean=72.14, SD=12.010). Lastly, comparison with the scores of pre-test and post-test shows that, in the Group B who use the traditional face-to-face learning does not have a significant difference on the scores of pre-test and post-test, but in the Group A who use the game-based learning have significant differences in the scores of pre-test (Mean=71.36) and post-test (Mean=80.24).

Table 2 Hypothesis results

Hypothesis	F	Sig.
H1: The student's background variables do not affect the learning motivation.	5.782 **	p<0.010
H2: The demographic variables do not affect the learning achievement.	6.782 *	p<0.040
H3: The learning motivation does not affect the learning achievement.	2.153 **	p<0.003
H4: There is no difference between traditional learning and game-based learning.	3.025 **	p<0.004
H5: ARCS factors cannot predict learning achievement.	4.020 ***	p<0.001

* P 0.05 ** P 0.01 *** P 0.001

Table 3 the results for the learning achievement of different teaching strategies

	Group	N	Mean	SD	t-test for Equality of Means			
					t	df	Sig. (2-tailed)	Comparison
Pre-test	A	33	71.36	8.287	-0.381	62	0.705	NA

	B	30	72.37	12.489				
Post-test	A	33	80.24	9.327	3.025	62	0.004	A>B
	B	30	72.14	12.01				

Note: Group A denotes students who use the game-based learning, Group B denotes students who use the traditional face to face learning. NA denotes no significant.

CONCLUSIONS

This study aimed at investigating how game-based learning strategy affects student's motivation and learning achievement in software engineering curriculum. To enhance software engineering learning, a 3D game-based learning system has been developed and evaluated to explore the students' motivation, satisfaction and learning achievement, it is effectively helps students to enhance in learning activities based on ARCS learning model. The results show that learning motivations of students have significant impact on learning achievement, and learning achievements of students with game-based learning are better than those who use traditional face-to-face teaching. Therefore, we re-check each questionnaire item; this paper finds that the game-based learning challenging and attractiveness can lead to learners' curiosity and immersion in learning activity. Meanwhile, nearly 80% students are satisfaction and 83% students are confidence (see Table 1) for the curriculum learning after use the game-based learning system.

From the results, some findings could be provided to other educators. Firstly, the students, who major in information, can be more familiar with the game process and curriculum content for getting the knowledge. Secondly, an interesting research result is that the students who play the game two hours each time and less than once a week with higher learning motivation. Thirdly, regarding gender issues, as shown in the study, the achievements of game-based learning have no significant differences between the males and females, which agrees with the same conclusion of the study (Ke & Grabowski, 2007), which found that gender does not impact the learning achievement. This study has also shown that the learning achievement is not impacted by accommodation. Fourthly, in the experimental group, the students who use game-based learning have better achievement than pre-test. Fifthly, the experimental group is higher than the control group for learning achievement. This result shows that the game-based learning system obviously improves the learning achievement of students. Last, educators should offer more interesting, challenging and attractive course content for students with interactive way. Furthermore, instructional design is extremely important in order to realize motivational improvements using technology-based instruction.

Future work can make more interactive contents to enrich the game graphics and contents, and build feasible evaluation criteria to inspire the learning motivations of students. Additionally, although this study has significant achievements for experimental group students, the experiment only includes partial university students in southern Taiwan and in specific subjects. Therefore, in future study, we could expand the experiment to other university and subjects.

REFERENCES

Barendregt, W. & Bekker, T. M. (2011). The influence of the level of free-choice learning activities on the use of an educational computer game. *Computers & Education*, 56(1), 80-90.

Barry, W. Boehm. (1988). A Spiral Model of Software Development and Enhancement. *IEEE Computer Society*, 21(5), 61-72.

Beale, I. L., Kato, P. M., Marin-Bowling, V. M., Guthrie, N. & Cole, S. W. (2007). Improvement in Cancer-Related Knowledge Following Use of a Psychoeducational Video Game for Adolescents and Young Adults with Cancer, *Journal of Adolescent Health*, 41(3), 263-270.

Bokyeong, K. , Hyungsung, P., Youngkyun, B.(2009). Not just fun, but serious strategies: Using meta-cognitive strategies in game-based learning, *Computers & Education*, 52(4), 800-810.

Camines, S. F., & Zeller, R. A.(1979). Reliability and validity assessment. *Beverly Hill*s, CA: Sage.

Chang, Wen-Chih., Wang, Te-Hua., Lin, Freya H., Yang, Hsuan-Che. (2009). Game-Based Learning with Ubiquitous Technologies. *IEEE Internet Computing*, 13(4),26-33

Csikszentmihalyi , M., & LeFevre, J. (1989), Optimal experience in work and leisure, *Journal of Personality and Social Psychology*, 56 (5), 815–822.

Felix, J. W., & Johnson, R. T. (1993). Learning from video games. *Computers in the Schools*, 9(2-3), 119-134.

Gee, J. P. (2003). What video games have to teach us about learning and literacy. *ACM Computers in Entertainment*, 1(1), 1–3.

Gunter, A. G., Kenny, F. R., & Vick, H. E. (2006). A Case for a Formal Design Paradigm for Serious Games. *The Journal of the International Digital Media and Arts Association*, 3 (2006), 93-105.

Gunter, A. G., Kenny, F. R., & Vick, H. E. (2007). Taking educational games seriously: using the RETAIN model to design endogenous fantasy into standalone educational games. *Educational Technology Research and Development*, 56(5-6),511–537.
Heinich, R., Molenda, M., Russell, J. D., & Smaldino, S. E. (2002). Instructional media and technologies for learning. *New Jersey: Merrill Prentice Hall*
Huang,Yueh-Min., Lin, Yen-Ting., Cheng, Shu-Chen. (2009). Effectiveness of a Mobile Plant Learning System in a science curriculum in Taiwanese elementary education, *Computers & Education*, 54(1), 47–58.
John D., (1938). Experience and Education. *New York: Collier Books.*
Karoulis, A., & Demetriadis, S. (2005). The motivational factor in educational games. Interaction between learner's internal and external representations in multimedia environments, *Research report, Kaleidoscope* NoE JEIRP, D21-02-01-F, 296-312.
Ke, F., & Grabowski, B. (2007). Game playing for maths learning: Cooperative or not? *British Journal of Educational Technology*, 38(2), 249-259.
Keller, J.M., Official site of John Keller's ARCS Model, from the World Wide Web: http://www.arcsmodel.com/
Keller, J. M. (1983). Motivational design of instruction. In C. M. Reigeluth (Eds.), Instructional-design theories and models: An overview of their current status (pp. 386-434). *Hillsdale, NJ: Lawrence Erlbaum Associates*.
Keller, J. M. (1987). Development and use of the ARCS model of motivational design. *Journal of Instructional Development*, 10(3), 2 – 10.
Liu, Tsung-Yu., & Chu, Yu-Ling. (2010). Using ubiquitous games in an English listening and speaking course: Impact on learning outcomes and motivation, *Computers & Education*, 55(2), 630-643.
Miller, L. M., Chang, Ching-I., Wang, Shu., Beier, M. E., Klisch, Yvonne.(2011). Learning and motivational impacts of a multimedia science game. *Computers & Education*, 57(1), 1425-1433.
Papastergiou, M. (2009). Digital Game-Based Learning in high school Computer Science education: Impact on educational effectiveness and student motivation, *Computers & Education*, 52(1), 1–12.
Portnoy, LG. & Watkins, MP (2000). Foundations of clinical research: Applications to practice (2nd ed.). Upper Saddle River, NJ: *Prentice-Hall*.
Prensky, M. (2001). Digital game-based learning. *New York: McGraw-Hill.*
Prensky, M. (2003). Digital game-based learning. *ACM Computers in Entertainment*, 1(1), 1–4.
Salajan, F. D., Perschbacher, S., Cash, M., Talwar, R., El-Badrawy, W. & Mount, G. J.(2009). Learning with web-based interactive objects: An investigation into student perceptions of effectiveness. *Computers & Education,* 53(3), 632-643.
Su, Y.S., Yang, J.H., Hwang, Wu-Yuin., & Zhang, Jia. (2010). A Web 2.0-based collaborative annotation system for enhancing knowledge sharing in collaborative learning environments, *Computers & Education*, 55(2), 752-766.
Thomas H., Thomas M. C., Mark S., Elizabeth A. B. (2011). Evaluation of a game to teach requirements collection and analysis in software engineering at tertiary education level. *Computers & Education*, 56(1), 21-35.
Von Wangenheim, C.G., Shull, F.(2009). To Game or Not to Game? *IEEE Computer Society*, 26(2), 92-94

A MODEL FOR INSTRUCTORS' ADOPTION OF LEARNING MANAGEMENT SYSTEMS: EMPIRICAL VALIDATION IN HIGHER EDUCATION CONTEXT

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ABSTRACT
Through the rapid expansion of information technologies, Learning Management Systems have become one of the most important innovations for delivering education. However, successful implementation and management of these systems are primarily based on the instructors' adoption. In this context, this study aims to understand behavioral intentions of higher education instructors towards Learning Management Systems and further to identify the influencing factors. A multidimensional research model has been proposed based on the Belief Factors, Application Characteristics, and Individual, Social and Technological dimensions to identify the effects of key variables on behavioral intentions of users. A comprehensive survey was conducted with 224 academicians, followed by semi-structured interviews with ten of them. This paper presents evidence for the factor structure, reliability and validity of the survey. Additionally; structural equation modeling, specifically partial least square, was applied to assess the proposed multi-dimensional research model. Consequently, relationships between the influencing factors were detected and the results showed that the research model significantly predicts instructors' behavioral intention towards Learning Management System use. Findings of this research will be valuable for academicians and practitioners in implementation, management and continuous improvement of learning management systems.
Keywords: E-learning adoption, Technology adoption, Structural equation modeling, Partial least squares, Learning management systems

INTRODUCTION

Rise of computers, information and communication technologies and rapid expansion of the Internet encourage universities to transform their educational programs. Through this transformation, universities promote online courses to increase communication with students, to establish new revenue sources, and to reduce the location dependency and time constraints that are associated with traditional education. The rapid development of information technologies provides tools to expand and support e-learning applications in higher education institutes. One of the major technological innovations to support e-learning programs is Learning Management Systems (LMS). Higher education institutes implement LMS to support their course curriculum with many types of tools; such as, discussion boards, forum, chat, online grade posting, online exam, file sharing, management of assignments, syllabi, schedules, announcements and course plans. Proper implementation of these tools is important for the success of courses; however, most of the time, implementation of such systems may be problematic and even may end with a failure (Legris et al., 2003). Successful implementation of this technology partly depends on factors related to attitudes and opinions of instructors, students, information technologies and university support (Davis et al., 1989; Webster, Hackley, 1997; Selim, 2007). Although these stakeholders are primary considerations of LMS for successful implementation, instructors play a central role in the effectiveness and success of e-learning based courses (Webster, Hackley, 1997; Selim, 2007). Instructors' decision on continuing to use the system after trying is one of the success indicators of LMS implementation; therefore, determining the factors affecting users' intention to continue e-learning service use is one of the critical issues for researchers (Chiu et al., 2005). Instructors' attitudes towards a technology will affect learning outcomes (Webster & Hackley, 1997) and should be considered when technology-mediated distance learning systems are evaluated (Dillon & Gunawardena, 1995). Instructors are becoming increasingly critical determinant for implementation, management and continuous improvement of LMS. Therefore, the reasons effecting instructors' adoption towards LMS use must be revealed for the successful implementation of such systems in higher education.

E-learning revolutionizes education and makes it more accessible with the innovative use of information technologies; however it brings formidable challenges for instructors and students (Liaw, et al., 2007). Upon the knowledge we gathered so far, the studies concentrating on students' adoption (Saade' & Bahli, 2005; Pituch & Lee, 2006; Lee et al., 2009) towards e-learning system reach a certain level of maturity. However, the number of

studies examining instructors' adoption towards e-learning system is not sufficient to make a generalization. There is no single study that has examined instructors' adoption towards e-learning system considering **Belief** - *Perceived Usefulness and Perceived Ease of Use,* **Application Characteristic** – *Compatibility,* **Individual** – *Application Self Efficacy***,** **Technological** – *Technological Complexity* and **Social** – *Subjective Norm* dimensions all together. Among the limited number of studies that examined attitudes of instructors towards e-learning systems, Wang and Wang (2009) only concentrated on Perceived Usefulness, Perceived Ease of Use, Subjective Norm and Self-Efficacy dimensions and Sánchez-Franco (2009) only examined flow construct.
In these contexts, in order to increase the LMS use, it is essential to understand the reasons behind instructors' rejection and identify the critical success factors affecting their adoption. Therefore **the aims of this study** are as follows:

- Identifying the key factors affecting instructor adoption of LMS in higher education
- Developing a multidimensional model to reveal the main reasons behind the instructors' rejection of LMS.

This paper is organized as follows. First, the proposed research model and hypotheses are introduced. Second, information is given about preparation of the survey instrument, data collection process and participants of the research. Third, the survey instrument has been explored for validity and reliability. Exploratory factor analysis has been conducted to identify the factor structure of the survey instrument. In addition, structural model is presented considering the relations between factors and results of the analysis. Fourth, the findings of the research have been discussed in the light of literature and qualitative analyses results. Lastly, contributions of this study are summarized and potential future research topics are addressed.

RESEARCH MODEL AND HYPOTHESES

Research model

Most of the studies have examined users' e-learning acceptance or adoption either by using the original Technology Acceptance Model (TAM) (Davis, Bagozzi & Warshaw, 1989) or by extending it with different variables. They do not utilize a framework in developing their research models. This situation is a limitation because there is no clear pattern in selecting the external variables of the research models. Researchers are advised to avoid using a single linear methodology when evaluating individual attitudes toward e-learning (Liaw et al., 2007; Wang, 2003). Therefore, in this study, a multidimensional approach is considered to evaluate the behavioral intention of higher education instructors towards LMS use and the variables of the research model are selected under the control of related dimensions. The proposed research model is presented in Figure 1.

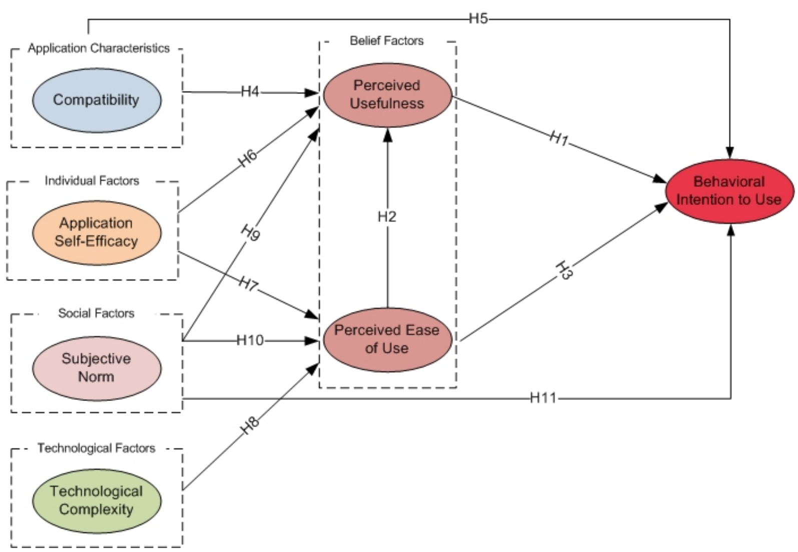

Figure 1. Proposed research model

The dimensions of the proposed research model and the related hypotheses are presented below;
Belief Factors examines individual's cognitive perception concerning the functionality of the system and his beliefs that using the system will have job related or, in general, utilitarian outcomes (Karaiskos, 2009). The factors under this dimension measure that how individual's perception is affected when they use information systems which provide utilitarian outcomes like improving effectiveness and efficiency in accomplishing tasks, fulfilling tasks without effortless and timeless (Karaiskos, 2009). In this context Perceived Usefulness (PU) and

Perceived Ease-of-Use (PEOU) are grouped under this dimension as indicative factors to evaluate that how system's utility and easiness affect users' perception and intention to system use. These two factors have become evident to have direct effects on behavioral intention to use LMS. However, too few studies (Liaw et al., 2007; Wang & Wang, 2009) verify the relationship between perception and intention from higher education instructors' perspective empirically in the context of e-learning systems. In the proposed research model, PU of LMS is defined as "the degree to which an instructor believes that using such systems will enhance his or her teaching performance" and PEOU of LMS is defined as "the degree to which an instructor believes that the system will be used easily" (Davis et al., 1989). Davis in 1989 concluded that PEOU has a significant direct effect on PU, and most of the recent studies verified the relation empirically in the context of LMS use (Lee et al., 2009; Chang & Tung, 2008), except one study, which aimed to predict university students' perception towards a web-based comprehensive class management system (Yi & Hwang, 2003). PU and PEOU are the key factors that affect the behavioral intention to use technology. Previous studies stated that both PU and PEOU directly affect the intention to use (Chang & Tung, 2008). Thus the hypotheses related with PU and PEOU are as follows:

Hypothesis-1: Perceived Usefulness will have a positive direct effect on Behavioral Intention.
Hypothesis-2: Perceived Ease of Use will have a positive direct effect on Perceived Usefulness.
Hypothesis-3: Perceived Ease of Use will have a positive direct effect on Behavioral Intention.

Also, a three-level framework developed by Cho in 2005 is used in constructing the research model. The framework includes the Technological, System and Application levels. The study indicates that Technological, System and Application characteristics, as well as Individual dimensions should be considered when evaluating technology adoption and usage (Cho, 2005; Cho et al., 2009).

Application Characteristics capture perceived innovation characteristics stating that behavioral intention and actual use are heavily depend on user perception of innovation (Conner, 2002). Under this dimension effects of the task and service characteristics of the systems on users' behavioral intention are examined. Compatibility (CMP) is explored under the Application Characteristics to reveal the effects of satisfaction between system characteristics and instructors' needs on behavioral intention to use. CMP assesses the effects of user's values, previous experiences and needs (Rogers, 1995) over the user's perception towards LMS use. Effects of CMP have not been verified from the perspective of higher education instructors in the scope of LMS. Chang and Tung (2008) examined the relations among CMP, PU and BI to examine the students' behavioral intention to use an online learning course web site and concluded that CMP has a direct effect on PU and BI. Thus the hypotheses related with CMP are as follows:

Hypothesis-4: Compatibility will have a positive direct effect on Perceived Usefulness.
Hypothesis-5: Compatibility will have a positive direct effect on Behavioral Intention.

Individual Factors refer personal traits that define the boundaries of individual's perception and assessments over the behavior (Karaiskos, 2009). Self-abilities and experiences of an actor who performs the behavior are considered with this dimension to evaluate LMS adoption and use. Effects of Application Self-Efficacy (ASE) are examined under the Individual Factors to capture that how an people's characteristics influence their intention to use a system. ASE is utilized to evaluate the effects of instructors' judgments about their LMS use capabilities. Venkatesh and Davis (1996) states that PEOU and self-efficacy are related and many studies have proved that self-efficacy has a direct relation with PEOU in the scope of web-based learning systems (Wang & Wang, 2009; Pituch & Lee, 2006). The relationship between ASE and PEOU is assessed in the proposed model. The hypotheses related with ASE are provided below:

Hypothesis-6: Application Self Efficacy will have a positive direct effect on Perceived Usefulness.
Hypothesis-7: Application Self Efficacy will have a positive direct effect on Perceived Ease of Use.

Technological Factors examine the characteristics of the technology. Complexity is included in the research model to understand the effects of technological characteristics on users' easiness perception. Technological Complexity (TC) is grouped under technological factors and considered in the research model to evaluate how perception about system complexity will affect the instructors' intention. TC is defined as "the degree to which technology is perceived as relatively difficult to understand and use" (Thompson, Higgins, & Howell, 1991). In a previous study, effect of TC on PEOU was analyzed to explain pre-service teachers' intention toward technology use (Teo, 2009). The study stated that if a technology perceived as being difficult, it is perceived as being tedious and time consuming, which results in a lot of effort to be spent to benefit from it. The hypothesis related with TC is as follow:

Hypothesis-8: Technological Complexity will have a negative direct effect on Perceived Ease of Use.

Social Factors explore effects of environmental factors like other people's attitudes and behaviors and social pressures imposed to the individuals. Social factors capture that how individuals who are important for end users have an effect on them towards using a system. Subjective Norm (SN) is grouped under environmental dimension and defined in the model to evaluate the effects of others' opinions on the instructors' decisions. Many instructors choose to use LMS upon recommendations from their colleagues or students, who are the users of the system. Previous studies indicate that SN has a direct relation with both PU (Wang & Wang, 2009; Yuen & Ma, 2008; Park, 2009) and BI (Wang & Wang, 2009; Yuen & Ma, 2008; Park, 2009) in the scope of e-learning systems. Although, Park (2009) found insignificant effects of SN on PEOU when evaluating university students' adoption of e-learning, Yuen and Ma (2008) found a significant relation between SN and PEOU in their study that concentrated on teachers' acceptance of e-learning technology. To offer a new viewpoint, relation between SN and PEOU is being analyzed in the proposed model. Thus the following hypotheses are formulated by these considerations;

Hypothesis-9: Subjective Norm will have a positive direct effect on Perceived Usefulness.
Hypothesis-10: Subjective Norm will have a positive direct effect on Perceived Ease of Use.
Hypothesis-11: Subjective Norm will have a positive direct effect on Behavioral Intention.

RESEARCH METHOD

Study Settings

In this study, METU Online learning management system was taken into consideration when evaluating users' behavioral intention towards LMS use. METU Online is a learning management system developed by Informatics Institute of Middle East Technical University (METU) and being used since 1997 to meet the e-learning needs of METU students and academicians. This LMS provides an educational environment in which instructors and students can easily communicate with each other synchronously and asynchronously. METU Online enables an instructor to share and arrange lecture notes, syllabus and course schedule, publish assignments, announcement and grades of the students, communicate with students via e-mail, chat and forum and evaluate their students with online exams.

Survey instrument and data collection

In this study, both quantitative and qualitative research methods were used to test the proposed research model. A comprehensive survey instrument was prepared after a detailed literature review to collect data from higher education instructors about their perceptions of the LMS in regards to their adoption level. **Content validity** of the survey instrument was checked, in order to evaluate whether the measurement reflects the intended domain of content specifically (Carmines & Zeller, 1994). Judgments were taken from seven experts to assess each item in the survey as 'essential', 'useful but not essential' or 'not necessary'. Four of the experts were from the Information Systems Evaluation and Integration Group (ISEing), Brunel University, London, UK; two from the Education Sciences, METU, Ankara and one from the Informatics Institute, METU, Ankara, Turkey. Then the instrument was demonstrated over a small group including ten PhD students.

Before the main survey was performed, a pilot study was applied on 86 instructors who are employed in various institutions in METU. Pilot survey included 46 items to measure the constructs of the proposed research model. The results and feedbacks from the pilot survey were taken as basis for preparing the main survey.

The resulting survey consisted of two main parts. The first part included demographic questions. The second part consisted of 27 five-point likert-type scale questions aiming to assess the seven constructs of the proposed research model. These questions are anchored from 1 to 5, where 1 indicates strong disagreement and five indicates strong agreement. All responses were guaranteed confidentiality. This measurement items are presented in Table 1. Initially, an electronic version of the survey was distributed to 1000 instructors via email. Due to low response rate (0.5%), distribution of the survey was continued by hand. Moreover, for qualitative analysis, 10 active users of the LMS were interviewed face-to-face via use of semi-structured questions (A.1). The Semi-structured interviewing method was chosen because it is useful for obtaining information to test a specific hypothesis that the researcher has in consideration (Fraenkel & Wallen, 2006).

Participants

A total of 500 questionnaires were distributed to the higher education instructors. The data used to evaluate the proposed research model was collected from full time instructors working in School of Foreign Languages, Faculty of Education, Faculty of Arts and Science and Faculty of Engineering of METU, Turkey. In total 250 surveys were retrieved. 224 respondents were active users of the METU Online. The resulting total response rate was 50%. The demographic profile of the respondents included collecting responses on LMS usage, gender, age and evaluation of computer skills and major motivation of users. The demographic results showed that while 89.6% of the participants were using the METU Online LMS, the rest had not used it before. In addition, the participations awareness of other LMSs was asked and 20% of them were aware of Moodle, 20% of them were aware of Blackboard and 9% of them were aware of WebCT. The sample population showed diversity in gender as 62.5% of the respondents were female, and the rest of them were male. 90% of the respondents were between 20 and 39 years old and 68% evaluated their computer skills as pretty good. Also 44%, 38%, 27% and 12% of the respondents selected "Myself", "Course Content", "Students" and "Colleagues" respectively as a major motivation factor towards system use.

Data analysis and results
Data analysis and results of the research composed of preliminary data analysis, identification of factor structure, reliability assessment and assessment of the proposed research model stages. Steps of data analysis are illustrated in Figure 2.

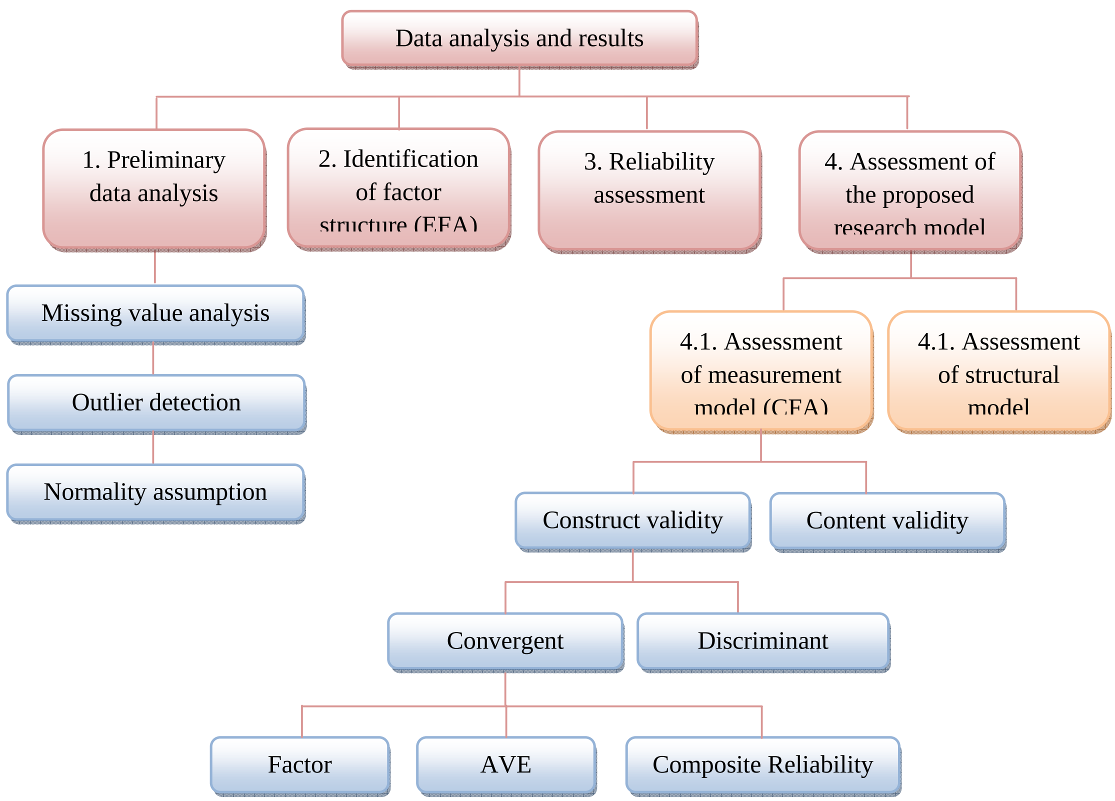

*Figure 2.*Steps of data analysis

Preliminary data analysis
Missing value analysis, outlier detection, multicollinearity analysis and normality assumption checks were performed before using the data set for further analyses (Hair, 2006). Hair (2006) indicated that missing values can be handled with any imputation method as long as missing data level is under 10%. For this reason, regression method was used to handle missing data of 224 usable questionnaires. Also, multivariate outliers were explored and none of the data appeared to be extreme. Lastly, skewness and kurtosis values were checked with Kolmogorov–Smirnov test (Field, 2009). All items were found significant ($p<0.05$) according to the result of this test. Also the skewness and kurtosis values of each item should be between -1 and +1 (Huck, 2004). In this study, the skewness and kurtosis values were between +2 and -2. According to these results, the data had non-normal distribution.

Identifying the factor structure
Explanatory Factor Analysis (EFA) was performed to show whether the related items were clustered under the same factors or not. Maximum likelihood extraction method and direct oblimin rotation were conducted on 27 items because factors in the proposed research model were related with each other. The Kaiser-Meyer-Olkin (KMO) measure equaled to .91 confirmed the sampling adequacy for the explanatory factor analysis (Field, 2009). Bartlett's test of sphericity $p < .001$, indicated that correlations between items were sufficiently large for maximum likelihood. Six components had eigenvalues over Kaiser's criterion of 1 and combination explained

67.75% of the variance. According to Hair et al. (2006), factor loadings should be between 0.3 and 0.4 to meet the minimal level. Table 1 shows the each item's factor loading after rotation. Factor 1 represents Perceived Usefulness, factor 2 represents Perceived Ease of Use, factor 3 represents Application Self-Efficacy, factor 4 represents Technological Complexity, factor 5 represents Subjective Norm and factor 6 represents Behavioral Intention.

Item 3, 5, 11, 13, 18, 19 and 21 were deleted because they did not cluster appropriately under the factors. None of the items clustered under the CMP dimension so CMP was removed from the proposed research model. As a result, the final version of the questionnaire contained 20 items.

Reliability assessment
Reliability was evaluated by considering the inter-item consistency assessed by Cronbach's Alpha value (Morgan et al, 2004). Morgan indicates that in order to provide a good support for internal consistency, the value of Cronbach's Alpha should be positive and even greater than 0.7. Additionally, Hair et al (2006) notes that a Cronbach's Alpha value ranging between 0.6 and 0.7 refers a lower level of acceptability. The 20-item instrument had a very high reliability with 0.894. Table 1 shows Cronbach's Alpha coefficients for the six constructs which were between 0.665 and 0.845. Although Cronbach's Alpha values of ASE and SN slightly lower than 0.7, the results lead to a conclusion that the reliability was assured.

Table 1. Descriptive statistics of the construct and items.

Construct / Item	Factor Loading	Cronbach's Alpha Coefficient	Reliability Result
Perceived usefulness (PU)	.490		
I1-PU1 : LMS enhances my course performance	.697		
I9-PU2 : LMS increases productivity of the course	.452	.808	Good
I17-PU3 : LMS helps me to satisfy the purpose of the course easily	.566		
I25-PU4 : LMS gives me a greater control over my course			
Perceived ease of use (PEOU)			
I2-PEOU1 : Interacting with LMS is clear and understandable	.572		
I10-PEOU2 : Interface of the LMS is clear and easy to understand	.660	.819	Good
I7-PEOU3 : Navigation among tools is not difficult	.578		
I15-PEOU4 : Interacting with LMS is not complicated	.427		
Application self-efficacy (ASE)			
I6-ASE1 : I can use LMS without support	.456		
I14-ASE2 : I can use LMS, even if there is no one for help when I get	.686	.684	Acceptable
stuck	.336		
I22-ASE3 : I was able to use LMS without observing anyone use it			
Technological complexity(TC)			
I26-TC1 : Interacting with LMS does not require much mental effort	.676		
I23-TC2 : It does not take too long to learn how to use LMS	.585	.845	Good
I27-TC3 : Using LMS does not take too much of my time	.654		
Subjective norm (SN)			
I8-SN1 : My colleagues encourage me to use LMS	.584		
I16-SN2 : My assistants / instructors support me to use LMS	.849	.665	Acceptable
I24-SN3 : Head of my department supports me to use LMS	.431		
Behavioral intention (BI)			
I4-BI1 : I will use LMS in the next semesters	.696		
I12-BI2 : I plan to use LMS in all of my courses	.779	.805	Good
I20-BI3 : It is worth to use LMS	.650		
Not Measured			
I3: I feel good about supporting the course with LMS			
I5: LMS is compatible to manage the course progress			
I11: LMS provides an attractive learning environment			
I13: LMS fits my teaching style			
I18: Interacting with LMS does not demand much care or attention			
I19: Supporting the course with LMS is better than the traditional methods to manage course			
I21: LMS is helpful to fulfill the needs of the course			

Ii: Number of survey items

Assessment of the proposed research model
The proposed research model was validated with structural model analysis using the partial least square (PLS) technique. In this study PLS was used to analyze data, instead of LISREL, because of the non-normal data distribution.

Assessment of the measurement model
Confirmatory Factor Analysis (CFA) was conducted to validate the correlation between items and factors before the structural model was evaluated. Additionally, CFA assessed the measurement model via convergent validity and discriminant validity that are two important components of construct validity.

Convergent Validity
Convergent validity is defined as the degree to which two variables share variance due to a given concept and correlation (Reichardt & Coleman, 1995). Convergent validity can be assessed with Factor Loadings, Composite Reliability and Average Variance Extracted methods and Hair (2006) explains these concepts as follows.

- *Factor loading* is the evidence of the variance shared between item and construct, and also its standardized value should be ideally 0.7 or higher, but 0.5 or higher is also acceptable. As shown in Table 2, standardized factor loadings ranged between 0.679 and 0.886. The values of the factor loadings validated the correlation between each item and their constructs in the data set.
- *Composite reliability (CR)* refers to internal consistency indicating that all measures consistently represent the same latent construct. A reliability value of 0.7 or higher refers good reliability. In this study, CR values were between 0.816 and 0.902; so the composite reliability of the date set was validated. CR values were shown in Table 2.
- *Average variance extracted (AVE)* value is to be computed for each latent construct of the measurement model. That value should be 0.5 or higher to provide adequate convergent validity. The AVE values ranged from 0.598 to 0.756. This indicated that each construct was strongly related to its respective indicators. AVE values were shown in Table 2.

As a result, the measurement model was evaluated to have an adequate convergent validity.

Table 2. Convergent validity

Item	Factor Loadings	Composite Reliability (CR)	Average Variance Extracted (AVE)
PU1	.782	.876	%63
PU2	.845		
PU3	.781		
PU4	.788		
PEOU1	.728	.879	%64
PEOU2	.857		
PEOU3	.824		
PEOU4	.802		
ASE1	.843	. 830	%62
ASE2	.782		
ASE3	.734		
TC1	.869	.902	%75
TC2	.852		
TC3	.886		
SN1	.812	.816	%59
SN2	.820		
SN3	.679		
BI1	.855	.892	%73
BI2	.852		
BI3	.861		

Discriminant Validity
Another important dimension of construct validity is discriminant validity which demonstrates that a measure should not correlate so highly with another measure (Peter, 1981). Fornell and Larcker (1981) indicated that square root of the average variance calculated for each construct should be greater than the correlation between a given construct and all other constructs. Table 3 shows that square root of average variance for each construct on the diagonal was greater than the other values. For this reason, Discriminant validity was reasonable to verify construct validity.

Table 3. Discriminant validity of measurement model.

Construct	BI	CSE	PEOU	PU	SN	TC
BI	**0.856**					
CSE	0.391	**0.788**				
PEOU	0.397	0.629	**0.804**			
PU	0.627	0.349	0.395	**0.799**		
SN	0.216	0.114	0.245	0.398	**0.773**	
TC	0.352	0.653	0.707	0.351	0.164	**0.869**

Assessment of structural model and hypotheses testing

SMART PLS was used to assess the statistical significance of each hypothesis considering the path coefficient values that are standardized betas. The data set composed of 224 samples was analyzed with a bootstrapping procedure to evaluate the significance level of the relations between constructs. The estimated path coefficients of the structural model are shown in Figure 3.

The summary of hypotheses tests, T values that have been considered to evaluate the significance of path coefficients and β values stating the standardized path coefficient are given in Table 4. When T and β values were considered, it was found that there were strong positive relations between PU-BI, ASE-PEOU, TC-PEOU and SN-PU at the $p<0.001$ level, therefore H1, H7, H8 and H9 accepted. Additionally, structural model analysis showed strong relation between TC and ASE at the $p<0.001$ level that was not a situation estimated before. The relation between TC and ASE was named as Additional Relation. A new constructed hypothesis had positive direct relation between TC and ASE. Also the results showed that the relations proposed in H3 and H10 were significant at the $p<0.01$ level, thus the hypotheses were accepted. The relations between PEOU-PU and ASE-PU were significant at the $p<0.05$ level, therefore H2 and H6 were accepted. There was not a significant relation between SN and BI, hence H11 was rejected. Furthermore none of the items clustered under the CMP dimension when explanatory factor analysis was performed. For this reason CMP was not included in the content of structural model and the relations between CMP and PU, CMP and BI were not analyzed. Therefore, H4 and H5 could not be measured.

The result of analyses showed that the model's predictive power (R^2) value was 0.42.

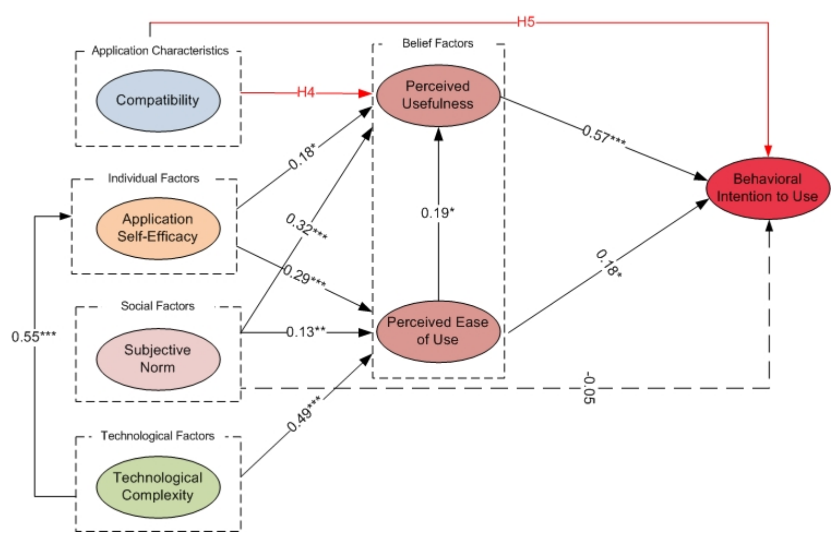

Figure 3. Result of the proposed research model
Path significance: *p<0.05; **p<0.01; ***p<0.001

Table 4. Summary of hypotheses tests.

Relationships	Hi	T-Values	β	Decision
PU -> BI	H1	9.010	0.579***	Accepted
PEOU -> PU	H2	2.382	0.197*	Accepted
PEOU -> BI	H3	2.950	0.183**	Accepted
CMP->PU	H4	-	-	Cannot be determined
CMP->BI	H5	-	-	Cannot be determined
ASE -> PU	H6	2.378	0.188*	Accepted

ASE -> PEOU	H7	4.995	0.291***	Accepted
TC -> PEOU	H8	8.294	0.497***	Accepted
SN -> PU	H9	5.207	0.328***	Accepted
SN -> PEOU	H10	2.621	0.131**	Accepted
SN -> BI	H11	0.941	-0.058	Rejected
TC -> ASE	Additional Relation	15.310	0.553***	Accepted

*p < 0.05; **p < 0.01; ***p<0.001

DISCUSSION

In this empirical study, a number of relationships were examined to reveal instructors' adoption of LMS in higher education. The relations among factors were examined under the Belief, Technological, Social, Application Characteristics and Individual Dimensions.

Belief Factors*: Perceived Usefulness and Perceived Ease of Use*

The first dimension identified the effects of Belief Factors on behavioral intention towards LMS use from the perspective of higher education instructors. The relations among PU, PEOU and BI were examined in the proposed research model.

Statistical results (in Table 4) proved that PU had a positive significant relationship with BI (i.e. hypothesis 1). This result leads to similar conclusions with some previous studies in the literature (Saade' & Bahli, 2005). Focus group interviews confirmed the significant relation between PU and BI. Qualitative findings supported that the usage of LMS reduces time and location dependency via use of forum, chat and e-mail tools and the effort spent for sharing and archiving course materials without any information loss. One of the instructors stated that "…I can manage my courses easily because I can access the system, organize course materials and communicate with my students whenever I want…" Another instructor stated that "… I can achieve my course materials easily with METU Online. The prepared lecture notes, syllabi and schedules are kept in the system, so I won't need to prepare same documents for upcoming semesters…" These two arguments support the quantitative results in a way that instructors' performance increase with LMS uses in their course organization. Also instructors' behavioral intention towards system use increase when they perform their jobs in an efficient and effective way.

In addition, statistical analyses revealed that PEOU was positively correlated with PU (i.e. hypothesis 2), which was consistent with the previous studies (Lee et al., 2009; Lee, 2009). The relation emphasized that if an instructor perceives LMS as easy to use, his/her usefulness perception will increase about supporting the course by the system. One of the instructors stated that "…I don't spend too much time when submitting grades of the students, due to user friendly interfaces; also I don't have to enter each student's grade separately, thanks to the mass grades registration…" This comment proved that when instructors perform a job in an easy way, they have pleasure and this feeling increases their usefulness perception towards system use.

The focus group discussion explored the positive relation between PEOU and BI (i.e. hypothesis 3) and the significance of the relation was lower than the relation between PU and BI. One of the instructors stated that "…although, in the first time, the relation between course and its application tools seemed a little bit confusing, learning the usage of system did not take too much time and effort…" Another instructor stated that "…despite navigation among tools is so easy, path information is needed to understand where I am at that moment…" In the first time, instructors had some difficulties to learn LMS use; however they learned thoroughly all aspects of system use after several trials. In this study, the effect of PU on BI was more influential than the effect of PEOU. Although PEOU is an important determinant of behavioral intention, instructors have adequate capability to overcome the related difficulties. So system usefulness is a more influential factor than easiness factor for instructors' decision to LMS use.

Application Characteristics: *Compatibility*

The second dimension tried to identify the effects of Application Characteristics' effect on behavioral intention. However, CMP dimension had been removed from the model because of the inconsistent explanatory factor analysis results. Therefore, the effects of CMP on PU and BI were not analyzed (i.e. hypothesis 4 and hypothesis 5). When conducting focus group interviews, it was seemed that the instructors' opinions diverse on the compatibility of the system. While a group of instructors found the system so beneficial to organize their courses, some of them thought that the system is inappropriate to support the courses. Qualitative findings supported that the main reason of the diversity emerged because of the courses' properties. An engineering science instructor stated that "…there is no tool available to support laboratory activities so I cannot use LMS to organize my laboratory sections…" The result of the interview was in parallel with the literature. Bourne et al.

(2005) states that engineering education fell behind some other education areas in the field of adoption of online methodologies, due to laboratory works, intensive mathematical computations, designing tools requiring computing power and graphics.

Individual Factors: *Application Self Efficacy*
The third dimension identified the effects of Individual Factors on behavioral intention to use LMS. This dimension examined that how users self efficacy towards an application affects their future decision to use system.

ASE significantly influenced PU (i.e. hypothesis 6), as claimed by Hsu et al. (2009) that concentrate on statistical software-self efficacy of students. Users' self-confidence towards LMS use increases their usefulness perception towards system use. As indicated in the study of Wang & Wang (2009), higher education instructors have basic computer literacy; for this reason, they have self-confidence while using web-based learning systems. Similar results were seen in this study, as 68% of the instructors evaluated their computer abilities as pretty good, which shows the instructors' self-confidence towards system use.

Moreover ASE significantly affected PEOU (i.e. hypothesis 7). Morris and Venkatesh (2000) examined age differences in a workplace to reveal their technology adoption, and they found that older workers may be less self-confident in their ability to use a new technology. In this study, 63% of the participants were young people whose ages were between 20 and 29. For this reason, most of the participants of this research had ASE when using LMS, so self-confidence positively influences their ease of use perception. Additionally, according to focus group interviews an instructor indicated that "…availability of the manual increases my self-confidence, so I don't care about the difficulty of the system. Since, I know that I will be able to use the system with the help of manual…" This comment also showed that additional supportive activities enhance users' self confidence towards system use.

Like previous studies have revealed, ASE positively affected both PU and PEOU (Hsu et al., 2009; Yi & Hwang, 2003). However, effect of ASE on PU was lower than PEOU. An instructor statement supported this argument by claiming that "…when I created lecture notes for the first time, the interface confused me. Because, the resource files of the lecture notes and the files to be shared with students are being organized in the same interface. I could not understand the difference between these two structures, so I called the help desk to for assistance in creation of the lecture notes…" This statement showed that the instructor was confused and need to take help to solve this dilemma. Although instructor had self confidence to use system and easily learned the system use, he did not find the system so useful to achieve his aim at the first time. Therefore, effects of instructors' self-efficacy towards application were lower on his usefulness perception.

Technological Factors: *Technological Complexity*
The fourth dimension identified the effects of Technological Factors on behavioral intention of instructors towards LMS use. Statistical results showed that TC had a strong and positive effect on PEOU (i.e. hypothesis 8). Although it was hypothesized that technological complexity negatively related with perceived ease of use, the statistical analysis showed that there was a positive relation between these two constructs. This positive relation was caused by the participants' capability to use computer technology and their self confidence towards LMS use. They found the system use simple; so they did not feel anxiety when using LMS and live any complexity problem when using LMS. An instructor's comment supported the strong positive relation between TC and PEOU. He said that "…the applications, such as sending announcements, posting assignments and file sharing, integrated to the system are not confusing. However, preparing an online exam with the system is a little bit confusing, so I prefer paper based exam instead of using online exam tool…" One of the instructors stated that "…technical support is so beneficial, so I don't need to spend much time to solve a problem…" These statements showed that instructors did not have difficulty in using the system. The result of this relation was parallel with the study of Teo (2009). He indicated that the perception of difficult technology discourages instructors towards LMS use, because they think that the usage of the system is so tedious and time confusing that a lot of effort is needed to benefit from the system.

Additionally, significant relation, which was not estimated before, was detected between Technological and Individual dimensions; TC had a strong positive effect on ASE (i.e. Additional Relation). This positive affect may be caused because of the instructors' self confidence. This relation showed that the complexity of the technology affects user's self-efficacy towards application use. One of the instructors stated that "…I am not so successful in computer usage, so simplicity of the system increases my self-confidence towards LMS…." This statement supports that simple systems increase users' self confidence. The relation between TC and ASE shows that although instructors have self confidence towards system use, simple systems enhance their confidence.

Social Factors: *Subjective Norm*
The fifth dimension identified the effects of Social Factors on behavioral intention of instructors towards LMS use.

Statistical results showed that SN positively and directly influenced PU (i.e. hypothesis 9). In parallel with the literature, social environments of instructors' increase their usefulness perception (Wang & Wang, 2009; Park, 2009).

Additionally, SN was positively correlated with PEOU (i.e. hypothesis 10) even if its effect was lower than the one on PU. The result of this relation was inconsistent with the study of Park (2009).

In this study, SN did not have any direct effect on BI (i.e. hypothesis 11). The study of Morris and Venkatesh (2000) indicated that age has a positive direct influence on subjective norm which means that older people may consider the opinions of friends and coworkers more. In this research, most of the respondents were young, and they did not care about what people around them believe. Additionally, a generic question was asked in the questionnaire to obtain information about the major motivation of users when deciding about system use. The results showed that, users' own decision and course content (44% and 38%, respectively) were more effective than the students and the colleagues (27% and 12% respectively) as motivation to use LMS. According to these finding, the insignificant relation between SN and BI was reasonable. Additionally, an instructor stated that "…before I used the system, my students and friends were mentioning about the LMS. After I tried it, I realized that the system could be beneficial to support my courses…" This statement supported that, although the user was influenced by the others' opinions at the beginning, the others' opinions were not as effective as at the beginning, when giving decision about continuing system use. Although usefulness and ease of use perceptions were affected from the people around the user; the final decision towards system use was given by the user him or herself.

CONCLUSION
This study aimed to propose a LMS adoption model from the perspective of higher education instructors. The model comprised of five dimensions – Belief, Application Characteristics, Individual, Social and Technological – and a scale has been developed to examine the relations among their variables. Validity tests have proved that the following variables and their corresponding dimension of the model were significant in explaining the behavioral intention of instructors towards LMS use: (1) Belief - Perceived Usefulness and Perceived Ease of Use, (2) Individual – Application Self Efficacy, (3) Social – Subjective Norm, (4) Technological – Technological Complexity. However, the fifth dimension and its variable, i.e. Application Characteristic – Compatibility, could not be incorporated within the proposed model because of the inappropriate correlation between the items and the factor. The final model explained a significant amount of the variance of behavioral intention towards LMS use ($R^2 = 0.423$). The results provide considerable insights about instructor adoption of LMS in higher educations. Moreover the findings of this study contribute to the e-learning literature by identifying the factors that influence instructor adoption of LMS for successful system use in learning and teaching in higher education.

Information systems success is based on the multidimensional approach and interdependent construct (DeLone & McLean, 2003). In that regard, different dimensions were considered to investigate external variables of the proposed research model. However, there may be other influencing factors for instructor adoption of LMS. Hence future research should be performed to explore and test the causal relationships among different factors considering the proposed dimensions within the boundary of LMS. Another future study would be to confirm the validity of the research model on different learning management systems.

The proposed adoption model is not a fixed and unchanged model and is open to continuous development. Future studies may extend or modify this adoption model through adding other dimensions or external variables valid for various educational level contexts, i.e. elementary level education, etc. For future work, the validated research model and the developed scale could be taken as a basis forming a starting point when developing other instruments for LMS evaluation with respect to other educational level instructors' perceptions.

In time, changes in e-learning technologies and their perceptions by users will inevitably raise the need for a continuous research for technology adoption in this field. The instructor adoption of LMS model presented in this study can greatly benefit those engaged in the management and development of learning management systems as a guidance to better understand how instructors' adoption can be increased and how the use of LMSs can be continuously improved.

REFERENCES

Bourne, J., Harris, D., & Mayadas, F. (2005). Online engineering education: learning anywhere, anytime. Journal of Engineering Education, 9(1), 131-146.

Carmines, E. G., & Zeller, R.A. (1994). Reliability and validity assessment. M. Lewis-Beck (Ed.). Basic measurement (pp. 1–58). London: Sage.

Chang, S. C., & Tung, F. C. (2008). An empirical investigation of students' behavioural intentions to use the online learning course websites, British Journal of Educational Technology, 39(1), 71–83.

Chiu, W., M., Hsu, M. H., Sunb, S., Y., Lin, T. C., & Sun, P. C. (2005). Usability, quality, value and e-learning continuance decisions. Computers & Education, 45(4), 399-416.

Cho, V. (2005). A study of the roles of trusts and risks in information-oriented online legal services using an integrated model. Information & Management, 43(4), 502-520.

Cho, V., Cheng, T. C. E., & Hung, H. (2009). Continued usage of technology versus situationalfactors: An empirical analysis. J. Eng. Technol. Manage, 26(4), 264-284.

Conner, C. (2002). The influence of personal characteristics, perceived innovation characteristics, attitude, and subjective norm upon intent to adopt internet pharmacy service: An adoption of innovations study. Unpublished PhD Dissertation. University of Texas.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models, Management Science, 35(8), 982-1003.

DeLone, W. H., & McLean, E. R. (2003). The delone and mclean model of information systems success: A ten-year update. Journal of Management Information System, 19(4), 9–30.

Dillon, C.L., & Gunawardena, C.N. (1995). A framework for the evaluation of telecommunications-based distance education. in Stewart, D. (Ed.), Selected Papers from the 17th Congress of the International Council for Distance Education, Vol. 2, Open University, Milton Keynes, pp. 348-51.

Field, A. (2009). Discovering Statistics Using SPSS. S. Sage, London

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variable and measurement error. Journal of marketing research, 18(1), 39-50.

Fraenkel, J. R., & Wallen, N. E. (2006). How to design and evaluate research in education (6th Edition). McGraw-Hill International Edition.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). Multivariate data analysis (6rd. ed). Pearson Prentice Hall.

Hsu, M. K., Wang, S. W., & Chiu, K. K. (2009). Computer attitude, statistics anxiety and self-efficacy on statistical software adoption behavior: An empirical study of online MBA learners. Computers in Human Behavior, 25(2), 412–420.

Hu, P. J. H., Clark, T. H. K., & Ma, W. W. (2003). Examining technology acceptance by school teachers: a longitudinal study. Information and managment, 41(2), 227-241.

Karaiskos, D. C. (2009). A predictive model for the acceptance of pervasive information systems by individuals. Unpublished PhD Dissertation, Athens University of Economics and Business.

Lee, B. C., Yoon, J., & Lee, I. (2009). Learners' acceptance of e-learning in South Korea: theories and results. Computers & Education, 53(4), 1320-1329.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. Information and Management, 40(3), 191-204.

Liaw, S., S., Huang, H., M., & Chen, G., D. (2007). Surveying instructor and learner attitudes toward e-Learning. Computers and Education, 49(4), 1066-1080.

Morgan, G.A, Leech, N.L., Gloeckner, G.W., & Barrett, K.C. (2004). SPSS for introductory statistics use and interpretation. (2rd. ed). Lawrence Erlbaum associates, publishers.

Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-Learning. Educational Technology & Society, 12(3), 150–162.

Peter, J.P. (1981). Construct validity: a review of basic issues and marketing practices. Journal of Marketing Research, 18(2), 133-45.

Pituch, K. A., & Lee, Y. (2006). The influence of system characteristics on e-learning use. Computers & Education, 47(2), 222-224.

Reichardt, C. S., & Coleman, S. C. (1995). The criteria for convergent and discriminant validity in a multitrait-multimethod Matrix. Mirlfivariafe Behavioral, 30, 513-538.

Rogers, E. (1995). Diffusion of innovations, The Free Press, NY.

Saade', R., & Bahli, B., (2005). The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line leaning: an extension of the technology acceptance model. Information & Management, 42(2), 317-327.

Sánchez-Franco, M., J., Martínez-López, F., J., Martín-Velicia, F., A. (2009). Exploring the impact of individualism and uncertainty avoidance in Web-based electronic learning: An empirical analysis in European higher education. Computers & Education, 52 (3), 588-598.

Selim, H. M. (2007). Critical success factors for e-learning acceptance. Confirmatory factor Models. Computers and Education, 49 (2), 2007, 396-413.
Teo, T. (2009). Modelling technology acceptance in education: a study of pre-service teachers. Computers & Education, 52(2), 302-312.
Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization, MIS Quarterly, 15(1), 124-143.
Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: development and test. Decision Sciences, 27(3), 451–481.
Wang, W., & Wang, C. (2009). An empirical study of instructor adoption of web-based learning systems. Computers & Education, 53(3), 761-774.
Webster, J., & Hackley, P. (1997). Teaching effectiveness in technology-mediated distance learning. The Academy of Management Journal, 40(6), 1282-1309.
Yi, M. Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. Int. J. Human-Computer Studies, 59(4), 431–449.
Yuen, A. H. K., & Ma, W. W. K. (2008). Exploring teacher acceptance of e-learning technology. Asia-Pasific Journal of Teacher Education, 46, 3, 2008, 229-243.

A.1

Qualitative questions

While you are using METU Online, how frequently do you use these tools: Lecture Notes, Online Exam, Assignment, Announcement, Grading, E-Mail, Chat, Forum, Schedule and Syllabus?
Why do you choice METU Online to support your courses?
Are you satisfied with the use of METU Online system?
Do you have any problems when using METU Online? Please give some examples.
What is your overall thought about METU Online?

A STUDY ON THE USABILITY OF A UNIVERSITY REGISTRAR'S OFFICE WEBSITE THROUGH THE METHODS OF AUTHENTIC TASKS AND EYE-TRACKING

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ABSTRACT
Universities are one of the most important institutions that offer online services. It is observed that one of the most used web pages by university students is the registrar's office website, since students can access a great deal of information they need through this page. In this study, the usability of the registrar's office website, which can be regarded as the most-used and most-needed website by students, will be examined. The aim of this study is to demonstrate the usability of Hacettepe University Registrar's Office (HURO) website for students. To this end, researchers defined authentic tasks by considering situations that students use the most. The data were collected both using the data collection instrument developed by the researchers and the eye-tracker in a human-computer interaction laboratory. The usability of the website was tested through tasks performed in authentic or suitable environments with authentic users, problems related to usability were put forth, and solutions offered were presented. The results indicated that while none of the users reported problems in terms of content and up-to-dateness, the site could be improved in terms of its visual design and navigation.

INTRODUCTION

With the advancement of the internet, user-based system design has become important in the web environment. The increased volume and speed of information sharing via websites paves the way for questions about how the users can access information and use websites more effectively (Şengel & Öncü, 2010). Design of websites by paying attention to their usability has become an important issue today. In this respect; numerous variables such as the characteristics, interests and purposes of use of people are regarded as important variables that need to be given priority while defining the properties that websites should have (Lee & Koubek, 2010). After the characteristics of users; other factors that render a website successful and preferable are ease-of-use, performance, aesthetics, cost, the value of information that is provided via that website, and the extent to which it satisfies users' demands (Rosson & Carroll, 2002). Among these factors, usability has always been regarded as one of the most important factors that influence users' preferences.

Usability, in its simple sense, is defined as for a person who uses a product to rapidly and easily accomplish her task (Dumas & Redish, 1993). IEEE (The Institute of Electrical and Electronics Engineers), on the other hand, defines usability as facilities where users learn about the processes, prepare inputs accordingly and interpret the system's outputs (Andrzejczak & Liu, 2010). Usability is also referred to as the easy and effective use, under suitable environmental conditions, of works, which are defined in an application, after giving the required training and technical support to those users who have been specified as the target audience (Acartürk & Çağıltay, 2006). Nielsen (2003) suggests that usability is of great importance for web applications, and that people will not use a website if it is difficult to use it, if it does not clearly demonstrate its objectives and what can be done on it, if people get lost on it, if texts it includes are not easily legible, and if the website does not answer important questions.

Then, what makes a product or a system usable? What features embedded in it make it easily usable and friendly? These questions are not the ones understood by everybody in the same way and answered easily. What is easy for a user might not be easy for another one (Nielsen, 1994). Norman (1988), while defining user-friendly design, suggested that those designs that are based on users' needs and interests, and that focus on rendering products usable and comprehensible can be user-friendly. According to Norman, products become usable and comprehensible when the end users understand what they want to do and states what they can do. Then, it could be argued that what makes a system or a product user-friendly is its user-oriented design.

Characteristics that are attributed to usability in several definitions in the literature were grouped under different categories and then analyzed. ISO (International Standard Organization) defined the three essential aspects that should be considered while determining an interface's usability level as effectiveness, efficiency and satisfaction (Norman & Panizzi, 2006; Smith, 1997). In ISO's definition; effectiveness is measured with respect to the levels of users to accomplish their objectives and tasks accurately and fully; efficiency is measured with respect to the resources, time and efforts spent while accomplishing these objectives and tasks; and satisfaction is measured with respect to the positive attitudes of users towards the use of the system. These three elements specified in the above definition are frequently used in the evaluation of websites' usability along with the usability of many other products (Uçak & Çakmak, 2009). Thomas (1998) divided usability features into three main categories: output, process and tasks. Elements of effectiveness, efficiency and satisfaction involve the outputs of the system; ease-of-use, interface, learnability and memorability involve the elements that influence the process of the system; whereas functionality and compatibility involve the tasks related to the system (Gürses, 2006).

Usability testing involves systematic measurement techniques based on testing interfaces through authentic users and authentic tasks (Dumas & Redish, 1993; Rubin, 1994). There exist a high number of methods and techniques used in usability evaluation: participatory design, focus group researches, paper and pencil evaluation, expert review, usability tests, field researches, monitoring studies, and usability calculations (Rubin, 1994). The usability evaluation methods defined in the literature are divided into three: inquiry, inspection and usability testing (Battleson, Booth, & Weintrop, 2001). In the inquiry method, users' opinions about the product are collected by means of various check lists or questionnaires. In the inspection method, the product is inspected by experts. Finally, in the usability testing method performed by authentic users, users are observed while they are fulfilling the authentic tasks related to the product. In a sense, usability testing is making pre-determined users fulfill pre-defined tasks in the product (system, interface, and website) that is intended to be evaluated and asking these users in this process to evaluate the product with respect to effectiveness, efficiency, and satisfaction. The aim of this method is to examine the interaction between the product and the user and to detect the usability problems that hinder the use of the product (Kılıç and Güngör, 2006).

There exist three different opinions about the evaluation of usability:

- Product-oriented: It can be evaluated through the product's ergonomic features.
- User-oriented: It can be evaluated through the user's mental effort and attitudes.
- User performance: It can be evaluated through the way the user interacts with the product. For example, ease of use is related to the extent using a product is easy or difficult, whereas acceptability pertains to the use of that product in the real life (Bevan, Kirakowski, & Maissel, 1991).

Usability tests have five common features (Dumas & Redish, 1993):

1. The primary goal is to improve the usability of the product. There should be more detailed targets and interests while planning for each test.
2. Test participants should represent authentic users.
3. The participants should do real tasks.
4. What participants do and say should be observed and recorded.
5. The obtained data should be analyzed, potential problems should be diagnosed and changes should be recommended to fix these problems.

In usability tests, more than one technique and method can be used together. The primary methods are observation and interview techniques. In usability tests in which the participants are selected from potential users, the tasks that will be performed by the participants should be defined by researchers beforehand. During the test, various techniques are also employed in order to collect data such as video recording, capturing, transaction file analysis, and think aloud protocol (Gürses, 2006). Additionally, the eye-tracking method is also employed in usability studies. Eye-tracking practices are used in fields such as neuroscience, psychology, industrial engineering, human factors, marketing, advertising, and computer sciences (Duchowski, 2002). The method of tracking eye movements has been known for a long time; however, the usability of the method has increased only with technological advancements (Özdoğan, 2008). Besides, thanks to new technologies, users' eye movements can be tracked more easily and accurately during human-computer interaction (Özçelik, Kurşun, & Çağıltay, 2006). Eye-tracking is a method that provides objective and quantitative data about attention processes and it is argued that it adds a diagnostic dimension to the evaluation phase of these methods (Duchowski, 2002). This method provides data about at what points and for how long an individual looks and thus produces a significant amount of data about the processed information or the point in consideration (Nakatani & Pollatsek, 2004). Practitioners can obtain more information by using eye-tracking data about the fields the user focused more on a website, the fields that were overlooked and the fields that distracted her (Russell, 2005). In addition, eye movements reflect knowledge acquisition (Lohse & Johnson 1996; Rayner 1998). Using eye movement data obtained through eye-tracking, information can be gathered about how the users have learned how to use the designed website.

With the advancement of distance education and web technologies, institutions' websites should be original and usable pages that offer fast access to information and provide good experiences. Today, university websites are the media where students, university administrators, and other people share information, which makes these websites very important in the lives of these people.

University websites include webpages of Registrar's Office, which carries out students' all university-related procedures throughout their affiliation with the university and performs the task of inspection in this respect by working in cooperation with relevant units. Through these pages, follow-up of numerous activities are carried out such as students' enrollment procedures, announcements about courses, scholarships, graduation procedures, arrangement of documents about students, and so forth. Since these webpages are used by university students very frequently, they should be ensured to be easy-to-use, effective, efficient, and satisfactory. Website developers should understand this condition, know well why individuals visit these pages, what their expectations are and what they want to do on these pages (Zaphiris & Kurniawan, 2007).

Kıyıcı (2011) studied the perceptions and descriptions related to human-computer interaction and its basic concepts of teacher candidates studying at a Computer Education and Instructional Technology department. The results indicated that the teacher candidates properly described the Human-Computer Interaction and related basic concepts. However, when teacher candidates were asked to describe the concept of usability, %54 of the responses focused on satisfaction, while only %27 of the responses included effectiveness and %19 of the responses included efficiency. Kıyıcı (2011) indicates that these individuals will be responsible from instructional programs and software development including the web sites. Therefore, it is essential to provide exemplar methods of usability testing in our field. Kıyıcı's study is the only one related to Human-Computer Interaction that came out in the Turkish Online Journal of Educational Technology. This study is important in that it aims to contribute to this line of research while at the same time providing an exemplar methodology, namely the utilization of usability testing methods along with eye-tracking technology.

THE STUDY

AIM OF THE RESEARCH

In this study, it is aimed to test the usability of Hacettepe University Registrar's Office (HURO) website, where students carry out all university-related procedures throughout their studies online. The unit of analysis was chosen as the registrar's office web site for the reason that it is the most commonly used service by students at a university. In addition, the researchers were contacted by the Registrar's Office and conveyed the difficulties they encountered related to the usability of the website. Additionally, reported student complaints about the site paved the way to the reason for this site to be the main unit of analysis. So it is aimed to determine the problems that students encounter while using the website and to demonstrate what needs to be done in order to improve the effectiveness of the website. Finally, it is aimed to obtain students' opinions about the design of the medium. The main page of HURO website is shown in Figure 1.

RESEARCH METHOD

In this research, the case study method, which is one of the qualitative research methods, was used. Case study is a research method, where the phenomenon that is investigated is examined in its own living framework, the boundaries that separate the phenomenon and the environment it is found in are not strictly clear, and more than one proofs or data sources are used together (Yin, 1984). According to Creswell (2007), case study is a qualitative research approach in which the researcher examines one or more conditions limited to a certain time period through data collection tools that involve multiple sources, and defines conditions and themes related to these conditions (Yıldırım & Şimşek, 2006). In this study, the website was examined by the researchers thoroughly and authentic tasks were defined for students. Students were observed and the process was recorded while they were using the website.

PARTICIPANTS

The study group consists of 10 students attending different departments at Hacettepe University. The maximum variability sampling, which is one of purposeful sampling methods, was used in determining the study group. The purpose of maximum variability sampling is to construct a relatively small sample and include a wide range of extremes in this sample (Yıldırım & Şimşek, 2006). Students were selected from different faculties, different departments, and different grades. Most of the students were chosen from faculty of education based on the information that more number of students from this faculty experienced problems related to usability; however, 20% of the participants were also included from other faculties. Further, the distribution of participants to different departments was pursued. In addition, gender of participants was equally represented: the group includes five female and five male students. Table 1 shows demographic data about the participants.

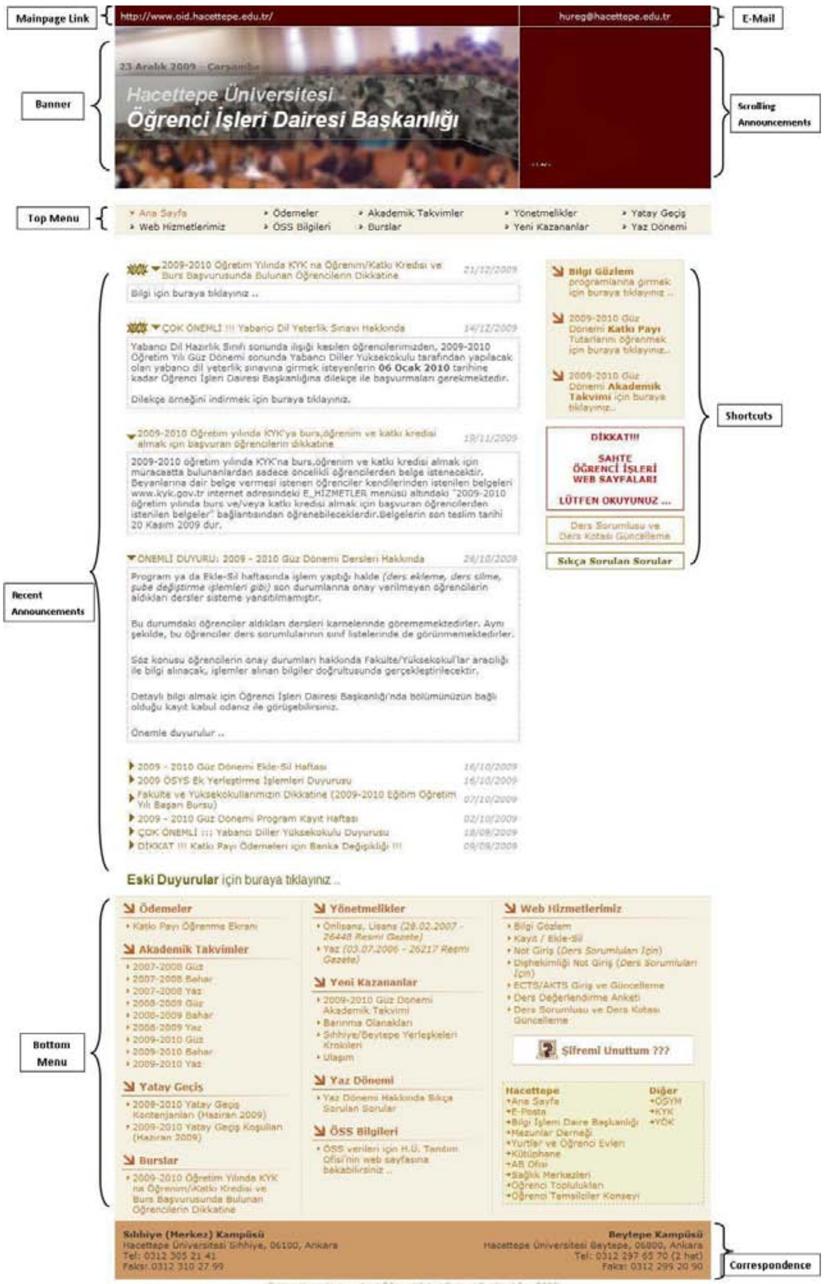


Figure 1: Mainpage of HURO Website

Table 1: Distribution of Users by Faculty, Department, Grade, and Gender

Users	Faculty	Department	Grade	Gender
User 1	Faculty of Education	CEIT	4	Female
User 2	Faculty of Education	CEIT	3	Male
User 3	Faculty of Education	Classroom Teaching	1	Female
User 4	Faculty of Education	English Teaching	2	Female
User 5	Faculty of Education	English Teaching	2	Female
User 6	Faculty of Education	CEIT	2	Male
User 7	Faculty of Education	CEIT	3	Male
User 8	Faculty of Engineering	Electrical-Electronics	1	Male
User 9	Faculty of Education	CEIT	2	Male
User 10	Health Faculty	Nursing	4	Female

Table 1 shows that students are distributed between Faculty of Education, Faculty of Engineering and Health

Faculty. Of eight students selected from Faculty of Education, five study Computer Education and Instructional Technologies (CEIT), two study English Teaching and one studies Classroom Teaching. One student selected from Faculty of Engineering attends the Department of Electrical and Electronics Engineering, whereas the student selected from Health Faculty studies Nursing.

As is seen in Table 1, four students were selected from the second-grade and two students were selected from each of other grade levels in order to ensure the participation of all grade levels in the study. In this respect, the study is able to demonstrate the opinions of experienced and inexperienced students. The motive behind including more first and second-graders is to put more emphasis on those who recently started to use the website.

Students were also asked questions regarding their computer and internet using experiences and number of hours they spend per day using computer and the internet. It was found that most of them have a computer and internet using experience of 4-6 years, whereas CEIT and Electrical-Electronics Engineering students have an experience of more than 7 years. In addition, while CEIT students reported that they spend 4-6 hours every day using computer and the internet, students from other departments reported 2-4 hours. In conclusion, the students who formed the study group of the research are experienced in using computer and the internet and use them every day.

RESEARCH PROCEDURES

Firstly, the researchers reviewed the HURO website and defined authentic tasks to be carried out by the students. While defining tasks, it was ensured that all sub-menus on the website would be used and tasks would be defined about all activities on the website. The researchers initially defined 20 tasks; then discarded eight of them since they were in parallel with the remaining twelve. While two of them were asked in order to make observations about returning to the homepage, the other ten are the main tasks all users are asked to complete.

DATA COLLECTION INSTRUMENTS

In the data collection, qualitative and quantitative approaches were used together. To this end, the researchers developed various forms and questionnaires explained below.

- Usability Test Information Form: This form informed the users about the aim, content and operation of the study.
- Computer and Internet Use Questionnaire: In this questionnaire, questions were asked aiming at determining the users' demographic characteristics, purposes and frequencies of using the website, and computer and internet use levels.
- Usability Satisfaction Interview Form: A semi-structured interview form was formulated in order to obtain the users' opinions and suggestions about the usability of the website.
- Website Evaluation Questionnaire: This form was prepared in order to gather the users' opinions through their grading the website with respect to its design, navigation, up-to-dateness, and content.
- Observation Form: This form was prepared in order to record data during the usability implementation.
- Form of Authentic Tasks to be Performed: It involves the tasks to be carried out by the users. Table 2 demonstrates the list of tasks to be completed by the students.

Table 2: List of Tasks

Tasks	Explanation
Task1	Find the information for contacting the Registrar's Office.
Task2	Find the date the classes begin in the Spring 2010 Semester.
Task3	Download the sample application form for taking the foreign language proficiency exam to be conducted by the School of Foreign Languages at the end of the Fall Semester of the 2009-2010 Academic Year.
Task4	A student received 67 as a grade in a course. Find the letter grade and coefficient equivalence from the regulations.
Task5	Find where to apply for a new password to be used for online actions on the HURO website in case you lose it.
Task6	Find the total number of credits you take this semester.
Task7	Find the date of the oldest announcement in the announcements archive.
Task8	Find what need to be done in case you lose your ID Card and need to get a new one.
Task9	Open the university's Beytepe Campus map.
Task10	Open the course evaluation survey page.

- Eye-tracking records: These are all the image, voice, screen and data records obtained from the implementation performed with three students in the human-computer interaction laboratory.
- Voice records: These are the voice records obtained from the implementations performed with seven students in authentic environments.

DATA COLLECTION PROCESS

The data collection process was carried out in two dimensions. While the first was in authentic environments with seven students, the second was carried out in a human-computer interaction laboratory with three students.

In the dimension carried out in authentic environments, researchers worked with students in, when available, environments such as department laboratories where they used the website. When not available, somewhere else suitable for users was selected by the researchers. The process commenced with the reading of the usability test information form. The users were informed about the aim, content and the execution of the study, and they were asked permission to use the data and voice records collected for possible analysis. In order to be able to record the users' voices and videos, the video capturing and recording software was installed in the computers. Then, the users filled the Computer and Internet Use Questionnaire that was distributed to them. After that, the users were given the Authentic Task Form. In addition, each task was read out to each user by the researchers. The users were asked to notify whenever they have difficulty in completing the task written on the task list or they want to proceed to the next task. In this process, they were asked to think aloud, to utter each action they work on and to explain step-by-step what they do. Those users who forgot to think aloud during the implementation were reminded of it. Along with voice and screen records, the users' behaviours and comments were recorded by the researchers on the observation form.

After authentic tasks were completed, we moved on to the interview questions on the Usability Satisfaction Interview Form. The semi-structured interview form included questions about the evaluation of the website with respect to its visual design, navigation and up-to-dateness as well as its overall evaluation. These semi-structured interviews were made in order to obtain the participants' opinions and suggestions about the usability of the website. In this way, most of the qualitative data were obtained through the interviews. After the interview, the users were given the Website Evaluation Questionnaire and asked to grade the website out of five.

In the second dimension of the study, on the other hand, the implementation was performed with three students in a Human-Computer Interaction (HCI) Laboratory. Different from the first dimension, the users' eye movements were recorded while they were completing the pre-defined tasks. Thus, data about at what points of the screen, for how long and when the users looked at while completing their tasks were collected. This way, the qualitative data obtained earlier were supported quantitatively by the eye-movement data collected at this environment.

ANALYSIS OF THE DATA

Minimum, maximum, range, average, and total values were calculated for task completion durations, percentages were calculated for the task success, and average fixation counts and average fixation lengths were calculated for the areas of interest when analyzing the quantitative data, whereas content analysis method was used to analyze the qualitative data.

FINDINGS

FINDINGS RELATED TO THE USERS' TASK COMPLETION TIMES AND SUCCESS RATES

The total, minimum, maximum and average times that the users spent while completing the tasks for the usability study of HURO website are shown in Table 3.

The implementation with the users 1, 2 and 3 was conducted in a human-computer interaction laboratory, whereas researchers worked with the other seven users in authentic environments. As Table 3 shows, the average duration that the users spent for tasks is 618 seconds. While the User 9 was the fastest (428 seconds) in completing tasks, the User 3 was the slowest one (1097 seconds). The task on which the users spent the longest time is the eight one (104 seconds), followed by the fourth (69,3) and the first tasks (62,9). On the other hand, the task on which the students spent the shortest time is the fifth task (39,5), which was followed by the third one (52,6). The notable point in Table 3 is high ranges of all tasks, that is, there are big differences between the completion times of the fastest and slowest users. The reason of this might be that students completed the tasks through the method of trial-and-error, and thus while those who had previously used the website spent less time to complete the tasks, others who had not used it before spent more time since they were not familiar with it.

Table 3: Users' Task Completion Durations (sec)

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task 10	Total Duration
User1	139	19	48	57	49	58	41	92	26	49	578
User2	13	17	16	45	38	51	34	163	120	21	518
User3	82	36	56	76	130	215	136	178	48	140	1097
User4	47	45	69	95	34	58	62	47	34	34	525
User5	96	78	118	135	45	123	98	118	82	55	948
User6	91	26	57	30	17	50	17	78	79	97	542
User7	48	71	27	57	21	35	27	114	46	23	469
User8	47	94	70	73	19	28	18	63	67	36	515
User9	46	57	53	27	17	35	18	71	26	78	428
User10	20	55	12	98	25	62	76	116	55	38	557
Minimum	13	17	12	27	17	28	17	47	26	21	428
Maximum	139	94	118	135	130	215	136	178	120	140	1097
Range	126	77	106	108	113	187	119	131	94	119	669
Average	62,9	49,8	52,6	69,3	39,5	71,5	52,7	104	58,3	57,1	618

Table 4 shows users' success levels and rates in completing the tasks. It suggests that all users successfully completed the third, fourth, ninth, and tenth tasks, whereas nine of the users successfully completed the fifth and seventh tasks. On the other hand, the task on which the students were least successful was the first one; only one student successfully completed it. The first task is also the one on which the highest number of students (7) were partially successful. The first task was followed by the eighth task with a 40% of success rate.

Table 4: Task Success

Tasks	Results			
	Successful	Unsuccessful	Partially Successful	Success Rate (%)
T1	1	2	7	10
T2	6	-	4	60
T3	10	-	-	100
T4	10	-	-	100
T5	9	1	-	90
T6	7	3	-	70
T7	9	-	1	90
T8	4	6	-	40
T9	10	-	-	100
T10	10	-	-	100

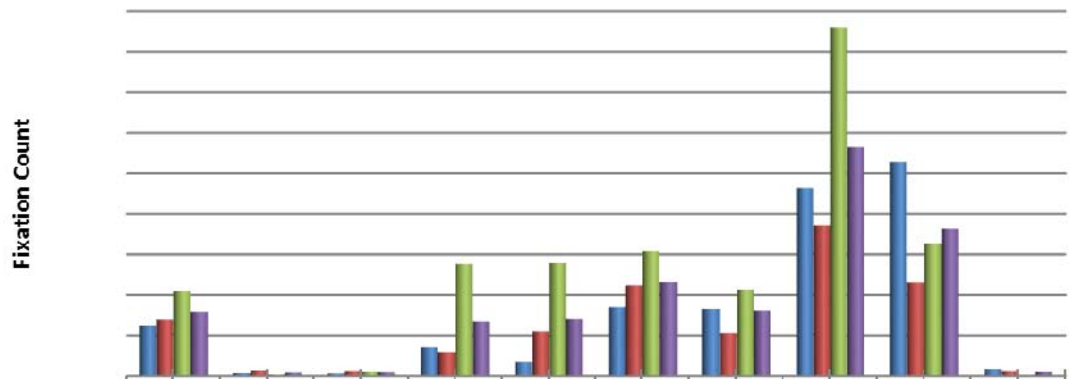
FINDINGS RELATED TO EYE-TRACKING OF THE USERS

It is possible to obtain ample amounts of data through the eye-tracking method. Based on the eye-tracking records of three users, analyses were conducted with the variables of Fixation Count, Fixation Length, Heatmap and Gaze Plot. Due to the structure of the website, only the data on its main page were analyzed in this study. It was aimed to demonstrate the areas the users focused on the most. For the analyses, the main page of the website was divided into nine areas of interest (AOI): Main Page Link, E-Mail, Banner, Scrolling Announcements, Top Menu, Recent Announcements, Shortcuts, Bottom Menu and Correspondence. These areas of interest are presented in Figure 2.

Figure 2: AOIs defined on the main page

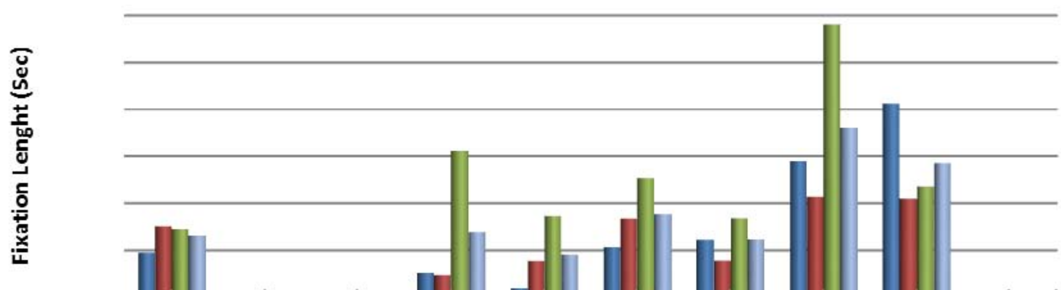
Figure 3 and Figure 4 demonstrates the users' fixation counts and fixation lengths, respectively. In addition, the heatmap about the areas on which the users focused the most is given in Figure 5.

As Figure 3 and Figure 4 shows, the sections that the users focused on and looked at the most are Recent Announcements, Bottom Menu and Top Menu, respectively. Figure 5 also suggests a similar pattern. Since the main page is long and exceeding the length of a screen, scroll bars or mouse wheel should be used in order to see the lower parts of the page. Therefore, the users tended to use the lower parts of the page since it includes more information and is more attention-grabbing. Moreover, using scroll bars became inevitable due to the banner takes one-third of a screen. Figure 3 and Figure 4 show that participants' fixation counts and fixation lengths differed for different AOIs; this reminds us how important it is to include test participants with differing characteristics in a usability study.



	Not AOI	Mainpag e Link	E-mail	Scrolling Announ cements	Banner	Upper Menu	Shortcut s	Recent Announ cements	Bottom menu	Corresp ondence
U1	123	7	6	70	36	169	164	463	529	16
U2	140	13	11	58	109	222	106	370	232	11
U3	209	4	10	278	280	308	212	859	328	2
Average	157,3	8,0	9,0	135,3	141,7	233,0	160,7	564,0	363,0	9,7

Figure 3: Fixation Counts and Graph with respect to Areas of Interest



	Not AOI	Mainpag e Link	E-mail	Scrolling Announ cements	Banner	Upper Menu	Shortcut s	Recent Announ cements	Bottom menu	Corresp ondence
U1	46,61	1,73	2,05	26,18	9,47	53,21	60,63	144,62	206,13	3,85
U2	75,34	3,35	4,96	22,63	37,96	83,24	38,54	106,31	104,45	2,83
U3	72,53	1,28	3,27	155,87	85,75	126,22	83,42	291,06	118,11	1,63
Average	64,83	2,12	3,43	68,22	44,39	87,55	60,86	180,66	142,89	2,77

Figure 4: Fixation Length and Graph with respect to Areas of Interest

Yet another noteworthy issue in Figures 3 and 4 is that the users focus highly on outside the areas of interest. The reason of this might be that the main page is too long and it includes too much unnecessary blank spaces. In addition, the users looked at the areas of interest of main page link, e-mail and correspondence at very low rates. These areas of interest did not attract the users' attention even while they were completing tasks. Furthermore, while dealing with the task "Go to the main page", neither the area of interest of main page link nor the main page link in the top menu was used. Instead, the users frequently used the "back" button of the browser.

There exist significant differences between the users with respect to fixation counts and lengths. For example, in Figure 3, while the User 3 focused very much on the AOI of banner, User 1 barely did it. This is also the case almost in all other areas of interest. Since the User 3, who has little experience in using the website, mostly used the trial-and-error method while completing the tasks, she focused and spent time on almost all areas of interest more than others did.

Figure 5: Heatmap of the main page

Figure 5 shows the eye movements and heatmap related to the areas on the main page on which User 1 focused until she clicked on the "announcements archive" link while completing the task "Find the date of the oldest announcement in the announcements archive". User 1 was on the bottom menu when the task was read out to her. Firstly, she quickly reviewed some part of the bottom menu and scrolled up. After looking over the shortcuts on the right side of the page, she focused on the top menu. Then, she focused on the scrolling announcements, which became the area of interest on which she focused and spent the most time. After that, she looked over the current announcements below the top menu and then clicked to the "older announcements" link towards the bottom of the main page. This suggests that User 1, while accomplishing this task, scanned the entire page and found the correct link by scanning the whole page.

It is important for a design to have an approach that makes the user's actions easier and does not constrain her. Figure 6 shows that the design of the webpage makes it more difficult for the user to do what she wants to do. The user achieved her objective through trial-and-error by scanning the entire page. Although the point she first focused was right, it failed to catch her eye.

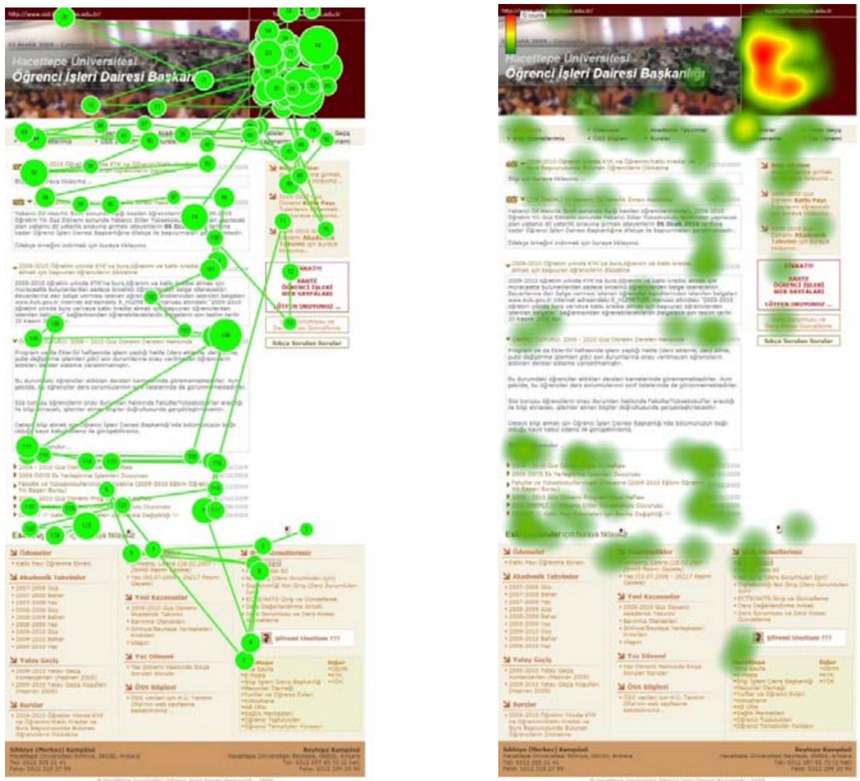


Figure 6: Eye movements and heatmap related to the process User 1 followed in order to open older announcements

INTERVIEW FINDINGS

After the task-related implementations, the participants were interviewed in line with the questions in the interview form.

Firstly, the users were asked the question, “How did you find the visual design of the website?” The responses given to this question can be divided into two categories namely positive and negative responses. In general, the users stated that the visual design of the website is simple and adequate, type font is legible and comprehensible although it might become even better if the font size is increased, and the color harmony is very good. The issue on which the users experienced difficulty and expressed negative opinions most is that texts on the website are too intertwined. They suggested that the website would be more attractive in terms of visual design if topic titles were bigger and clearer. Moreover, the announcements scrolling on the upper right-hand corner disturbed the users. Although the users found the design of the website usable and suitable in general, they complained about the intertwined distribution of texts, unclarity of menus and scarcity of detailed titles.

The users’ responses to the question, “Could you find what you were searching for easily? Where did you have difficulty the most?” can be divided into two as “I could find them easily” and “I struggled a little”. Whereas five of the users stated that they did not have any difficulty in completing the tasks, two of them reported that they struggled a little. Those users who reported that they had difficulty on the website associated this with their failure to accomplish the tasks they were given. The tasks on which the users had most difficulty are; finding what need to be done in case the ID card is lost, finding the campus map and finding the contact information. This finding overlaps with the data on the task success chart. Moreover, the users reported that they did not experience any difficulty in accessing the data they visited frequently, while they did in accessing unfamiliar information.

All users, as responses to the question “What do you think about the up-to-dateness of the information on the website?”, stated that the website is up-to-date, that the announcements are very recent and that the website has no problems with respect to up-to-dateness. In addition, the users reported that they are satisfied with the website and it meets their demands in accessing up-to-date information.

Finally, the users were asked the question “What could be changed to make the website better?” It is seen that the common problem among the users is about the visual design, navigation, and content of the website. The problems expressed by the users are; the website is too disorganized, the announcements cover the entire page, the banner is too thick, one needs to scroll up and down constantly as the page is too long, and menus are distributed all around the webpage.

DISCUSSION AND CONCLUSION

When the users' task completion times and the interviews are considered, it is possible to conclude that the users experienced problems with respect to the design of the website. It was observed that they struggled to find what they were searching for, they got lost between menus, and they could find the bottom menus after long efforts due to design errors on this page that is designed for them. According to Özçelik, Kurşun and Çağıltay (2006), the way information is presented on a webpage and the tasks given influence the participants' behaviours. Therefore, it is beneficial for designers to take into consideration the general design principles to enable users to find what they look for on a website in a faster and more accurate manner. As a guideline for the designers of the registrar's Office web sites, the pages should not be longer than a screen size could handle, and the height of the banner of the web site should be minimal. This way most of the problems experienced by the participants in this study (such as being lost between the menus, and losing the menus at the bottom) can be addressed.

Students' navigation on the page is affected by the fact that, unfitting to general website design standards, menus are located on the top and bottom sides of the page. The users, who firstly looked over the menus for long time, headed towards the bottom of the page since they could not find what they looked for and performed their actions there. This stems from the design errors and deficiencies of the HURO website. This finding is in parallel with the eye-tracking data. To solve this problem, the menus and titles on the upper side of the page can be re-arranged. As a guideline for the designers of the registrar's Office web sites, menus can be designed in the form of drop-down menu so that users can access the open form of the menus they prefer after clicking on them. Thus, the complicated nature of menus will be eliminated and students will spend less time. Besides, it will not be necessary to put open forms of menus at the bottom of the page.

Allocation of relevant links on different parts of the page created problems in terms of finding the desired link. To solve these problems, all relevant links could be put together on the visible parts of the page by the designers of the registrar's Office web sites. Along with giving link names clearly, data that are relevant to each other could be grouped under same titles since the eye moves by looking at close focal points (Özçelik, Kurşun & Çağıltay, 2006).

A general overview of the users' opinions and comments suggests that although the navigation on the system is easy, the users experienced difficulties in completing tasks since the page was too long, menus were distributed around the page and data were disorganized. In this respect, the layout of the website should be reviewed and menus should be re-arranged. While making these arrangements, high-load of data on the website could be eliminated, as the interviews conducted with the users suggest that they were unhappy with the intertwined layout of texts. Item sizes and spaces on the website should be proportional (Bayram & Yeni, 2011). Therefore, as a guideline for the designers of the registrar's Office web sites, it is important to adjust line and paragraph spacing. Additionally, there could be options to change the font size on the website. Students also reported that menus on the website are not clear and remarkable enough. Bayram and Yeni (2011) suggest that sizes of items and texts should neither be too small to go unnoticed nor be too big to distract attention. For this, it is thought that these problems can be eliminated if titles are designed in sizes and colours in a more distinguishable way and if announcement are put together under a specific link rather than on the main page.

The usability of the website, about which none of the users reported problems in terms of content and up-to-dateness, could be improved if its visual design and navigation are reviewed and if regulations are made specifically addressing the above-specified problems.

Although the qualitative and quantitative approaches, and observation, interview, and eye-tracking methods complemented the findings, this study has inherent limitations. Nielsen (2000) indicated that one can find 85% of the usability problems in a design with only 5 participants. While this study has included 10 participants in the usability tests, the usability tests utilizing the eye-tracking method only involved 3 participants. Further, although the usability problems were identified in this study, they were not addressed in the actual design. According to the systems view, changes in a system will result in further changes. Therefore, the suggested changes might result in additional usability problems. Future studies could take into account these limitations and could address them as part of their methodology.

REFERENCES

Acartürk, C. ve Çağıltay K. (2006). *İnsan bilgisayar etkileşimi ve ODTÜ'de yürütülen çalışmalar.* Akademik Bilişim 2006'da sunulan bildiri, Denizli.

Andrzejczak, C., & Liu, D. (2010). The effect of testing location on usability testing performance, participant stress levels, and subjective testing experience. *Journal of Systems and Software, 83*(7), 1258-1266.

Battleson, B., Booth, A., & Weintrop, J. (2001). Usability testing of an academic library web site: A case study. *The Journal of Academic Librarianship, 27*(3), 188-198.

Bayram, S. ve Yeni, S. (2011). Web tabanlı eğitsel çoklu ortamların göz izleme tekniği ile kullanışlılık açısından değerlendirilmesi. *Ahi Evran Üniversitesi Eğitim Fakültesi Dergisi, 12*(2), 221-234.

Creswell, J.W. (2007). *Qualitative inquiry and research design: Choosing among five traditions (2nd edition).* London: Sage.

Duchowski, A.T. (2002). A breadth-first survey of eye tracking applications. *Behavior Research Methods, Instruments, and Computers, 34*(4), 455-470.

Dumas, J.S., & Redish, J.C. (1993). *A practical guide to usability testing.* Norwood, NJ: Ablex Publishing Corporation.

Gürses, E.A. (2006). *Kütüphane web sitelerinde kullanılabilirlik ve kullanılabilirlik ilkelerine dayalı tasarım (Usability in library web sites and design based on usability guidelines).* Yayımlanmamış doktora tezi, Hacettepe Üniversitesi, Sosyal Bilimleri Enstitüsü, Ankara.

Kılıç, E. ve Güngör, Z. (2006). *Web site tasarımlarında kullanılabilirlik değerlendirme yöntemlerinin önemi.* Akademik Bilişim 2006'da sunulan bildiri, Denizli.

Kıyıcı, M. (2011). Determination of perceptions of the teacher candidates studying in the computer and instructional technology department towards human-computer interaction and related basic concepts. *The Turkish Online Journal of Educational Technology, 10*(2), 54-62.

Lee, S., & Koubek, R.J. (2010). The effects of usability and web design attributes on user preference for e-commerce web sites. *Computers in Industry, 16*(4), 329-341.

Lohse, G. & Johnson E. (1996). A comparison of two process tracing methods for choice tasks. *Organizational Behavior and Human Decision Processes, 68*(1), 28-43.

Nakatani, C., & Pollatsek, A. (2004). An eye movement analysis of "mental rotation" of simple scenes. *Perception & Psychophysics, 66*(7), 1227-1245.

Nielsen, J. (1994). *Usability engineering.* Boston, MA: AP Professional.

Nielsen, J. (2000). *Why you only need to test with 5 users*. Jakob Nielsen's Alertbox web sitesinden 15 Kasım 2008 tarihinde http://www.useit.com/alertbox/981115.html adresinden erişilmiştir.

Nielsen, J. (2003). *Usability 101: Introduction to usability.* Jakob Nielsen's Alertbox web sitesinden 15 Kasım 2008 tarihinde http://www.useit.com/alertbox/20030825.html adresinden erişilmiştir.

Norman, D.A. (1988). *Design of everyday things.* New York, NY: Currency Doubleday.

Norman, K.L., & Panizzi, E. (2006). Levels of automation and user participation in usability testing. *Interacting with Computers, 18*, 246-264.

Özçelik, E., Kurşun E. ve Çağıltay, K. (2006). *Göz hareketlerini izleme yöntemiyle üniversite web sayfalarının incelenmesi.* Akademik Bilişim 2006'da sunulan bildiri, Denizli.

Özdoğan, F.B. (2008). Göz izleme ve pazarlamada kullanılması üzerine kavramsal bir çalışma. *Gazi Üniversitesi Ticaret ve Turizm Eğitim Fakültesi Dergisi, 2*, 134-147.

Rayner, K. (1998). Eye movement in reading and information processing: 20 Years of research. *Psychological Bulletin, 24*(3), 372-422.

Rosson, M.B., & Carroll, J.M. (2002). *Usability engineering: Scenario-based development of human-computer interaction.* San Francisco: Morgan-Kaufmann.

Rubin, J. (1994). *Handbook of usability testing: How to plan, design, and conduct effective tests.* New York, NY: John Wiley & Sons Inc.

Russell, M.C. (2005). Hotspots and hyperlinks: Using eye-tracking to supplement usability testing. *Usability News, 7*(2), 1-11.

Smith, A. (1997). *Human-computer factors: A study of users and information systems.* New York, NY: McGraw.

Uçak, N.Ö. ve Çakmak, T. (2009). Web sayfası kullanılabilirliğinin ölçülmesi: Hacettepe üniversitesi bilgi ve belge yönetimi bölümü web sayfası örneği. *Türk Kütüphaneciliği, 23*(2), 278-298.

Yıldırım, A. ve Şimşek, H. (2006). *Sosyal bilimlerde nitel araştırma yöntemleri.* Ankara: Seçkin Yayıncılık.

Yin, R.K. (1984). *Case study research: Design and methods*. Newbury Park, CA: Sage.

Zaphiris, P., & Kurniawan, S. (2007). *Human computer interaction research in web design and evaluation.* London: Idea Grub Publishing.

AN EVALUATION OF ONLINE MACHINE TRANSLATION OF ARABIC INTO ENGLISH NEWS HEADLINES: IMPLICATIONS ON STUDENTS' LEARNING PURPOSES

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ABSTRACT
Nowadays, online Machine Translation (MT) is used widely with translation software, such as Google and Babylon, being easily available and downloadable. This study aims to test the translation quality of these two machine systems in translating Arabic news headlines into English. 40 Arabic news headlines were selected from three online sources, namely *Aljazeera*, *daralhayat*, and *Aawsat*, where their English manually-translated versions were available. The selected data was evaluated by conducting criteria of Hutchins and Somers (1992) to find the assessment of each system outputs. Besides that, the selected data was also examined to find the types of translation techniques that are available in both machine outputs. A questionnaire was assigned to experienced professionals to evaluate the outputs to examine and determine which system was better to use in translating the collected data. The evaluation was based on criteria proposed by Hutchins and Somers .The findings indicated that both Google and Babylon had 80% of clarity, and Google scored a higher value of accuracy, i.e. 77.5%, compared to 75% of accuracy for Babylon. However, Babylon scored a higher value for style, i.e. 72.5%, compared to a score of 70% by Google. Nevertheless, the results revealed that online MT is undergoing improvement, and it has the potential to be one of the elements of globalization. As implication, the students could use online MT for learning purposes easily and quickly.
Keywords: MT, News Headlines, Google and Babylon translation, quality, and online MT Evaluation

INTRODUCTION
Researchers in the field of natural languages have undertaken a serious effort to support manual translations by inventing machine translations. Hutchins (1986, p: 15) defines Machine Translation (MT) as "the application of computers in the translation of texts, from one natural language into another". Also known as automatic translation, MT has also been considered in the last decade as a computational linguistic phenomenon.

Apparently, MT is considered as a worthwhile subject for researchers, commercial developers and users (Hovy et al. 2002). As for researchers, they need to apply their theories to find out the differences that might be made by the machines. By doing so, it will be easier for developers to detect the most problematic issues and make the implementations on the system design. Evidently, the motive of commercial developers is to attract customers to buy their products. In turn, the users, who are interested in benefitting from MT, will decide which product meets their requirements. Examples of past researches and studies include the employment of various approaches to MT, such as studies by Marcu (2001), Richardson et al (2001), Tahir et al. (2010), and Groves (2006). Earlier researches focused on the direct approach such as the word-by-word analysis of the source language. Later on, researchers moved to the rule-based and statistical approaches. Salem (2009) is an example of this research trend. Meanwhile, there were researchers who were interested in the evaluation of MT quality since the users' demand increased for the use of machines with high levels of translation quality according to the rapid growth of technology and information. Different methods have been employed in measuring the quality of MT outputs according to different criteria outputs, such as *Fluency* and *Fidelity* (Eduard Hovy et al. 2002, p. 45). Some researchers analysed MT outputs for different purposes focusing on specific features; for instance, agreement of number, and relative clauses (Flanagan, 1994). Others used the judgment of evaluators to rate whole sentences in terms of the N-point scale (White et al., 1992, 1994; Doyon et al., 1998), while others made use of the "bigram or trigram language model of ideal translation" to automatically measure the confusion which resulted from complexities in the target text (Papineni et al. 2001).

Schiaffina and Zearof (2005) at the 46th ATA Conference explained how translation quality could be measured, and they introduced "types of errors" in an output, whether these errors lie in meaning, form, or in compliance. However, their point of view of "good" translated output is to have zero errors, and their definition of quality does not differ from the main idea of all pervious definitions. They defined it as "consistently meeting the needs and expectations of the customer or user". Furthermore, they identified two categories of methods for evaluating the quality of translation, such as: "argumentative-centred systems", and "quantitative-centred systems". The former focuses on the functional relations between parts and whole, whereas the latter focuses on counting errors. An updated model of "argumentative- centred systems" was proposed by William (2009, p. 3-23), for assessing quality of translation.

The fact is that there are several methods of evaluating machine translation, which have been utilized to assess the outputs of translation. Round- trip is an example of these methods. Although this method seems to be good for evaluation, it has been described as "a poor predictor of quality" (Hutchins & Somers, 2005). The second example of evaluation methods is the human evaluation. The idea of this method is to train human for the purpose of translation assessment. The assessment based on comparing the various levels of human translation with machine translation output by making use of the judgements by human subjects. A good example is a study, which has been reported by Automatic Language Processing Advisory Committee (ALPAC), which tackles the comparison of different levels of machine and human translation from Russian into English based on two criteria, "intelligibility" and "fidelity"(ALPAC, 1966). Interestingly, Abraham and Salim (2005) proposed a model, based on shifts of structure and semantic. This model could be applied to evaluate MT outputs. Those shifts are either shifts of structure or shifts of semantic of the target language, (Cyrus, 2009, p. 103). Furthermore, in the same context of evaluation, there is an automatic method to evaluate the machine translation outputs, according to a metric measurement. BLUE, NIST, WER (Word Error Rate), and METEOR, are typical examples for metrics, designed to evaluate the output of machine translation.

The current study uses a group of news headlines to be translated by two main MT's, where news headlines are considered as a 'Block Language', (Quirk et al., 1985, p.845). News headlines also have a special grammar, and style as stated by Swan (1996). Additionally, Iarovici and Amel (1989, p.441) define headlines as "a special kind of text, which cannot have an autonomous status". The selected news headlines in this current study are from Arabic source language. That is, Arabic language has its unique features, which distinguishes it from other languages, Arabic has its importance and has been subjected to some experimentation in MT, especially in the US, in the very early days of MT, (Zughul & Abu-Alshaar: 2005). Izwaini (2006, p.118) states that, "*Since it was developed, Arabic machine translation has been subject to description and evaluation*" (Chalabi 2001, Farghaly & Senellart 2003, Al-Salaman 2004). Arabic has been pointed out as "notorious for complex morphology" by (McCarthy, 1985; Azmi, 1988; Beesley, 1998; Ratcliffe,1998; & Ibrahim, 2002). The view is that, Arabic as other rich morphologically languages passes through multiple stages. The translation process is difficult and represents a challenge in computational analysis technologies. These stages are called "tokenization" (Habash and Sadat, 2006). A comparative study of Arabic-English by SaeedGh (2011, p. 80) , states that, in Arabic language, each word consists of stem and vowel melody, which is equivalent to 'al-harakaat' in Arabic like short vowels, which are pronounced to give tone to the word that determine the meaning as proposed by McCarthy (1979, 1981) and Harris (1941). The problem is that, when word translation is accessed, it is necessary to know the words with their 'harakaat' or short vowels, to distinguish the form and the function of the words. Those "harakaat" are: - u (Damma) , – a (Fatha), and – i (kasra). They are used in nominative "raf' ", accusative "nasb", and genitive "jar", respectively (Ryding, 2005, p.30). In addition, there are two types of Arabic sentences either nominal "Jumlaismiyya" or verbal "Jumlafi'liyya"(p.58). Furthermore, Arabic language has various word orders, which includes, Subject Verb Object (SVO), Verb Subject Object (VSO), Verb Object Subject (VOS) and Object Verb Subject (OVS), which should be taken into consideration during translation process. As an illustration of Arabic into English studies, Chafia and Ali (1995) conducted a study of machine translation from Arabic into English, and from Arabic into French. Besides, Abraham and Salim (2005) have also presented algorithms to analyze Arabic into English. They argued that these algorithms have a contrasted performance compared to " human annotation performance".

The motivation of the study in conducting Google because Google Translation has been proven, to be "the most powerful and accurate of any of the readily available machine translation tools"(Och, 2006). In the same study, a statement implies that, the developed machine translation can be achieved "without the need to understand the individual languages or their specific rules" (Och, 2006). On the other hand, Babylon is a computer dictionary and translation program for Microsoft Windows. The first version of Babylon was introduced in 1997. Within one year, in 1998, its number of users increased enormously and reached 4 million. Furthermore, in the year 2011, it became one of the most popular language translation applications. It can translate a full (text, Web page, and document) in 33 languages. It has a technical term, by including built-in dictionaries and community dictionaries.

Finally, translation quality is a concept which relates to the output of the translation, whether it is by a human or machine process. Linguists, philosophers and scholars are continuously discussing about the applicable criteria for good translations in order to assess their quality. This study aims to determine a better MT by comparing Google and Babylon, which would be more appropriate to be used in translating Arabic news headlines into English in terms of the Hutchins and Somers criteria (viz. *clarity, accuracy* and *style*).

METHOD

The study makes use of Hutchins and Somers criteria which could be summarized as follows:

The Criteria of Hutchins and Somers of Evaluation

It is important to stress that one of the main purposes of this study is derived from the role of evaluation, as to find out what machine translation systems are able and not able to do, according to the view of misunderstandings and misconceptions of transmitted message of news headlines. The evaluation is restricted on testing the raw outputs of two machine systems, specifically Google and Babylon, in reference to the manual translation that is available by the source of the data. The testing focussed on evaluating the quality of raw outputs based on the most basic principles of machine translation evaluation rather than to focus on the operations within the potential environments of systems, as it is the task of system developers. Some of these principles are: fidelity, intelligibility, and style, which they have been reflected by Hutchins and Somers (1992). The following represents the summary of these principles:

Fidelity represents the accuracy of machine translation performance. It also means to what extent that the translated output has the 'same' information as the original. On the other hand, intelligibility principle expresses the clarity in the translation output. In other words, it represents that the translated output should be free from obscurity, comprehensive, and understandable. The last one is style, which expresses to what extent the translation has used the language, suitable to its content and purposes.

Data of the Study

There were 40 news headlines, which were randomly chosen from three different Arabic journals, namely www.daralhayat.com, www. aljazeera.net, and www.asharqalawsat.com, dating from 1^{st} to 30^{th} September. The choice of these data is based on the availability of their human English translation.

Procedures of Analysis

The main procedures used in achieving the objectives of this research are stated below:

1. Collecting the data of the study which consist of Arabic news headlines with their English manual translated versions from online sources.
2. Each Arabic headline once will run into Google translator, and then into Babylon translator, to be translated into English.
3. The outputs of both Google and Babylon will be listed in one table.
4. To fulfil the evaluation objective, the researcher had distributed a questionnaire to a group of evaluators. The distributed questionnaire was based on the criteria provided by Hutchins and Somers (1992). The group of evaluators consists of 28 professionals whose native language is Arabic, and who work in different Iraqi Universities, and have good English Language proficiency.

The Evaluators Assessment

This part is the most important process, which is to calculate the human judgments based on the assigned questionnaire. The current study conducted 40 machine-translations of Arabic news headlines into English. The evaluators were asked to consider each Arabic headline and its machine-translated outputs to examine the three parameters which are provided in the questionnaire. The parameters consisted of three criteria: *Clarity, Accuracy, and Style*. Each criterion is defined according to Hutchins and Somers (1992). For each criterion there were 4 scores. There were 28 evaluators who participated in the assigned questionnaire. The average of each output was calculated based on the following statistical equation:

$$Av = \frac{X_1 + X_2 + X_3 \ldots + X_{28}}{n\{evaluator\}}$$

$$Av = average$$

$$X = the\ score\ of\ the\ evaluator$$

$$n = the\ number\ of\ the\ evaluators$$

Then, by summing up the averages of each outputs of the same parameter and dividing them by the number of outputs, we obtained the total average of each parameter according to the following equation:

$$\text{Total } Av = \frac{Av_{1+}\ Av_2 + \ldots + Av_{40}}{n\ \{output\}}$$

For example, to find the average of the clarity criterion of translated output for Headline **(1)** by Google under the aspect of clarity: *How easily can you understand the translation?*

1 – Not understandable 1 participant/28participants= 3.6 %
2 – Only small part understandable 0 participant/28 participants = 0.0 %
3 – Mostly understandable 5 participants /28 participants =17.8 %
4 – Fully understandable 22 participants /28participants = 78.6 %

As shown above, the first answer, "Not understandable", was chosen only by one out of 28 participants, giving a score of 3.6%. However, no participant chose the second answer, "Only small part understandable", and as a result the score was 0%. In contrast, the third answer, "Mostly understandable", was selected by 5 participants out of the total of 28 evaluators. However, the fourth answer had the highest score of 78.6%, as it was chosen by 22 participants. Consider the following Figure 1 which illustrates what mentioned above:

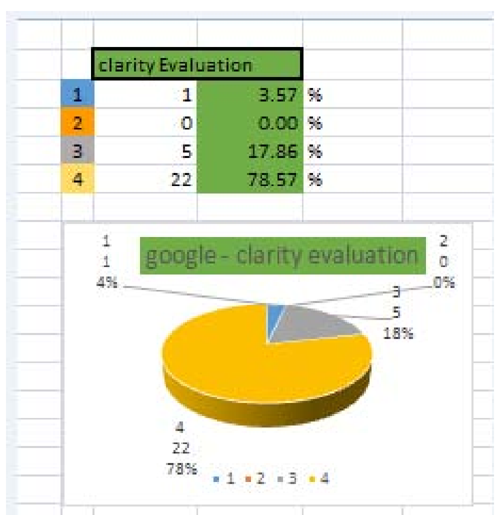

Figure 1. Percentage of the participants answers

Then, the Average will be calculated as the following :

$$Av = \frac{4+4+4+3+4+1+4+4+4+4+3+3+4+4+4+4+4+4+4+4+4+4+3+4+4+4+3+4}{28}$$

$$= \frac{104}{28}$$

$$= 3.7$$

The following Table 1 shows the process of Google output of Headline **(1). C**onsider the part related to the clarity criterion as shown in Figure 2.

Table 1. *Google translation output for Headline 1*

Arabic Headline n .1
هنية يدعو الرئيس المصري للتعجيل بإقامة المنطقة التجارية الحرة مع غزة
Google translation
Haniyeh calls for Egyptian President to accelerate the establishment of free trade zone with Gaza

participant	Google translation (GT)Evaluation clarity Evaluation	Accurac Evaluation	style Evaluation
1	4	4	4
2	4	4	3
3	4	3	3
4	3	4	4
5	4	4	3
6	1	2	2
7	4	4	4
8	4	4	4
9	4	4	3
10	4	4	3
11	3	3	3
12	3	3	3
13	4	4	4
14	4	4	4
15	4	4	4
16	4	4	4
17	4	3	3
18	4	4	2
19	4	4	2
20	4	4	2
21	4	4	2
22	4	4	4
23	3	2	3
24	4	4	4
25	4	4	3
26	4	4	4
27	3	3	3
28	4	4	4
	104	103	91

Figure 2. The participants answers of parameters

The same process was carried out to determine the clarity of the Babylon output for headline **(1)**:

1 – Not understandable 0 participant /28 participants = 0.0 %
2 – Only small part understandable 1 participant /28 participants = 3.6 %
3 – Mostly understandable 5 participants /28 participants =17.8 %
4 – Fully understandable 22 participants /28 participants = 78.6 %

As shown above, the answer, “not understandable”, scored 0.0% as no participant chose this answer, while one participant selected the second answer, “Only small part understandable”, giving a score of 3.6%.The third answer, “Mostly understandable”, obtained a score of 17.8%, as it was chosen by 5 out of 28 participants. On the other hand, the fourth answer, “Fully understandable”, was selected by 22 evaluators, giving an average score of 78.6% (Refer to Figure 3).

	clarity Evaluation		
1	0	0.00	%
2	1	3.57	%
3	5	17.86	%
4	22	78.57	%

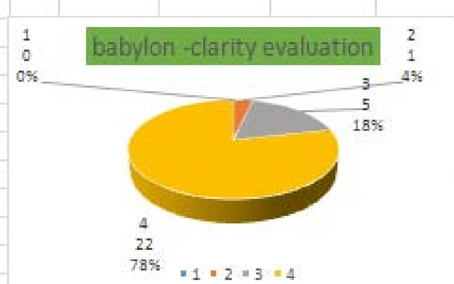

Figure 3. Percentage of participants answers

Moving to the Average, consider the following :

$$Av = \frac{4+4+4+3+4+2+4+4+4+4+3+3+4+4+4+4+4+4+4+4+4+4+3+4+4+4+3+4}{28}$$
$$= \frac{105}{28}$$
$$= 3.8$$

The following equation is used to find the percentage for each parameter or criterion:

$$\frac{Total\ (Av) \times 100}{4}$$

Consider the following Table 2 which shows the output of the same Headline produced by Babylon and the representative averages for each parameter is shown in Figure 4.

Table 2.*Babylon translation output for Headline 1*

Arabic Headline: n .1
هنية يدعو الرئيس المصري للتعجيل بإقامة المنطقة التجارية الحرة مع غزة
Babylon translation
Haniyya calls for Egyptian president to accelerate the establishment of free trade zone with Gaza

participant	Babylon translation (BT)Evaluation		
	clarity Evaluation	Accurac Evaluation	style Evaluation
1	4	4	4
2	4	4	4
3	4	3	3
4	3	4	4
5	4	4	3
6	2	1	1
7	4	4	4
8	4	3	3
9	4	4	3
10	4	4	4
11	3	3	3
12	3	3	3
13	4	4	4
14	4	4	4
15	4	4	3
16	4	4	4
17	4	3	3
18	4	4	2
19	4	4	2
20	4	4	2
21	4	4	2
22	4	4	4
23	3	2	3
24	4	4	4
25	4	4	3
26	4	4	4
27	3	3	3
28	4	4	4
	105	101	90

Figure 4. The participants answers of parameters

FINDINGS

The following sections will show the results of each criterion for each system. The results are based on the evaluators' assessment of the provided questionnaire, as well as the results of the preferred system in translating such data. The overall calculated averages of participants' responses for parameters for all headlines is shown in Figure 5 comparing Google and Babylon.

	Google translation (GT) Evaluation			Babylon translation (BT) Evaluation		
Headlines nr.	clarity Evaluation	Accurac Evaluation	style Evaluation	average clarity Evaluation	average Accurac Evaluation	style Evaluation
1	3.7	3.7	3.3	3.8	3.6	3.2
2	3.7	3.7	3.3	3.8	3.6	3.2
3	3.7	3.7	3.3	3.8	3.6	3.2
4	3.7	3.7	3.3	3.8	3.6	3.2
5	3.7	3.7	3.3	3.8	3.6	3.2
6	3.7	3.7	3.3	3.8	3.6	3.2
7	3.7	3.7	3.3	3.8	3.6	3.2
8	3.7	3.7	3.3	3.8	3.6	3.2
9	3.7	3.7	3.3	3.8	3.6	3.2
10	3.7	3.7	3.3	3.8	3.6	3.2
11	3.7	3.7	3.3	3.8	3.6	3.2
12	3.7	3.7	3.3	3.8	3.6	3.2
13	3.7	3.7	3.3	3.8	3.6	3.2
14	3.7	3.7	3.3	3.8	3.6	3.2
15	3.7	3.7	3.3	3.8	3.6	3.2
16	3.7	3.7	3.3	3.8	3.6	3.2
17	3.7	3.7	3.3	3.8	3.6	3.2
18	3.7	3.7	3.3	3.8	3.6	3.2
19	3.7	3.7	3.3	3.8	3.6	3.2
20	3.7	3.7	3.3	3.8	3.6	3.2
21	3.7	3.7	3.3	3.8	3.6	3.2
22	3.7	3.7	3.3	3.8	3.6	3.2
23	3.7	3.7	3.3	3.8	3.6	3.2
24	3.7	3.7	3.3	3.8	3.6	3.2
25	3.7	3.7	3.3	3.8	3.6	3.2
26	3.7	3.7	3.3	3.8	3.6	3.2
27	3.7	3.7	3.3	3.8	3.6	3.2
28	3.7	3.7	3.3	3.8	3.6	3.2
29	3.7	3.7	3.3	3.8	3.6	3.2
30	3.7	3.7	3.3	3.8	3.6	3.2
31	3.7	3.7	3.3	3.8	3.6	3.2
32	3.7	3.7	3.3	3.8	3.6	3.2
33	3.7	3.7	3.3	3.8	3.6	3.2
34	3.7	3.7	3.3	3.8	3.6	3.2
35	3.7	3.7	3.3	3.8	3.6	3.2
36	3.7	3.7	3.3	3.8	3.6	3.2
37	3.7	3.7	3.3	3.8	3.6	3.2
38	3.7	3.7	3.3	3.8	3.6	3.2
39	3.7	3.7	3.3	3.8	3.6	3.2
40	3.7	3.7	3.3	3.8	3.6	3.2
total	148.6	147.1	130.0	150.0	144.3	128.6
average	3.7	3.7	3.3	3.8	3.6	3.2

Figure 5. The calculated averages comparing Google and Babylon

Clarity:

Based on Figure 5, *Clarity* was the first parameter in which the participants were asked to evaluate. There were only minimal differences between the clarity of the Google and Babylon translations for each of the forty (40) outputs of headlines. From Figure 6, it is obviously shown that both the two translators were graded with an average of 3.2 out of the highest value of 4. We can say that the evaluators assessed both the Google and Babylon outputs as being equally understandable. The score was closest to 3, which indicates that “Mostly understandable” was the answer to the question *“How easily can you understand the translation?”*. Accordingly, the evaluators’ estimation for both Google and Babylon was 80% *clarity*.

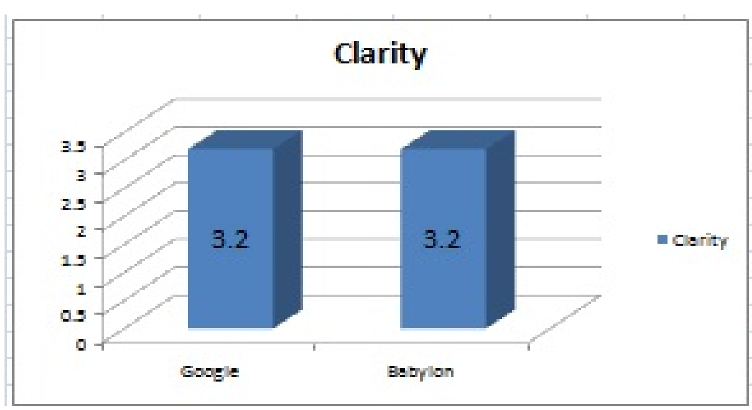

Figure 6. Clarity

Accuracy

The second parameter to be marked by the evaluators was *accuracy*. Referring to Figure 7, overall, Google scored higher than Babylon in terms of *accuracy*. Out of the highest value of **4**, Google had an average score of **3.1**, whereas the combined average score of Babylon was **3.0**. The assessment of the criteria indicated that both Google and Babylon were closest to the score of **3,** which gave the evaluators' answer to the question, "***To what extent does the translation contain the 'same' information as the source text?*** "It was clear that these two averages illustrated that there was a significant variation between Google and Babylon, as shown by the following rating: 77.5% for Google and 75% for Babylon. Accordingly, Google was highly regarded by the evaluators to be more accurate than Babylon, as can be seen in the following Figure:

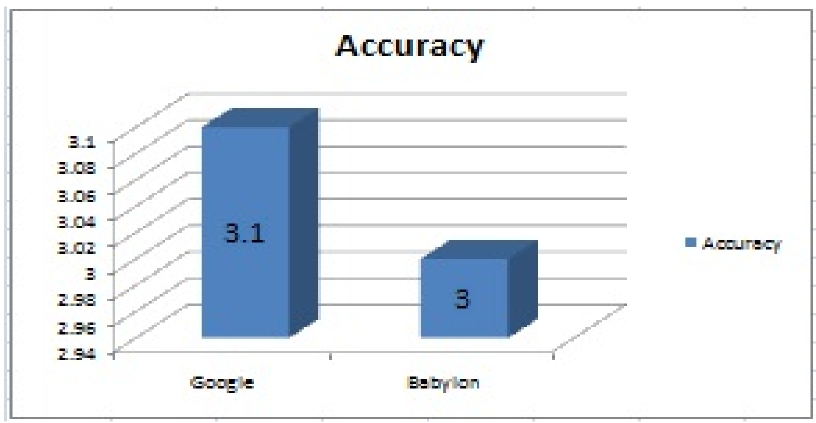

Figure 7. Accuracy

Style

The third parameter which the evaluators were asked to score was *style*. Babylon scored higher than Google, where the average for Babylon's average was 2.9 out of **4**, which represented the highest rating. Google's average meanwhile was **2.8**. Hence, the average of Google's style was considered as the lowest average out of the three criteria. It was apparently shown by accounting the percentage of each style average that the evaluators found that the style of the Babylon outputs was better than the style of the Google outputs. Thus, Google had 70% and Babylon had 72.5% of *style*. Concerning the criteria, the evaluation was based on answering the following question: "***Is the language used appropriate for a software product user manual? Does it sound natural and idiomatic?***" The answer revealed that Babylon somehow produced a more acceptable *style* in its outputs than the *style* of the Google outputs, as shown in the following Figure 8.

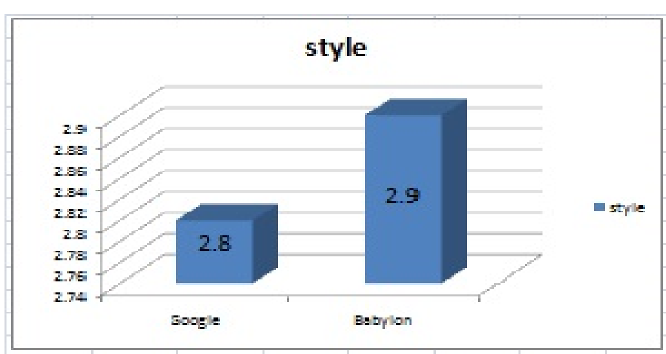

Figure 8. Style

Last but not least, the evaluators were asked to give their preferred system for translation. Interestingly, the results showed that 16 out of the 28 chose to use Babylon while the remaining 12 preferred Google. The following Figure 9 illustrates the percentage obtained by each system. 43% chose Google, while 57% preferred Babylon. . Consider the following Figure:

participant	GT	BT
1		1
2		1
3		1
4	1	
5		1
6	1	
7		1
8		1
9		1
10	1	
11	1	
12	1	
13		1
14	1	
15		1
16	1	
17		1
18		1
19	1	
20		1
21		1
22	1	
23	1	
24		1
25	1	
26		1
27		1
28	1	
TOTAL	12	16
average	43 %	57 %

Figure 9. The participants preferred system

To illustrate the percentage of their choice, see the following Figure 10.

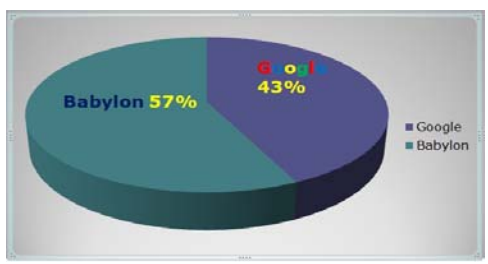

Figure 10. The prefered system

Finally, the evaluators' assessment indicated that the selected machine translators had *clarity*, *accuracy*, and *style* but each had different values. They also revealed that the majority of the evaluators preferred to use the outputs from Babylon rather than from Google.

For the third objective, the results showed that the evaluators' estimation was different for each system according to the provided criteria which they had to examine. Both systems had the same degree of value only in the criterion of clarity, whereas each system scored different values for the other two criteria of accuracy and style. For accuracy, Google got a higher value than the Babylon system. However, Babylon got a higher score in terms of style. The following Figure 11 shows the average values of the systems:

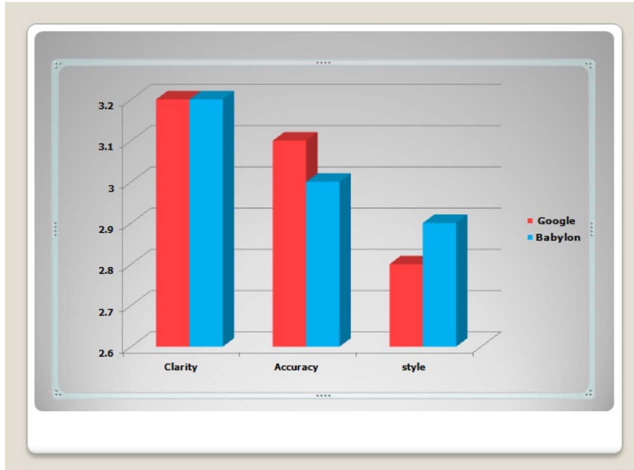

Figure 11. The averages of each system

In the above Figure 11, the score for the Google and Babylon systems was 3.2 in terms of clarity, while Google got an average of 3.1 and Babylon got an average of 3.0 in terms of accuracy. However, Babylon got a 2.9 average for style, which is higher than Google's average of 2.8. The following Figure (2.8) shows the percentage of each system with regard to these averages.

The results of the assigned questionnaire show that the evaluators preferred to use Babylon than Google. The former scored 57% of evaluators' preference, while 43% preferred that the latter be used in translating such data. The results also demonstrate that both translators, Google and Babylon, had the same score of 80%forClarity, in contrast to the second parameter, 'Accuracy,' for which Google scored a higher value than Babylon. The former scored 77.5%, whereas the latter scored 75% . However, Babylon had a higher value of 72.5% for Style, in contrast to Google's score of only 70%. In this case, Babylon focused on 'Style' more than Google from the evaluators' point of view.

IMPLICATIONS AND CONCLUSIONS

Online MT can be used for the purpose of learning from school to tertiary level because it has the characteristics of educational technologies that can help students, especially for students who want to pursue a foreign language. MT is commonly used to understand a second language text and express their ideas. MT has been shown to accelerate the translation work and very time saving. MT use in translation actually shortens some steps as used in the human translation. One no longer need to search for words, flipping page after page which is certainly time consuming then write back. Instead, the software can easily translate the content and quality translation results with word choices. In the era of globalization, the dominance of such information is a value added for individuals and the organization. Information can be obtained from a variety of languages throughout the world. With the availability of MT, such information can be obtained easily and cost effective without high investment. On the other hand, if a translation done by a professional translator, translation based on a per page basis would certainly be very costly and compared to the use of MT which involves a very minimal cost.

Confidentiality is also one of the characteristics found in the nature of MT-aided translation. MT usage ensures information translated is protected whereas; the submission of documents which holds sensitive information may risk leakage if given to a human translator. The software in MT has been designed for use in universal fields. MT is very suitable for use in science, literature, language and linguistics, and others whereas; human translation only covers specific areas of expertise.

Undoubtedly, MT has many benefits that can help students transfer information into preferred language. It is necessary for them to be more cautious when doing translation work since there are areas that cannot be translated as cultural aspects associated with the accuracy of meaning which cannot be produced by machine translation consistently. One can only obtain information in the form or essence of the draft document and it is not necessarily fully accurate. This is because MT is only capable of conducting literal translation of the words without understanding the actual information in context that may need to be corrected manually later. Another flip side of MT is that it cannot handle ambiguities that exist because it was created under the laws of systematic and formal rules of the language and certainly could not translate words based on experience, emotions, values, and mental outlook compared to human translation. However, online machine translation systems are continuously undergoing development, and the outputs might be improved in the near future to help students' learning more effectively.

REFERENCES

Alsalman, S. (2004).The Effectiveness of Machine Translation. In IJAIS, International Journal of Arabic-English Studies, 5, pp.145-160

Abraham, I., Salim, R.(2005). A Maximum Entropy Word Aligner for Arabic-English Machine Translation. Proceedings of Human Language Technology Conference and Conference on Empirical Methods in Natural Language Processing (HLT/EMNLP), pp. 89–96, Vancouver.

ALPAC (1966). Languages and machines: computers in translation and linguistics. A report by the Automatic Language Processing Advisory Committee, Division of Behavioral Sciences, National Academy of Sciences, National Research Council. Washington, D.C.: National Academy of Sciences, National Research Council, 1966. (Publication 1416.)

Chalabi,A. (2001). Sakhr Web-based Arabic/English MT Engine. <www.elsnet.org/arabic2001/chalabi.pdf> [10 August 2010].

Chafia, M., Ali, Mili.(1995). Machine Translation from Arabic to English and French Infomation Sciences.E.lsevier Science Inc. 655 Avenue of the Americas, New York, NY 10010, 3(2):91-109.

Cyrus L. (2009). Old Concepts, New Ideas: Approaches to Translation Shifts.University of Münster.

Doyon, J., Taylor, K. B., and White, J. S. (1998).“The DARPA Machine Translation Evaluation Methodology: Past and Present.” Philadelphia: AMTA98.

Farghaly, A., Senellart, J. (2003). Intuitive Coding of the Arabic Lexicon. A paper read at The MT Summit IX – Workshop: Machine translation for semitic languages, New Orleans, USA.

Flanagan, M. (1994).Error Classification for MT Evaluation. In Technology Partnerships for Crossing the Language Barrier: Proceedings of the First Conference of the Association for Machine Translation in the Americas, Columbia, MD.

Groves, D., Way, A. (2006). Hybrid data-driven models of machine translation. Springer Science & Business Media B.V. Volume 19 PP 301-323.

Harris,Z.(1941). Linguistic Structure of Hebrew.Journal of the American Oriental Society.

Hutchins, W.J. (1986). Machine Translation.Past, Present, Future. West Sussex, England: Ellis Horwood Limited.

Hutchins, J. and Somers, H. (1992).An Introduction to Machine Translation. London: Academic Press Limited

Hovy , Eduard H.,Margaret King and Andrei Popescu-Belis. (2002), ‘Computer-Aided Specification of QualityModelsforMT Evaluation’, in LREC 2002: Third International Conference on LanguageResources and Evaluation, Las Palmas de Gran Canaria, Spain, pp. 1239–1246.

Hovy, Eduard H.,Margaret King and Andrei Popescu-Belis: (2002), ‘Principles of Context –Based Machine Translation ‘.Machine translation 17: 43-75,2002.© 2003 Kluwer Academic Publishers. Printed in the Netherlands.

Iarovici, E. and Amel, R. (1989).The Strategy of the Headline.Semiotica. 77(4): 441- 459.

Izwaini, S. (2006). Problems of Arabic Machine Translation: Evaluation of Three Systems. Proceedings of the International Conference at the British Computer Society (BSC), London.

Marcu, D. (2001). Towards a unified approach to memory- and statistical-based machine translation. In: Association for Computational Linguistics: 39th annual meeting and 10th conference of the European chapter, Toulouse, France, pp. 378–385.

McCarthy, J.(1981).A Prosodic Theory of Non concatenative Morphology. Linguistic Inquiry. Eport.

Och, F. J. (2006). The Alignment Template Approach to Statistical Machine Translation. MIT Press Journals, 30(4), 417-449.

Papineni, K., Salim, R., Todd, W., Wei-Jing, Z.(2002). Bleu: a method for automatic evaluation of machine translation. Proceedings of the 40th annual meeting on association for computational linguistics,pages 311–318.

Quirk, R., et al. (1985) .A Comprehensive Grammar of the English Language.Longman . London and New York . © Longman Group Limited 1985.

Richardson, S., Dolan, W., Menezes, A., Pinkham, J. (2001).Achieving commercial- quality translation with example-based methods. In Proceedings of MT Summit VIII, Santiago De Compostela, Spain.

Ryding, Karin C. (2005). A Reference Grammar of Modern Standard Arabic.

Salem, Y., Arnold, H., Brian, N.(2008). Implementing Arabicto- English Machine Translation using the Role and Reference Grammar Linguistic Model, in Proceedings of the Eighth Annual International Conference on

Information Technology and Telecommunication (ITT 2008), Galway, Ireland.(Runner-up for Best Paper Award).

Schiaffino R. &Zearo F. (2005). 46th ATA Conference, Seattle. Aliquantum and L10NBRIDGE.

Swan M. (1996). Practical English Usage.International Student's Edition.Second Edition .Oxford University Press. P: 359- 369
Tahir, G.R., Asghar, S., Masood, N. (2010). Knowledge Based Machine Translation. Proceedings of International Conference on Information and Emerging Technologies (ICIET), Karachi, Pakistan pp. 1-5.
White, J., O'Connell, T. and O'Mara, F. (1994) "The ARPA MT Evaluation Methodologies: Evolution, Lessons, and Future Approaches". Proceedings of the 1st Conference of the Association.
Williams,.M (2009).Translation Quality Assessment.University of Ottawa.Vol 2, No 1. 2009. pp. 3 – 23.
Zughoul, M, Abu-Alshaar, A. (2005).s: A Historical Perspective Translators' Journal 50 (3): 1022–1041.Retrieved from http://id.erudit.org/iderudit/011612ar. Retrieved 2 June 2011.

CAN SOCIAL NETWORKS AND E-PORTFOLIO BE USED TOGETHER FOR ENHANCING LEARNING EFFECTS AND ATTITUDES?

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ABSTRACT
As the choices that information technologies offer has increased, efficiency of these at education, the area and time it covers increases, as well. E-portfolio and social networks are the latest choices that informational technologies offer. In this study, both technologies have been used at education and results have been analyzed. For that purpose, there has been integrated an e-portfolio application prepared by the researcher on Facebook, which is one of the most popular social networks of the present-day and has been made available the use of for students. The study in which there has been used Isman Instructional Design Model has been used was carried out with 10th grade students studying at Tekirdag Technical and Industrial Vocational High School in the 2nd term of 2010-2011 academic year and it lasted for 18 weeks. Personal Information Questionnaire, Academic Success Test and Attitude Scale towards E-Portfolio Process have been used as data collection tools. It's observed that the averages of doing homework given for education and level of interest towards this homework have been fairly low, the interest of students towards the homework on e-portfolio application has been found as high. It has shown that e-portfolio application is a process in which students revel in participating. Although students have been abstained at the beginning of the application, creating original products, developing the skills of using technologies and having low grade anxiety has caused change of students' viewpoints towards the application positively. SPSS 17.0 packaged software has been used for the statistical analysis while evaluating the data obtained from the research.
Keywords: Social networks, e-portfolio, Isman Model, online portfolio, Facebook

INTRODUCTION
In the present-day when informational and communicational technologies have made a rapid progress, opportunities that the Internet offers to people have pushed the limits. Personal web sites, forums, blogs and ultimately, social networks have become one of the indispensible part of the life. Individuals have used the Internet for various different purposes. Social networks have been popularized as the most preferred way of communication for the people to establish communication. Social networks can be used as multi-purpose with technological convergence as it is for many technological products. Technological convergence means interwinement of technological products each of which has different functions and only one product's actualizing more than one function. Social networks that have Web 2.0 properties render personalized services and provide opportunities for users to identify, arrange and share this produced content (BY, 2010). Facebook, twitter, linkedin, badoo, myspace, netlog, flickr, friendfeed, pinterest and jaiku are some of those mostly known social networks.

Facebook has been the most popular one among the social networks with its users over 750 million as of September, 2011. Some statistics explained by the Facebook on http://www.facebook.com/press/info.php?statistics address in September, 2011 have been listed below:

- Average number of friends of each user on Facebook is 130.
- Users spend time over 700 billion minutes on Facebook for each month on Facebook.
- One user creates on average 80 contents.
- 30 billion contents have been shared on a monthly basis.
- Nearly 70% of the Facebook users are out of the United States of America.
- Facebook users download 20 million applications every day.
- Active users over 250 million access to Facebook from mobile equipments.
- Users who access from mobile equipments access to Facebook two times more than the ones who do not have mobile.
- More than 200 GSM operators in 60 countries support Facebook applications.

If the world population has been considered as being over 7 billion, there can be said that one of each 7 people is a Facebook user. If the regions where the use of informational technologies and the rate of Internet connection is low, this rate has been noticed as much higher in developed and developing countries.

E-portfolio offers students the opportunity of creating, sharing and developing their own ideas. Those properties which are in accordance with the basic philosophy of the structuralist approach have caused the use of e-portfolio and social networks on education to be unavoidable.
It's aimed to use e-portfolio in different manner because there are kinds of e-portfolios used alone or implemented in a school webpage. Social netwok would be a good choice as an interface because more students use and interacts in social networks. Facebook preferred because it's the most popular. The main idea was using e-portfolio as helpful tool and an evalution method. Social network is support tool to interact with students and create virtual classrooms.
In this study, an e-portfolio has been integrated into Facebook as application. For this reason, education, social networks and e-portfolio are in interaction with each other (Figure 1.).

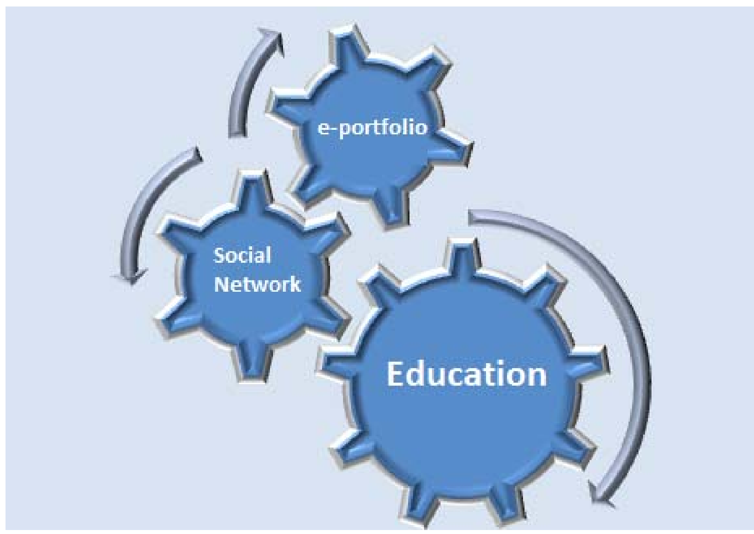

Figure 1. The education, e-portfolio and social network relationship

RELEVANT STUDIES
In this section, there has been given information about some studies and researches that have been carried out about the use of both e-portfolio and social networks on education.

Studies about E-Portfolio

Whereas studies about e-portfolio started to be increased at the beginning of 2000, it has shown increase in Turkey especially as of 2006. There have been many studies as both articles and notification. Especially in recent years, increasing of the studies on this subject has revealed that the researches and practices have created positive conclusion.

Macedo et al. (2001), Sjunnesson (2001), Sanalan and Altun (2001) and Erdogan (2006) have developed an e-portfolio in order to evaluate studies of the students. Wang (2004) has suggested that e-portfolio is not only an evaluation instrument but also an instrument that structures teaching and learning consideration. Mason et al. (2004), have carried out a practice on a course after graduation in Open University Educational Technologies Institute. Chen (2005) has carried out a research for e-portfolio use of pre-service teachers in Ohio State University in 2003-2004 academic year. Bahceci (2006) has used a portfolio developed to teach skeleton and muscular system in anatomy course. Albert (2006) has emphasized the process of creating an e-portfolio for learning, evaluation, employment on teaching training in Department of Music Education. Kazan (2006) has mentioned that he aimed to reveal how Online Portfolio will be used in Turkish Educational System in details. Cayırcı (2007) has analyzed the effect of Web Based Portfolio site upon the academic success of elementary education 7th grade students in verbal and numerical courses. Gurol and Demirli (2007) have researched the effect of e-portfolio process that emerges as a reflection of changes in pedagogy and technology on educational practices upon the motivation of students. Erice (2008) has researched the effects of online portfolio upon the writing skills of the students who have intermediate level English language skills. Hargadon (2008) has suggested that Web 2.0 technologies are the future of education. Doslu (2009) has asked for the opinions of students about the web-bases portfolio preparation and web-based portfolio evaluation in secondary education 10th grade Information and Communication course, and also has analyzed success of students developed as result of using web-based portfolio method and attitudes of students towards e-portfolio teaching process.

Basciftci (2011) has researched the effect of portfolio upon student success and permanence in elementary education 6th grade Science and Technology course "Journey to the Internal Structure of Living Being".

Studies about Use of Social Network on Education

Social networks have recently become one of the concepts as the first thing coming to mind with Internet. Integration of the technology into education has been actualized through the concepts such as computer-assisted training and Internet-assisted training. There have been carried out studies for the use of every technological innovation on education. There have also been carried out many studies for the use of social networks that are coming into our life rapidly on education. Whereas those studies have been carried out in abroad more, they have been intensely carried out in our country, as well. So much so that the topic title of the opening speech of Prof. Dr. Petek Askar in "World Conference On Educational Technology Researches-WCETR" that has been carried out in Turkish Republic of Northern Cyprus in July, 2011 was "Social Network Analysis for E-Learning Environments".

Siemens (2004) has defined in his study called "Connectivism: A Learning Theory for the Digital Age" that the three approaches as behaviorist, cognitive and structuralist have been the mostly used to create learning environments. He has supported that the concept of connectivism will be one of the theories to create learning environments in conjunction with the popularization of the Internet. Vuorikari (2005) has emphasized whether social networks will improve learning and education in near future. He has suggested a concept that is called "folksonomy" cretated with the combination of "folk" and "taxonomy" words. This means arrangement of the digital content on web. In the study, properties of different social networks have been listed and there have also been emphasized that those will be able to be used in future for educational purposes. Lockyer and Patterson (2008), Conole and Culver (2009) have emphasized the use of web technologies and social networks on education together with the development of Web 2.0 technologies. Ivanova (2008) has placed an e-portfolio within NING, which is one of the social networks, and has proved that this will facilitate learning and communication. Ovur (2009) has emphasized the positive and negative effects of Facebook upon the community life. Muñoz and Towner (2009) have analyzed usability of social networks (Facebook) on education. Mazman and Usluel (2010), Mazman (2009) have researched how Facebook will be modeled to be used for educational purposes. Atici and Polat (2010) and Kert and Kert (2010) have analyzed the effects of social networks upon success of elementary education students and their learning environment preferences. Gulbahar et al. (2010), Robyler et al. (2010) have dealt with the researches and suggestions carried out for the use of social networks such as Facebook, Twitter and Flicker in educational processes in different ways. Brady et al. (2010) have mentioned that several lecturers of distance education have used social networks. They also mentioned that several social networks such as Facebook, MySpace and LinkedIn have been used. Ozmen et al. (2011) have offered suggestions based upon the literature to reveal the importance of social network sites for individual and social development, to analyze functions of social networks on education and to use social networks efficiently in terms of career development. Tiryakioglu and Erzurum (2011) have tried to determine whether lecturers of Anadolu University Faculty of Communication Sciences have used Facebook that takes place within the social networks as an educational material or not.

PURPOSE OF THE STUDY

The purpose of the study is to provide students studying at Tekirdag Technical and Industrial Vocational High School Informational Technologies and Electric-Electronic departments to learn concepts and skills included in Career Development course efficiently and make an evaluation at the end of the training process using e-portfolio. In accordance with this purpose, there has primarily been designed an e-portfolio interface. Students have been provided to gain access to this e-portfolio interface which has been integrated into a social network (Facebook). Then, instructional design model (Isman Model) has been determined for the course that will be taught in this teaching management system. Whereas subjects have been taught through face-to-face training at school, the homework prepared by the students has been collected through e-portfolio interface. By this means, there has been aimed for students to accept Facebook as a training environment of which they have used for entertaining before.

In this study, an e-portfolio applied teaching and evaluation process has been actualized using Isman Instructional Design Model so as to create a more significant and permanent teaching experiences in Career Development course of secondary education students. At the end of this process, there have been sought answers to the questions below:

1. In order to support traditional intraclass teaching activities, do e-portfolio applications used as being integrated into Facebook social networking site provide more efficient contributions for students upon their learning concepts and skills included in Career Development course of the students?

2. Do e-portfolio applications used as being integrated into Facebook social networking site provide contributions for students upon their attitudes regarding the e-portfolio process positively?

IMPORTANCE OF THE STUDY
E-portfolio which has been used in all aspects of life is one of the current educational technology instruments, as well. In this study, there has been used an e-portfolio format that was integrated into a social network website unlike other known e-portfolio applications. Recently, use of social social network websites is very popular. It can be possible to reach more students including those websites into the educational process. Moreover, by this means, there has been aimed to practise and design a more entertaining, motivating, efficient and permanent educational process. E-portfolios' attaining a place within social network websites will bring a new perspective into education.

MATERIAL AND METHOD
Research Model
In this study, there has been used Pre-test and Post-test Control Group Design Model from experimental designs.

Population and Sample
Study group of the research has included Informational technologies and Electrical-Electronical Technology students studying in the 10^{th} grade of Tekirdag Technical and Industrial Vocational High School in 2010-2011 academic year. Tekirdag Technical and Industrial Vocational High School contains 3 different school types within itself. These schools are Industrial Vocational High School, Technical Vocational Highs School and Anatolian Technical Vocational High School. Implementation groups have been chosen randomly in a way the researcher can control the implementation. Including different school types and students from different departments has been aimed while creting the groups.

Limitations
1. The homeworks given in e-portfoio application is limited in Vocational Development course.
2. This study is limited in 2009-2010 term at Tekirdag Technical and Vocational Highschool 199 10th grade students of IT and Electric-Electronics Fields students.
3. The course subject is limited in Vocational Development course subject when implementing Isman Instrutional Design Model.
4.

Data Collection Tools
As data collection tool in the research;
Personal Information Questionnaire: This questionnaire has been created by the researcher in order to obtain data regarding personal information, time to use computer and Internet and time to use social networks of students besides their demographical information.
Academic Success Test: This test developed by the researcher has been used to determine academic success of students after the implementation and readiness level of students.
Attitude Scale Towards E-Portfolio Process: There have been 38 clauses in this attitude scale prepared by Demirli (2007). Cronbach Alpha coefficient has been found as 0,885 for the pre-test and as 0,919 for the post-test performed in the research.

Determination of Instructional Design Model
In the research, there have primarily been reviewed instructional design models that take place within the literature while determining the instructional design model. After analyzing different instructional design models, Isman Model has been decided to be used. This model was firstly created by Isman in 2005 and took its final form in 2011 by being developed. Isman Model has been defined as a systematical planning process including five steps (Isman, 2011). These steps are: Input, Process, Output, Feedback and Learning.
The design has been actualized considering these steps while preparing the e-portfolio. In the ***input*** step which is the first step of Isman Model, there should be actualized the steps of identifying needs, identifying contents, identifying goals and objectives, identifying teaching methods, identifying evaluation materials and identifying the instructional media. Depending upon the steps in input step, there has been determined for what purpose the e-portfolio will be designed, who will use, what it will include, what will be on interface and what will be shared and on what level the access level will be.

In the process ***step*** which is the second step; there should be actualized the steps of test prototypes, redesigning of instruction and teaching activities. Before implementing the prepared e-portfolio, there has been performed a preliminart test in another classroom. The mistakes have been cleared considering the technical problems encountered during the feedbacks of students and test and teaching activities have been fulfilled finalizing its form.

In the ***output*** step which is the third one; there have been actualized the steps of evaluation and revising teaching. Because e-portfolio application has been the basis of the research, it has become more of an issue. Homework declared to the students at the beginning of the term has been evaluated during the term as being interpreted.

In the ***feedback*** step which is the fourth one; the relevant step has been returned evaluating the outputs acquired at the end of the teaching process and feedbacks from the students. Within this context, subsequent studies of students have been aimed to be better as being interpreted from e-portfolio by both teachers and their classmates. Moreover, good and bad examples from the studies of the students have been tried to offer an insight into subsequent students being presented in classroom.

In the last ***learning*** step; permanent learning has been fulfilled. In this step, there has been observed whether students accomplished the targets of teaching plan. If accomplished, new learning activities have been performed and at the end of this step instructional designer has become to fulfill permanent learning. At the end of e-portfolio teaching process, e-portfolios created by the students have been evaluated. At the same time, to what extent e-portfolio affects student success has been noticed performing academic success test.

Preparation of E-Portfolio Application

Characteristic features of a social network are target, belonging, process, compliance and opportunity factors (Pettenati and Cigognini, 2007). When those features have been taken into consideration, integration of the social networks into education can be actualized creating an environment where equal opportunities have been provided, there is no time limitation providing them the feeling of belonging and in accordance with a specific purpose. In this study, an e-portfolio application has been integrated into a social network using the opportunities Facebook provides accompanied with these parameters. This process has been actualized through a systematic and comprehensive study (Figure 2).

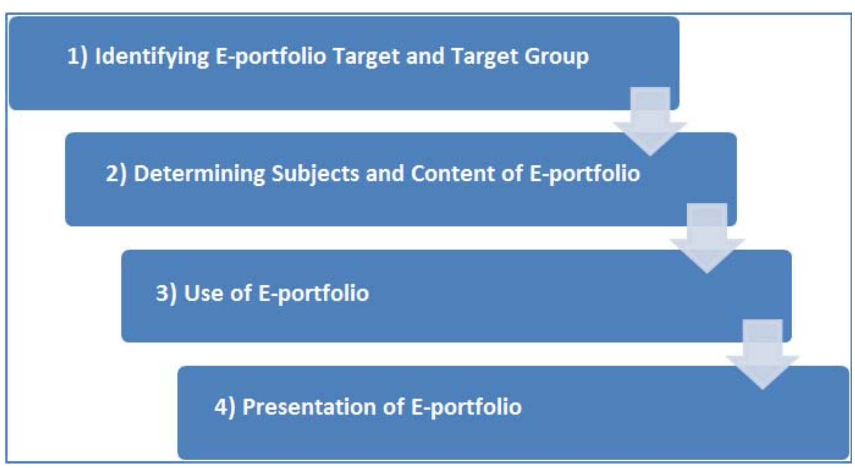

Figure 2. E-portfolio networking stages

1) ***Identifying E-portfolio Target and Target Group:*** In this step, there have been sought answers to the questions of
   - For what will e-portfolio be designed?
   - For what reason will e-portfolio be used?
   - Who will use the e-portfolio?

   Type and user group of e-portfolio is determined according to this.
2) ***Determining Subjects and Content of E-portfolio:*** In this step, there have been sought answers to the questions of
   - What will e-portfolio platform include?
   - What will there be on interface?
   - What will be shared?
   - How will the access level to data be?

   Content, shape and access level of the e-portfolio is determined according to this.

3) ***Use of E-portfolio:*** In this step, the subjects of,

- The format of content that will be included in the e-portfolio,
- Access type of the e-portfolio,
- Interaction of e-portfolio with social network,
- Use of social network components,

have been identified. By this means, there have been determined the issues such as the environment where e-portfolio will be used, the usage in this environment, format of the data that will be added to the e-portfolio and how these data will be saved.

4) ***Presentation of E-portfolio:*** In this step, there has been determined how e-portfolio platform and downloading data will be saved and presented (disc, database, web, etc.).

Stages of Research Development

In this section, stages of the research have been presented in steps. Depending upon the calendar given in thesis proposal, the research has been carried out in a structure including 11 steps.

1) **Performing personal information questionnaire:** In Tekirdag Technical and Vocational High School, correspondingly with the research,

- experimental and control groups have been determined,
- which social network will be used has been decided

performing personal information questionnaire to student groups which have been chosen randomly before.

2) **Creating E-portfolio structure:** Being prepared as in the way mentioned above, integration of e-portfolio into the social network (Facebook) has been acturalized. Facebook has a structure that allows applications to be used by being added within its content. There have primarily been designed interfaces of the e-portfolio application that will be primarily prepared in the research. There have been designed two different interfaces as the student interface (Figure 3.) and teacher interface (Figure 4.). ASP programming language has been used while preparing the application. Prepared interfaces have been integrated into Facebook.

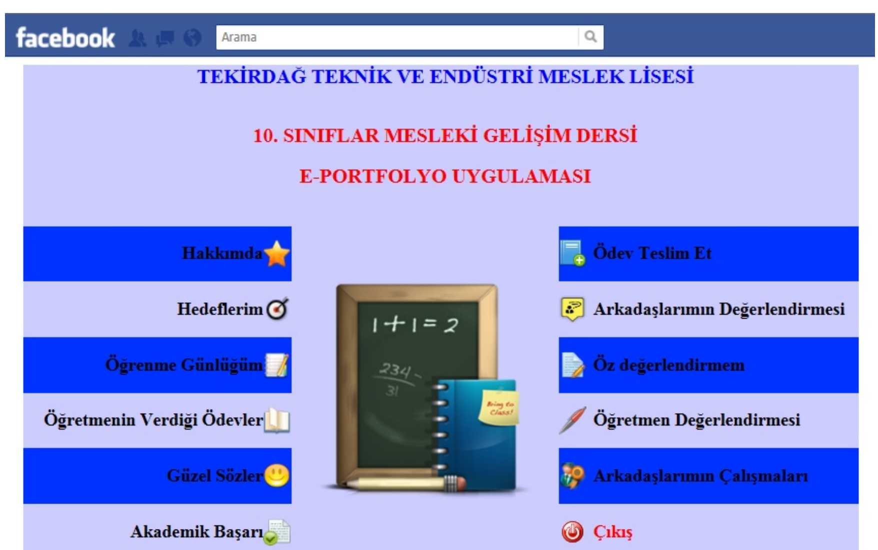

Figure 3. E-portfolio student interface

Figure 4. E-portfolio teacher interface

3) **Publishing of e-portfolio in social network:** Prepared e-portfolio was started to be published on Facebook. Later on,
   - visuality has been revised,
   - there has been performed a pilot scheme for four weeks at 11th grade Visual Programming course, feedbacks have been rovided,
   - contextual and technical mistakes have been removed according to feedbacks and it has been finalized.
4) **Informing students in experimental and control groups:** Students in the experimental group have been informed about e-portfolio, web-based and assisted education and computer-assisted education. Moreover, students in the experimental group have been acquainted with e-portfolio interface and how to use it has been demonstrated. Students in the control group have been informed about the research.
5) **Performing of scales as pre-test to the students:** In this step, students in the experimental group has been performed
   - Attitude scale regarding the e-portfolio process,

   and moreover, academic success test has been performed to students in the experimental and control groups as pre-test.
6) **Determination of homework that will be placed in e-portfolio:** In this step, determining homework titles according to the curriculum and targets of the course,
   - scores have been graded,
   - they have been declared from the e-portfolio,
   - there has been specified to what extent they will effect final academic success grade.
7) **Registering students to e-portfolio:** According to the data obtained from personal information questionnaire performed before, whole of the students in the experimental group have been known as the member of Facebook. Because of their this membership,
   - they have been registered to use e-portfolio,
   - an e-portfolio group has been created on the social network,
   - message groups have been created categorizing according to classes.
8) **Actualizing e-portfolio application:** E-portfolio application has been performed during the 2nd term of (18 weeks) in 2010-2011 academic year. At the end of each period given for homework, the homework presented by the students has been evaluated.
9) **Presenting good and bad examples:** During and after the application, studies having good and bad grades have been presented to students in the classroom.
10) **Performing scales to students as post-tes:** In this step, attitude scale regarding the e-portfolio process has been performed to the students in the experimental group. Furthermore, academic success test has been performed to students as post-test.
11) **Evaluation of studies presented in e-portfolio:** At the end of the term, year end grades of the students have been determined reflecting them in the rate given in Table 1 to academic success points they acquired from the studies they presented in e-portfolio.

Table 1. Determining year end academic grades of the students

Measurement	Efficiency Percentage
First written examination	% 15
Second written examination	% 30
Oral examination	% 10
Averages of homework grades	% 40
Averages of grades of which friends gave	% 5
Year end grade	**% 100**

Data Collection

Some of the scales and questionnaires used in the research have been paper-based and some of them have been performed using Google questionnaire tool. Paper-based data have been taken into digital media using Google questionnaire tool and whole input data were transferred into MS Excel.

Data Analysis

SPSS 17.0 package software has been used for the statistical analysis while evaluating the data obtained in the study. For two groups, Mann Whitney U-test has been used for the intragroup comparison of parameters that do not represent normal distribution to compare quantitative data. For more than two groups, Kruskal Wallis test has been performed for intragroup comparison of parameters that do not represent normal distribution to compare qualitative data and Mann Whitney U-test has been used for determining the group that causes difference. The results were at 95% confidence interval and significance has been evaluated on $p<0.05$ level.

FINDINGS

In this section of the research, qualitative and quantitative data obtained as result of the experimental studies have been evaluated by analyzing. Findings have been acquired collating observations made durinf the practice and results of attitude scale, literacy scale, academic success test and personal information questionnaire.

Findings Relevant to the First Problem

Regarding to the primary problem of the research, pre-test and post-test academic success test results of the experimental and control groups have been given in Table 2.

Table 2. Academic success test results of the experimental and control groups

	Experimental		**Control**		**t**	**p**
	Avg	Sd	Avg	Sd		
Academic Success (pre-test)	60,696	12,905	50,764	14,856	5,021	0.000**
Academic success (post-test)	70,935	12,675	62,655	14,297	4,315	0.000**
p	t= 7,59; .,000**		t= 7,83; 0.000**		**p<0.01	

The difference between group averages has been found as statistically significant as result of the t-test performed to determine whether academic success (pre-test) grade averages of the research participants differ according to the education or not ($t=5,02$; $p=0.000<0.05$). Academic success (pre-test) grades of the students in the experimental group have been found as higher than the academic success (pre-test) grades of the students in the control group.

The difference between group averages has been found as statistically significant as result of the t-test performed to determine whether academic success (post-test) grade averages of the research participants differ according to the group variable or not ($t=4,31$; $p=0.000<0.05$). Academic success (post-test) grades of the students in the experimental group have been found as higher than the academic success (post-test) grades of the students in the control group. The graphic that represents academic success pre-test and post-test results of the students in the experimental and control groups have been given in Figure 5.

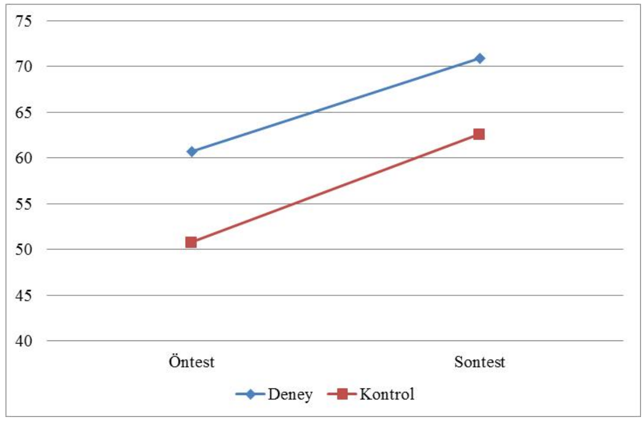

Figure 5. Academic success pre-test and post-test results graphic of the students in the experimental and control groups

Kolmogorov and Smirnov test of normality has been performed to analyze whether the difference between pre-test and post-test of the experimental and control groups was significant or not. The difference ($p<0.05$, $p=0.016$) has been noticed as normal at the end of performed test. For this reason, there could not be found a significant difference as result of the Mann Whitney U-test performed to analyze whether the difference between Academic Success pre-test and post-test results of the students in the experimental and control groups was significant or not.

Findings Relevant to the Second Problem

Findings relevant to the second problem of the research have been given in Table 3.

Table 3. Effect of e-portfolio application upon the attitude for e-portfolio process

	Before		**After**		**t**	**p**
	Avg.	Sd.	Avg.	Sd.		
Attitude For E-Portfolio Process	2,904	0,516	3,409	0,595	-12,473	0.000

There has been found a statistically significant difference between the arithmetic meansat the end of the matched group t-test performed to determine whether averages of Attitude for E-Portfolio process (before) and Attitude for E-portfolio process (after) have differed significantly or not ($t=-12,473;p=0.000<0.05$). Average of Attitude for E-portfolio Process (after) has been found as higher than the average of Attitude for E-portfolio Process (after).

CONCLUSION AND SUGGESTIONS

In this section of the research, findings obtained at the end of the experimental studies have been interpreted. Student attitudes and computer literacy levels have been analyzed. Moreover, academic success results and observations made during the practice have been discussed.

Results for the First Problem of the Research

Primary problem of the research is "*In order to support traditional intraclass teaching activities, do e-portfolio applications used as being integrated into Facebook social networking site provide more efficient contributions for students upon their learning concepts and skills included in Career Development course of the students?*". Although the results obtained for this sub-problem have not been statistically significant, academic success post-test grades of the students in the control group have been higher than the grades of students in the experimental group amd this can be said as affecting the success of the students during the e-portfolio assisted teaching process.

E-portfolio applications are not only about the academic sides of the students. It has supportive features about increasing comprehension and skills of the students together with their knowledge. As knowledge and skills about the chosen course increases in e-portfolio applications, there has also been increase at knowledge and skills about the informational technologies.

E-portfolio is an archive in which studies are saved and presented. This property of e-portfolio has been considered as arousing the attention of students. Whereas the averages of doing homework given for education and level of interest towards this homework have been fairly low, the interest of students towards the homework on e-portfolio application has been found as high. Normally, whereas the students studying especially at vocational high schools adopt a reckless manner about homework, there has been observed a feedback at a quite high rate in this study.

Results for the Second Problem of the Research

In this section, when the findings of the second problem of "*Do e-portfolio applications used as being integrated into Facebook social networking site provide contributions for students upon their attitudes regarding the e-portfolio process positively?*" have been analyzed, there was found a statistically significant difference between the attitudes of the groups. Whereas the average of the attitudes of the students before the application was 2,904, it was 3,409 after the application. In the studies carried out in previous years as in this study, there can be told of negative sides of this process together with students' having positive attitude at the end of the e-portfolio assisted training process. Problems such as its taking much time, technological incompetencies and difficulty in evaluation are the leading of those.

According to the findings about this problem, e-portfolio application is a process in which students revel in participating. Although students have been abstained at the beginning of the application, creating original products, developing the skills of using technologies and having low grade anxiety has caused change of students' viewpoints towards the application positively. E-portfolio application's being a student-cenetered method is another positivity of it. At the end of the practicing this application which has a supportive role in traditional education method there has been observed that students were satisfied with presentation of their own studies and evaluation of those studies by their friends. Presentation of good and bad examples chosen during and after the practice has become motivating for carrying out better studies.

Giving homework in vocational education institutions and doing the homework or not has always become a matter of discussion. Whereas there has been observed that the homework was not handed in, and the result of homework was not cared about in traditional education method, during this study there has been noticed that students checked whether the teacher took the homework or not or whether their studies were evaluated by their friends. Moreover, students have been observed as doing their homework more voluntarily.

In addition to these, such a practice process has helped to teach the concept of e-portfolio to the students. It has also caused to the consideration that e-portfolio can be used in fields apart from the education. An e-portfolio sthat has been structured and practiced considered the areas that students find as negative can be thought to be more productive.

SUGGESTIONS

In this section, there have been offered suggestions to researchers and implementers in consideration of the findings obtained fron questionnaire and scales performed and difficulties that have been encountered during the practice.

1) There can be researched whether the use of e-portfolio has been more productive by itself alone or as being integrated into a social network.
2) There can be researched the usability of social networks apart from Facebook for educational purposes.
3) There can be developed an attitude scale regarding the use of social networks on education.
4) The use of learning management systems with social networks can be experimented.
5) There can be proovided the collocation of e-portfolio application placing it into learning management system.
6) There can be prepared e-portfolio templates free to use of anyone as being integrated into any social network.
7) There can be carried out studies regarding the use of e-portfolio applications in vocational education, especially in information technologies.
8) There can be designed a national e-portfolio template in parallel with the FATIH Project that has been conducted by the Ministry of National Education.
9) Advantages and disadvantages of using e-portfolio and social network can be revealed analyzing the previous implementation results.
10) There can be researched which social network will be better for e-portfolio integration.
11) There can be researched how instructional design will be provided under the support of social network.
12) There can be researched the position of virtual socialization concept developed within the scope of social networks in terms of pedagogy and social psychology.

13) There can be researched the relation of connectivism with e-portfolio applications and use of social networks on education.

* This study has been prepared benefiting from the *“Integration of The E-Portfolio into a Social Network and Analysis of Results”* doctoral thesis of Mehmet Fatih BARIS.

REFERENCES

Albert, K. (2006). An E-Portfolıo Model For Learnıng, Assessment, And Employment In Teacher Educatıon At West Chester Unıversıty Of Pennsylvanıa. Pennsylvania, USA.

Atıcı, B., Polat, Ö. (2010). Sosyal Ağların İlköğretim Öğrencilerinin Başarısı ve Öğrenme Ortamı Tercihine Etkisi. IETC - April 26-28, 2010 Istanbul, TURKEY.

Bahçeci, D. (2006). Anatomi Dersinde Portfolyo Kullanmanın Öğrencilerin Bilişsel Ve Duyuşsal Özellikleri Üzerine Etkisi. Doktora tezi, Gazi Üniversitesi, Ankara, Türkiye.

Başçiftçi, R. (2011). Portfolyonun Fen ve Teknoloji Dersindeki Öğrenci Başarısı ve Kalıcılığa Etkisi. 2nd International Conference on New Trends in Education and Their Implications, 311.

Brady, K., Holcomb, B., Smith, B. (2010). The Use of Alternative Social Networking Sites in Higher Educational Settings: A Case Study of the E-Learning Benefits of Ning in Education. Journal of Interactive Online Learning, www.ncolr.org/jiol, Volume 9, Number 2, Summer 2010, ISSN: 15414914.

BY, (2010). 2. Uluslararası Değişen Dünyada Bilgi Yönetimi Sempozyumu. Hacettepe Üniversitesi, Ankara, Türkiye. http://by2010.bilgiyonetimi.net/.

Chen, S. (2005). A Study To Understand Preservice Teachers’ Learning Experiences While Developing Electronic Portfolio in A Teacher Education Program. The Ohio State University, USA.

Conole, C., Culver, J. (2009). Cloudworks: Social Networking for Learning Design. Australasian Journal of Educational Technology, 25(5), 763-782.

Çayırcı, Ç. (2007). İlköğretim 7. Sınıfta Web Tabanlı Portfolyo Uygulaması: Fen Bilgisi ve Sosyal Bilgiler Örnekleri. Dokuz Eylül Üniversitesi, İzmir, Türkiye.

Demirli, C. (2007). Elektronik Portfolyo Öğretim Sürecinin Öğrenen Tutumlarına ve Öğrenme Algılarına Etkisi. Doktora Tezi, Fırat Üniversitesi, Elazığ,Türkiye.

Döşlü, A. (2009). Ortaöğretim 10. Sınıf Bilgi ve İletişim Teknolojileri Dersinde Web Tabanlı Portfolyo Kullanımı. Çukurova Üniversitesi, Adana, Türkiye.

Erdoğan, T. (2006). Yabancı Dil Öğretiminde Portfolyoya Dayalı Değerlendirmenin Öğrenci Başarısı ve Derse Yönelik Tutumlarına Etkisi. Dokuz Eylül Üniversitesi, İzmir, Türkiye.

Erice, D. (2008). The Impact of E-Portfolio on The Writing Skills of Foreign Language Learners Studyong at Abant Izzet Baysal University Basic English Program. Bolu, Türkiye.

Gülbahar, Y., Kalelioğlu, F., Madran, O. (2010). Sosyal Ağların Eğitim Amaçlı Kullanımı. inet-tr.org.tr/inetconf15/ozet/10.html.

Gürol, M., Demirli, C. (2007). E-Portfolyo Sürecinde Öğrenci Motivasyonu. Fırat Üniversitesi, Elazığ, Türkiye.

Hargadon, S. (2008). Moving Toward Web 2.0 in K-12 Education. Britannica Blog http://www.britannica.com/blogs/2008/10/moving-toward-web-20-in-k-1.

Ivanova, S. (2008). Learning Eportfolio Deployment In Social Network Ning. ELECTRONICS’ 2008, 24 – 26 September, Sozopol, BULGARIA.

İşman, A. (2011). INSTRUCTIONAL DESIGN IN EDUCATION: NEW MODEL, TOJET: The Turkish Online Journal of Educational Technology – January 2011, volume 10 Issue 1, 137.

Kazan, Z. (2006). Elektronik Gelişim Dosyasının Eğitim Amaçlı Tasarlanması Ve Öğretmenlik Uygulaması Dersinde Kullanımının Değerlendirilmesi. Ankara Üniversitesi, Ankara, Türkiye.

Kert, S., Kert, A. (2010). The Usage Potential of Social Network Sites for Educational Purposes. International Online Journal of Educational Sciences, 2010, 2 (2), 486-507.

Lockyer, L., Patterson, J. (2008). Integrating Social Networking Technologies in Education: A Case Study of a Formal Learning Environment. Eighth IEEE International Conference on Advanced Learning Technologies.

Macedo, P., Snider, R., Penny, S., Laboone, E. (2001). The Development of a Model for Using E-Portfolios in Instructional Technology Programs. Virginia Polytechnic Institute and State University, USA.

Mason, R., Pegler, C., Weller, M. (2004). E-portfolios: an assessment tool for online course. British Journal of Educational Technology, Vol 35 No 6 2004 717-727.

Mazman, S. (2009). Sosyal Ağların Benimsenme Süreci Ve Eğitsel Bağlamda Kullanımı. Yüksek Lisans Tezi, Hacettepe Üniversitesi, Ankara.

Mazman, S., Usluel, Y. (2010). Modeling Educational Usage of Facebook. Computers & Education 55 (2010) 444-453.

Muñoz, C., Towner, T. (2009). Opening Facebook: How to Use Facebook in the College Classroom. Society for Information Technology and Teacher Education conference in Charleston, South Carolina, USA.
Övür, A. (2009). Facebook ve Simülasyon Evreni. Yüksek Lisans Tezi, Marmara Üniversitesi, İstanbul, Türkiye.
Özmen, F., Aküzüm, C., Sünkür, M., Baysal, N. (2011). Sosyal Ağ Sitelerinin Eğitsel Ortamlardaki İşlevselliği. 6th International Advanced Technologies Symposium (IATS'11), 16-18 May 2011, Elazığ, Turkey.
Pettenati, M., Cigognini, M. (2007). Social Networking Theories And Tools To Support Connectivist Learning Activities.
Roblyer, D., McDaniel, M., Webb, M., Herman, J., &Witty, J. (2010). Findings on Face in Higher Education: A Comparison For College Faculty And Student Uses And Perceptions Social Networking Sites. Internet and Higher Education, 13, 134-140.
Sanalan, A., Altun, A. (2001). Bir Veri Tabanı Uygulaması Olarak Elektronik Portfolyo. Erzincan Eğitim Fakültesi Dergisi Cilt-Sayı: 4-1 Yıl:2002.
Siemens, G. (2004). Connectivism: A Learning Theory for the Digital Age. www.connectivism.ca.
Sjunnesson, J. (2001). Digital Learning Portfolios: Inventory and Proposal for Swedish Teacher Education. Dept of teacher education, Uppsala university 2002-01-23.
Tiryakioğlu, F., Erzurum, F. (2011). Bir Eğitim Aracı Olarak Ağların Kullanımı. 2nd International Conference on New Trends in Education and Their Implications. Antalya, Turkey. www.iconte.org.
Vuorikari, R. (2005). Can personal digital knowledge artefacts' management and social networks enhance learning?. European Schoolnet, http://insight.eun.org.
Wang, s. (2004). Learnin Experiences in Developing Electronic Portfolios in a Master's Educational Technology Program: A Case Study. The College of Education of Ohio University, Ohio, USA.

COMPARISON OF PERCEPTION TOWARD THE ADOPTION AND INTENTION TO USE SMART EDUCATION BETWEEN ELEMENTARY AND SECONDARY SCHOOL TEACHERS

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ABSTRACT
The purposes of this study are to investigate the attitudes and perceptions of teachers toward the adoption of and intention to use Smart Education, to examine empirically the relationship between intention to use Smart Education and the consequential effect factors, and to obtain measures for revitalizing Smart Education. In order to accomplish all these, we suggested an expanded model based on a model for the theory of reasoned action. The results of the study are as follows. Firstly, attitude, subjective norms, teacher efficacy, resistance to class, and organizational citizenship behavior, respectively, affect intention for using Smart Education. Also, educational value and teacher efficacy have an impact on the attitude; furthermore, the burden for class and organization citizenship behavior affected the teacher efficacy. Secondly, the following were seen to have a high path coefficient: the elementary school teachers in H1 (Attitude → Intention to use), H3 (Teacher efficacy → Intention to use), H4 (Resistance to class → Intention to use), H6 (Educational value → Attitude), H8 (Teacher efficacy → Resistance to class); and the secondary school teachers in H2 (Subjective norms → Intention to use), H5 (Organization citizenship behavior → Intention to use), H7 (Teacher efficacy → Attitude), and H9 (Teacher efficacy → Organization citizenship behavior). And through these results, the factors for introducing and promoting Smart Education and its invigoration measures were presented.
Keywords: Smart Education, Theory of Reasoned Action, Innovation Resistance, Teacher Efficacy, Organization Citizenship Behavior

INTRODUCTION

According to the Korea Communications Commission and the IT industry, smart phone users have surpassed 26 million 720 thousand as of May 11th, 2012 (Hur, 2012). Also, as SNS and cloud computing services have become more and more mainstream, it is not an exaggeration to say that our society has hailed in a so called 'Smart phone era'. In 2011, based on these trends, the Ministry of Education, Science and Technology launched the 'Smart Education' executive planning and related government programs and an executive strategy roadmap. Starting in 2012, Education Offices in the cities and regions of Korea began planning and quickly executing detailed strategic plans for individual schools within their region to this effect. Furthermore, in the academic field, many researchers have been publishing research on utilizing social network services (Brady et al., 2010) or smart phone based services (Lee & Jung, 2010; Cho, 2009) etc., for education, which show the synergy effects of SNS-type social media with education and have also shown to have a positive effect on providing the student with a more inviting and voluntary study environment.

However, even though we have set up a very high standard of education policies through the private sector and in households, due to cursory implementation, effective methods and strategies were not set in place making it not uncommon to see the proposed education methods disappear from the site of education or the impact of education unable to be maximized. Understanding how a new education method like Smart Education spreads and how it affects education begins with understanding the educational organization, which design the smart learning programs (Kim & Han, 2006), and in order for an innovative education method to be successful, efforts must be made to convince as many early adopters as possible in the early stages and also sources of dissatisfaction must be determined from the feedback quickly.

There is a string of research regarding the specific characteristics of the professors supporting this new method of education, the style of the innovation, development of prediction models for new technology development, professors' study strategies, and introductory timing related to introducing this new method of education. However, because the focus of previous research was on implementing and successfully launching a new education method, there is a lack of opinions from professors' that evaluate the likelihood of Smart Education being adopted and going main stream. And up to this point, since most empirical research regarding implementing new education methods focused on a narrow aspect, there is a limitation on citing the research as a result of in-depth and multilateral analysis. Continuing this logic, we are attempting to validate and analyze the best way to introduce smart learning, through a survey inquiry determining what elements in the research affect the motivations for applying smart learning and also what factors affect the attitude and actual usage motivation for the professors that manage the realistic capacity and conclusions of the education.

On the other hand, school organizations are quite different from other organizations and even more so depending on the educational quality of the school (Oh & Jung, 2006). Elementary and secondary schools have a separate set of educational goals, environments and are operated by a different type of teaching staff structure. Therefore, it is expected that teachers that wish to apply a new educational method to their classrooms will have differing perspectives so the need for basic research such as comparing and analyzing the reason that elementary school and secondary school teachers are implementing Smart Education exists. This study is based on the perspectives of the teachers regarding the implementation and application of Smart Education and empirically investigates the relationship between the intent to apply smart learning and the elements that affect this intent while also analyzing the difference of the intent for applying Smart Education by the quality of the school in order to discover a method to propagate the adoption of Smart Education.

THEORETICAL BACKGROUND AND RESEARCH HYPOTHESIS

Selecting and organizing teachers' knowledge and experience, the paradigm from the past that teachers' language was centralized in the role of knowledge messenger is being developed to the educational paradigm that is anchored in various students utilizing ICT. Likewise, the content of education with the changes of learning, educational methods, educational environments are being changed, and Smart Education is receiving a great deal of attention recently. Though Smart Education is defined variously by many scholars (Noh et al., 2011; Jo & Lim, 2012; Kim & Kim, 2012), when we synthesize those definitions, it is chiefly concerned with learners' differing learning styles and capabilities, and it focuses on increasing development in learners' thinking skills, communication skills, problem solving skills etc, and providing chances for cooperation learning and individual learning, Smart Education makes learning more enjoyable and can be explained as intelligence tailored learning based on ICT or smart devices.

When we look at these Smart Education related research works, firstly there are research works which surveyed positive educational effects utilizing various methods (Greenhow & Robelia, 2009; Yue et al., 2009; Thomas, 2010; Cochrane & Bateman, 2010) and secondly, there is research which shows Smart Education in a negative light (Lee, 2012; Kim & Kim, 2011; Lee, 2010). Also, we look that the research, which suggests directions for policy, method, system for Smart Education (Kim & Son, 2011; Lee, 2010; Lim, 2011) largely deals with the factors that are necessary for the implementation of Smart Education techniques and systems.

In this context, working to improve Smart Education's strengths and finding ways to mitigate its negative aspects, Smart Education is necessary as a new learning method for teachers on the front lines of education in order to train effective and skillful people in the 21st century. For the necessity of Smart Education and spreading sympathy, it may be important to understand teachers' thoughts and experiences regarding the introduction and utilization of Smart Education.

The adoption and use of ICT in educational sites is in fact not so much influenced by the Education Administration Authority, but in fact by the real teachers and students themselves. Without the support for change by these individuals, it is difficult to affectively apply a new education method (Pelgrum, 2001). Bullock (2004) announced research results stating that the ultimate decision for adopting and applying new technologies into the classroom was done by the teachers and, Kersaint et al (2003) also stated that teachers comfortable with new technology also had a tendency to be comfortable using ICT as a real educational tool. This is due to the fact teachers are introspective action takers and not passive people who just take and execute orders (Schon, 1987). Marcinkiewicz and Regstad (1996) reported that the biggest influence on computer use was how the teachers felt about using personal computers for education purposes. Expression of subjective norms can be suppressed socially or politically. Subjective norms that are shown in planned behavioral theory usually manifest themselves based on how the individual perceives the opinion of the group / society on the specific behavior (Fishbein & Ajzen, 1975). In other words, when defining subjective norms as a manifestation of how an individual perceives the expectations of a behavior by a group / society, it can be said that the important variables determining the subjective norms in the educational scene are the individual expectations on Smart Education regarding the students, parents, and education associates, principal and vice principal, etc. When explaining the intent for adopting new technologies, the subjective norm factor is often brought up as a variable (Kim et al., 2009; Davis & Wong, 2007; Park, 2009; Teo, 2010). In this study, Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB) are analyzed and based on the research results above, by determining that the attitude of teachers toward Smart Education has an effect on the intent to apply smart learning, we hypothesize the following:

H1: Attitude towards Smart Education will have a positive effect on the intention to use.
H2: Subjective norms towards Smart Education will have a positive effect on the intention to use.

The efficacy of teachers means the positive effect that a teacher can have on the performance of the students (Ashton, 1984). Bandura (1997) emphasized that teacher efficacy could be a self-evaluating belief system for teachers based on efficient student leading and efficient classroom time. When the efficacy of teachers is high, they try to steer the classroom activities and education in a desirable direction while also being more open to trying individually creative educational methods. On the other hand, teachers with a low efficacy are more likely to adopt a strict, uniform and more traditional education style (Tshannen-Moran et al., 1998). Based on research precedence, it is shown that elementary and secondary school teachers with high efficacy had a tendency to have an open attitude towards new ideas and wished to utilize various teaching tools in their curriculum (Potosky, 2002; Tondeur et al., 2008; Yang, 2012). Based on these research results, it was determined that teacher efficacy has a positive effect on the intent for teachers to apply Smart Education activities, and the following hypotheses were set:

H3: Teacher efficacy towards Smart Education will have a positive effect on the intention to use.

In general, the necessary adoption of innovation for changes to a school system occurs on a systematic and individual level (Ellsworth, 2000). Especially, regarding the level of execution as an adopter of an innovation, teachers show a variety of profiles. Some teachers contribute very actively while others are passive in their contributions to the process of school change. Also, some teachers resist school change. In the case of Ncube (1998), the resistance to change by the teachers was often a main obstacle for the school improvement program. As a result, because it is the teachers that spread the innovation and the innovative ideas with the school, resistance to change by the teachers is a very significant factor. In Greenberg and Baron (2008), the teachers rejected change in the name of keeping the school as-is creating an obstacle for changing the habits of the teachers. In the case of Zimmerman (2006), the reason for the reluctance to change stemmed from the fear of new changes. If a school had previously failed at implementing a change, this experience caused fear of new changes for the teachers. Along the same logic, because it is determined that in this study the resistance and pressure regarding Smart Education will weaken the intent for teachers to apply Smart Education, the following hypothesis is set:

H4: Resistance to classes utilizing Smart Education will have a negative effect on the intention to use.

Bateman and Organ (1983) described organizational citizenship behavior as a behavior that is not formally defined or guaranteed by contract, but a behavior that manifests not from reward but a voluntary behavior for the overall good of the organization. Organizational citizenship behavior does not occur because the participant is expecting pay or a raise, nor does it occur out of a sense of obligation. However, organizational citizenship behavior is essential for maintaining the robustness of an organization. It could be said that the organizational citizenship behavior requirements during the process of implementing a new education method has many differences in scope and intensity. However, considering the difficulties in the innovation process for introducing a new education method, it is easy to see the possibility that the personal preferences of the teachers can have an influence on the success of the education. Moreover, because the ultimate purpose of introducing Smart Education is not merely just to introduce a new education method, but to start an education revolution through Smart Education, it is determined that applying organizational citizenship behavior could have significant meaning, thus the following hypothesis is set:

H5: Teachers' organization citizenship behavior will have a positive effect on the intention to use.

The educational value of Smart Education is not only because of its efficiency, customizability and individualized nature in regards to the education method, but also the expectation that the traditional classroom experience can be enhanced as well. In general, when the educational value of a certain education method is high, it is reported as having a positive impact on the introduction intent (Kim, 1998; Choi et al., 1999; Kang & Kang, 2009; Yuan & Lee, 2012). For applying Smart Education, the value of the education can have a positive impact on the attitude towards Smart Education. Therefore, the following hypothesis is set:

H6: The educational value of Smart Education will have a positive effect on the attitude towards Smart Education.

On the one hand, the change in the beliefs and attitude of the teachers stems from the specific performance of the students or education value but the teachers' efficacy is also a relevant parameter. Teachers' efficacy is defined by their own belief of how much the teachers affects the student's performance (Ashton, 1984), or also the teachers' confidence in their own ability to put into practice those education activities that are meaningful to the students (Gibson & Dembo, 1984). Since it is determined that a teachers' efficacy can be viewed as serving an important role in the ability to maintain a positive and innovative belief and attitude during the process of syllabus preparation, when actually teaching or confronted with unexpected problems such as device failure, the following hypothesis is set:

H7: Teacher efficacy towards Smart Education will have a positive effect on the attitude towards Smart Education.

The research of Hysong and Miguel (1998) demonstrated that a teachers efficacy has a positive effect on the innovation and performance of an individual in a new environment, and as the concept of self efficacy is introduced to the field of IT systems, self efficacy has been widely regarded in many studies as a main variable, which affects innovative performance or performance in general (Jang & Jo, 2002; Compeau & Higgins, 1995). Meanwhile, people with a low level of self efficacy minimize anxiety by choosing a method they are familiar with even if a better method exists. Therefore, it can be viewed that the resistance against innovation can be affected by a teachers' perceived efficacy. Thus, based on previous research, this study determines that the degree of resistance against the introduction of Smart Education differs depending on the teachers' efficacy and assumes that an analogy can be drawn from the concept of innovation resistance, which is mainly used in the IT field and applied as education pressure in the education field, the following hypothesis is set:

H8: Teacher efficacy towards Smart Education will have a negative effect on the resistance to class of Smart Education.

Ashton (1984), Gibson and Dembo (1984) stated that teachers with a high efficacy regarded performance expectations from students and responsibilities towards their students' studies very highly and wished for their students to improve academically, and if the students failed, rather than thinking that it was the student's fault or inability, the teachers thought that there was a problem with their own teaching method and immersed themselves even further in their teaching. From this perspective, teachers that believe their teaching techniques can change their students showed not only a high level of organizational citizenship behavior while teaching in the classroom, but also amongst colleagues in the school. During teaching, this high level of organizational citizenship behavior in turn translated into the student's confidence in succeeding academically, and through determining that this behavior could increase the application of Smart Education, the following hypothesis is set:

H9: Teacher efficacy towards Smart Education will have a positive effect on organization citizenship behavior.

Based on previous research above that is related to Smart Education, to analyze the effects of 6 selected research parameters (Attitude, Subjective norms, Resistance to class, Organizational citizenship behavior, Educational value and Teachers efficacy) and their effects on behavioral theory model, the following structural equation is set (shown in Figure 1) and the causal relationship between the factors are verified.

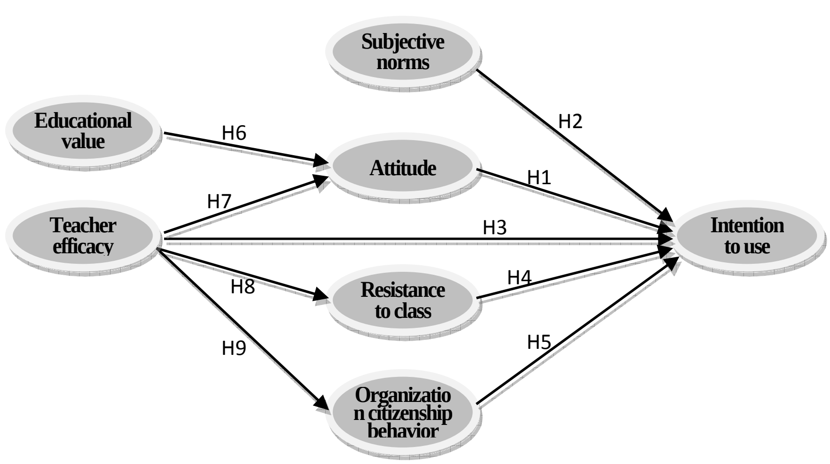

Figure 1: Summary of research hypothesis

RESEARCH HYPOTHESIS PROOF ANALYSIS AND RESULTS

Summary of choosing research subject and analysis

Proof and analysis for the research was conducted with teachers in the elementary and secondary schools of the Gyeonggi region as the research subjects. Research subjects were chosen by method of an online survey only accessible via a work managed email system using only the individual's electronic verification sign on certificate. Once logged on, the survey polling the teachers' opinion was introduced and the purpose of the survey was promoted by a video about introducing and applying Smart Education. The research survey was open between April 11th, 2012 and April 17th, 2012 and had a total of 1868 teachers participate, and excluding insufficient survey input from 51 of those teachers, the final tally of 1817 responses were sorted for final analysis.

Table 1: Reliability of research variables with respect to the entire sample and appropriateness analysis result

Construct	Composition of survey categories	Factor loading	t-value	CR	Cronbach α	AVE	Reference
Organization Citizenship Behavior	OCB1	0.782	20.560	0.898	0.864	0.595	○ Belogolovsky & Somech (2010) ○ Organ et al. (2006)
	OCB2	0.770	20.342				
	OCB3	0.832	23.728				
	OCB4	0.751	17.785				
	OCB5	0.806	22.306				
	OCB6	0.680	15.423				
Subjective Norms	SN1	0.896	69.040	0.948	0.931	0.784	○ Marcinkiewicz & Regstad (1996) ○ Venkatesh & Davis (2000)
	SN2	0.896	66.240				
	SN3	0.910	65.422				
	SN4	0.848	56.267				
	SN5	0.874	57.190				
Attitude	attitude1	0.885	67.245	0.945	0.927	0.775	○ Warburton & Terry (2000) ○ Keenan et al. (2006)
	attitude2	0.896	75.248				
	attitude3	0.831	62.338				
	attitude4	0.915	73.707				
	attitude5	0.873	67.713				
Educational Value	eduvalue1	0.876	68.771	0.959	0.946	0.823	○ LEE et al. (2003) ○ Singhal (1997)
	eduvalue2	0.916	83.024				
	eduvalue3	0.929	92.819				
	eduvalue4	0.917	90.391				
	eduvalue5	0.895	81.782				
Teacher Efficacy	efficacy1	0.846	61.933	0.930	0.905	0.727	○ Gangadharbatla (2008) ○ Goddard et al. (2000)
	efficacy2	0.893	72.011				
	efficacy3	0.728	32.531				
	efficacy4	0.883	68.722				
	efficacy5	0.899	68.224				
Intention to Use	intention1	0.856	72.499	0.958	0.945	0.821	○ Davis & Wong (2007)
	intention2	0.924	102.405				
	intention3	0.940	104.986				
	intention4	0.905	92.931				
	intention5	0.903	83.762				
Resistance to Class	resist3	0.892	15.744	0.891	0.834	0.732	○ Oreg (2003) ○ Ram (1987)
	resist4	0.766	3.785				

resist5	0.903	20.506

The survey was similar to a 7-scale likert type and there were no missing values. SPSS 18.0 and Smart PLS 2.0(M3) were the statistical packages used to analyze the qualitative data. Path Analysis utilizing PLS differs from LISREL, AMOS, etc., in that it is a structural equation mainly focused on the main dispersion factor. The strengths of PLS are not only its ability to read into the relationships between the variables, but also that it allows the prediction of variable values (Haenlein & Kaplan, 2004). On top of this, in contrast to the structural equation models that are based on common factors, this model has no limitations in terms of sample size or variable residual standard distribution (Fornell & Cha, 1994), and is a useful analytic tool that is better suited for causal relationship prediction rather than theoretical verification.

The benefit of PLS analysis is that it is the most appropriate empirical analysis method in determining and predicting a certain behavior such as the teachers' intent for introduction of Smart Education as suggested in this research.

Without separating the 2 entities and analyzing the measurement sample of the combined sample, the results, as seen in Table 1 show that the individual survey category load across the entire sample is more than 0.5, while the t value showed similar results. Complex reliability was also greater than 0.7 across all variables, and the average dispersion extraction value was also above the standard value of 0.5; therefore, showing that there was no problem with the appropriateness of the relationship between the survey elements. As for determinant appropriateness, the square root of the average dispersion extraction value exceeds the relational calculation value, and if the average dispersion extraction value exceeds 0.5 it is viewed as appropriate. Since all the analysis results meet the conditions, there are no problems with appropriateness. In addition the explanation values (R^2) for the intention to use, attitude, resistance to class, and organization citizenship behavior all exceed the appropriate threshold values.

Evaluation goodness of fit of research model

For the structural model of the results' overall goodness of fit, there is a Redundancy index, which is cross-verified Stone-Geisser Q^2 test statistics. This index shows the structural model's suitability as structural model's statistically estimated volume, and the value must be positive (Chin, 1998; Tenenhaus & Esposito Vinzi, 2005). Like in table 2, centralizing in latent variable, all the values are positive in this research

Table 2: Model goodness of fit index

Construct	R^2	Communality	Redundancy
Teacher Efficacy		0.727	
Educational Value		0.823	
Intention to Use	0.769	0.821	0.140
Resistance to Class	0.065	0.732	0.038
Organization Citizenship Behavior	0.159	0.595	0.093
Subjective Norms		0.784	
Attitude	0.648	0.775	0.339

Outside of that, evaluation of goodness of fit on average about PLS structural model first requires us to consider the evaluation of each individual endogenous variable route structure, and is evaluated as relevant Latent variable R^2 value. According to Cohen (1988), R^2 value's effect degree is separated to high (above 0.26), medium (0.13-0.26), and low (0.02-0.13). Based on this evidence, established research module's goodness of fit in the model studied satisfies all thresholds.

Lastly, PLS path model's Goodness of Fit is defined as all endogenous variable's R^2 average value multiplied by communality's average value, then square rooted (Tenenhaus & Esposito Vinzi, 2005). The size of this goodness of fit must be at least above 0.1, and depending on the size, it is separated into the high (above 0.36), medium (0.25-0.36), low (0.1-0 .25) categories, and after measuring the overall goodness of fit of the research's

PLS path module, it is determined that the overall endogenous variable's R^2 average is 0.41, and communality average value is 0.75, and the square root of these two multiplied values is 0.56, thus the model's overall goodness of fit is shown to be very high.
Thus, the research model's goodness of fit is confirmed, the hypothesis' verified, and interpretation of the result is shown to be possible.

Results of the structure model against the entire survey participants
The results of the structure model against the entire survey participants, all 9 of the hypothesis were adopted with a significance level of 1%. As the core of this research lies in comparing and analyzing the path coefficient regarding the application intent of elementary and secondary school teachers, the analysis results for the entire sample is shown in Table 3. We determined that the result comparison between elementary and secondary school teachers had more significance than the analysis results of the entire sample size.

Table 3: Entire sample path coefficient value and verification results

Hypothesis	Path	Path Coefficient	Standard Error	t Value	Verification Result
H1	Attitude → Intention to use	0.489	0.023	20.976	**adopt ***
H2	Subjective norms → Intention to use	0.298	0.026	11.298	**adopt ***
H3	Teacher efficacy → Intention to use	0.123	0.026	4.709	**adopt ***
H4	Resistance to class → Intention to use	-0.069	0.012	5.702	**adopt ***
H5	OCB → Intention to use	0.047	0.015	3.179	**adopt ***
H6	Educational value → Attitude	0.458	0.029	15.828	**adopt ***
H7	Teacher efficacy → Attitude	0.386	0.029	13.256	**adopt ***
H8	Teacher efficacy → Resistance to class	-0.256	0.025	10.183	**adopt ***
H9	Teacher efficacy → OCB	0.399	0.023	17.608	**adopt ***

**, $|t| > 2.326$, $\alpha=0.01$ significance (or $p<0.01$)

ANALYSIS RESULTS COMARISON FOR EACH GROUP'S PATH
Next, we compare analysis results between groups of elementary school and secondary school teachers for each hypothesis. Each average cause value t is compared against the validated result and the path comparison results using the PLS method can be seen in Table 4 and Table 5.

In Table 4 of the elementary and secondary school teachers' average cause value comparison, it is shown that in the case of elementary school teachers, the organization citizenship behavior average score is significantly high.

Table 4: Factor average value comparison of elementary and secondary school teachers

Construct	Average		t Value	Difference
	Elementary(n=544)	Secondary(n=1273)		
OCB	5.77	5.58	4.226 *	**Elementary** > Secondary
Educational value	4.73	4.81	-1.090	Elementary < **Secondary**
Teacher efficacy	4.76	4.83	-1.191	Elementary < **Secondary**
Resistance to class	4.47	4.43	0.699	**Elementary** > Secondary
Attitude	4.76	4.99	-3.329 *	Elementary < **Secondary**
Subjective norms	4.68	4.75	-1.040	Elementary < **Secondary**
Intention to use	5.07	5.16	-1.352	Elementary < **Secondary**

***, p<0.001

In previous research for elementary school teachers' culture, consideration for others, cooperation, respect for individual teachers and school management, sharing of teaching materials, etc., were reported (Oh & Jung, 2006). Sharing and cooperation in the elementary school teachers' teaching culture seem to have contributed to the organizational citizenship behavior element in the survey.

On the other hand, in the case of secondary school teachers, there was statistical significance in the attitude towards Smart Education. Through this, it is determined that the fear of early Smart Education for elementary school teachers (Newby, 2000; Lee, 2001) caused their attitude towards Smart Education to have less of an impact on the average attitude towards Smart Education than that of secondary school teachers.
It is suggested that path-coefficient that composite research module may also have a slight difference depending on groups, so we will try to account for this. The analysis of path difference between groups by Teo at al. (2003), and Keil et al. (2000) is processed as it is presented in table 5 below.

Table 5: 2 groups' path coefficients difference's comparison analysis process

step	method of progression	note
step 1	Reliability and validity verification for the overall group	If suitable move on to step 2
step 2	Reliability and validity verification for individual group	If suitable move on to step 3
step 3	Correlation and distinction validity verification	After overall group and individual group's validity is tested, move on to the next step if it is suitable
step 4	Path-coefficient can be compared path coefficient difference only about similar hypothesis	Using second path-coefficient difference compare modification (formula 1), compare difference of path coefficient

$$S_{pooled} = \sqrt{\frac{(N_1-1)}{(N_1+N_2-2)} \times SE_1^2 + \frac{(N_2-1)}{(N_1+N_2-2)} \times SE_2^2}$$

$$t = \frac{(PC_1 - PC_2)}{S_{pooled} \times \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}$$

S_{pooled} = pooled estimator for the variance
t = t-statistic with $N_1 + N_2 - 2$ degrees of freedom
N_i = sample size of dataset for culture i
SE_i = standard error of path in structural model of culture i
PC_i = path coefficient in structural model of culture i
Formula 1: Path coefficient difference comparison modification

As can be seen in Table 6, with the exception of elementary school teachers group's H5 (Organization Citizenship Behavior→ Intention to use), all path coefficients of the hypothesis differed from the significance level by approximately 5%. If one particular group's specific path was not significant, even without statistical analysis, it can be determined that the path that shows a significant value has a greater effect (Mun & Kim, 2011; Kim et al., 2010). In other words, in the case of the secondary school teachers group H5, the path is significant but the same is not true for the elementary school teachers group. Therefore, in the secondary school teachers group, it can be determined that the organizational citizenship behavior had a larger impact of application intent than it did for the elementary school teachers group.

Table 6: Path coefficient comparison between elementary and secondary school teachers

Hypothesis	Path	Path Coefficient Elementary (n=544)	Path Coefficient Secondary (n=1273)	Path Difference t-value	Difference
H1	Attitude → Intention to use	0.494*	0.486*	4.497**	**Elementary**>Secondary
H2	Subjective norms → Intention to use	0.265*	0.314*	-24.743**	Elementary<**Secondary**
H3	Teacher efficacy → Intention to use	0.156*	0.108*	23.677**	**Elementary**>Secondary
H4	Resistance to class → Intention to use	-0.076*	-0.065*	-12.695**	**Elementary**>Secondary
H5	OCB → Intention to use	0.037	0.045*	-7.488	Elementary<**Secondary**
H6	Educational value → Attitude	0.497*	0.441*	26.216**	**Elementary**>Secondary
H7	Teacher efficacy → Attitude	0.350*	0.403*	-24.855**	Elementary<**Secondary**
H8	Teacher efficacy → Resistance to class	-0.283*	-0.240*	-24.507**	**Elementary**>Secondary
H9	Teacher efficacy → OCB	0.324*	0.440*	-70.589**	Elementary<**Secondary**

1) *, $p<0.05$ 2) **, $p<0.05$

When the paths of each group are both significant, the PLS model must analyze the difference between the groups using a deduction equation. By comparing the path coefficient value, the elementary school teachers group's H1 (Attitude → Intention to use), H3 (Teacher efficacy → Intention to use), H4 (Resistance to class → Intention to use), H6 (Educational value → Attitude), and H8 (Teacher efficacy → Resistance to class) path coefficients were shown to be greater than that of the secondary school teachers group's. For the secondary school teachers group the H2 (Subjective norms → Intention to use), H5 (Organization citizenship behavior → Intention to use), H7 (Teacher efficacy → Attitude), and H9 (Teacher efficacy → Organization citizenship behavior) path coefficients were shown to be higher than that of the elementary school teachers group's.
The results for the difference in the path coefficient for each hypothesis regarding each group were observed. First, in the case of H1 (Attitude → Intention to use) it was shown that attitude had a positive effect for the application intent for both elementary and secondary school teachers. The elementary school teachers' path coefficient value was shown to be significantly greater than that of the secondary school teachers. This can be translated as elementary school teachers having the ability to be moved more effectively towards Smart Education through policies that are positive towards the attitude element compared to secondary school teachers. Therefore, offering a slight relative change to the attitude of elementary school teachers will show a favorable response to applying Smart Education.

In the case of H2 (Subjective norms → Intention to use), both elementary school teachers and secondary school teachers showed that subjective norms had a positive effect on application intent. The path coefficient value for secondary school teachers showed greater significance than that of elementary school teachers. This means that for secondary school teachers, by raising subjective norms for Smart Education, application intent can be higher than that of elementary school teachers. Therefore, if it is possible to give a slight relative change to subjective norms, it can be inferred that secondary school teachers are more likely to apply Smart Education. These results mean that for secondary school teachers, when utilizing a new technology such as Smart Education, they are more concerned about what other people who are interested in the matter will perceive of the new adoption results of technology.

In the case of H3 (Teacher efficacy → Intention to use) it was demonstrated that for both elementary and secondary school teachers, teacher efficacy had a positive effect on application intent. The path coefficient value for elementary school teachers was shown to have greater significance than that of secondary school teachers. This can be translated as elementary school teachers being more likely to apply smart learning by raising Smart Education teacher's efficacy compared to secondary school teachers. In this result, elementary school teachers had low teacher's efficacy towards Smart Education, but through related training if teachers efficacy is raised, it is determined that it is possible to impact their intent to utilize Smart Education in the classroom for improved teaching.

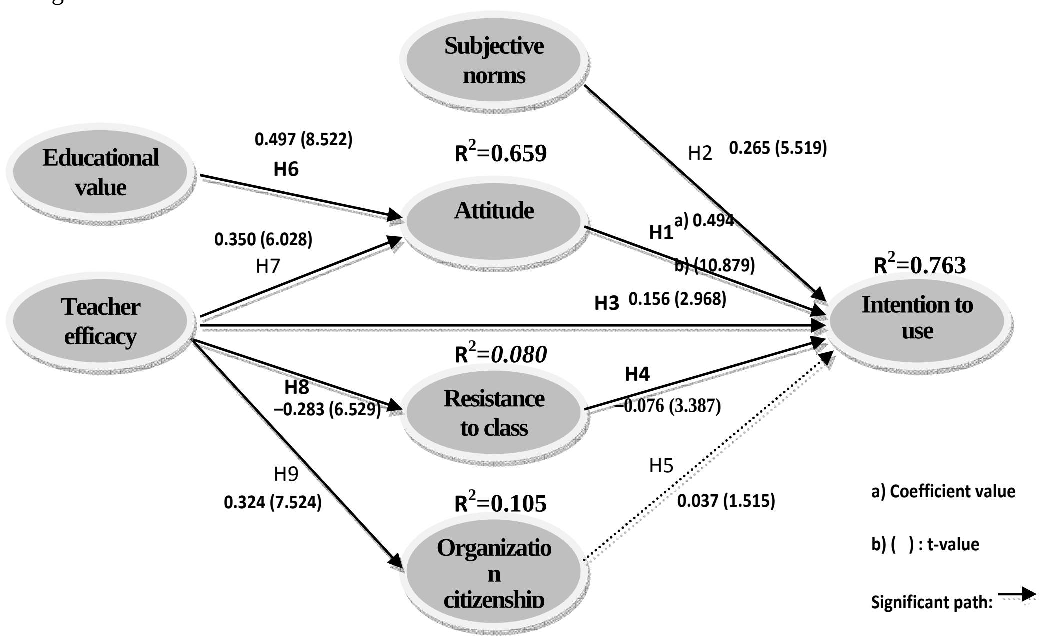

Figure 2: Survey analysis results for elementary school teachers

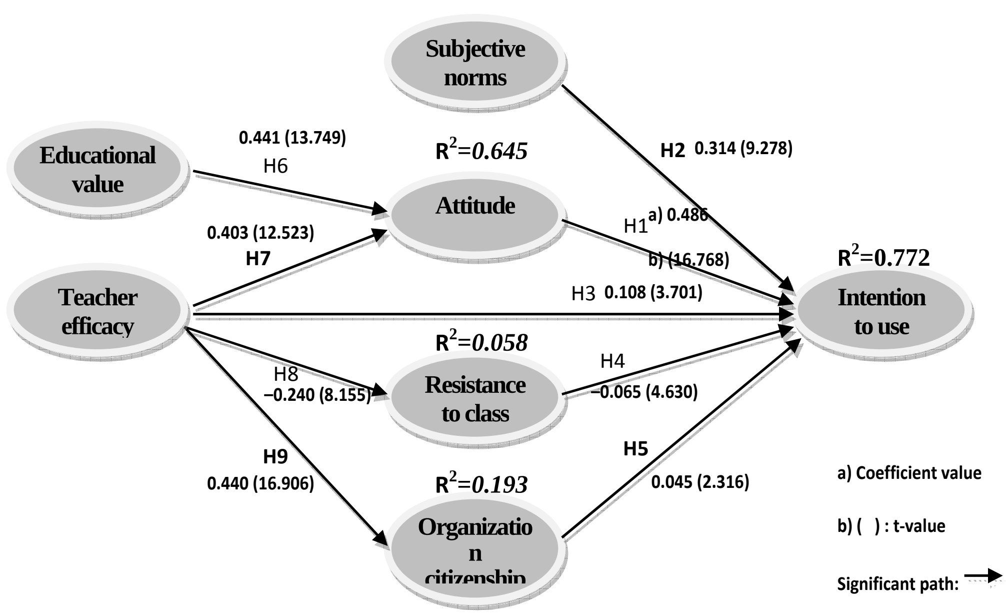

Figure 3: Survey analysis results for secondary school teachers

In the case of H4 (Resistance to class → Intention to use), it was shown that for both elementary and secondary school teachers, teaching pressure had a negative effect on application intent. The path coefficient value for elementary school teachers had a greater negative significance than that of the secondary school teachers. This can be translated as, if the teaching pressure of Smart Education can be relieved slightly for elementary school teachers, their intent for utilizing Smart Education can be greater than that of secondary school teachers. This result is determined to mean that if elementary school teachers are able to reduce teaching pressure because they have more opportunities to exercise flexibility in the curriculum and teaching method, their application intent can be affected more in comparison to secondary school teachers.

In the case of H5 (Organization citizenship behavior → Intention to use) it was shown that for both elementary and secondary school teachers, organizational citizenship behavior had a positive effect on application intent. The path coefficient value for secondary school teachers was shown to have greater significance than that of elementary school teachers. Thus, if the organizational citizenship behavior towards Smart Education in regards to secondary school teachers can be raised slightly, they will utilize Smart Education more than elementary school teachers. Since the organizational citizenship behavior causal average for secondary school teachers was relatively low, if there is a reason to slightly raise the dedication towards students, colleagues, and the school in the form of organizational citizenship behavior, there is a greater impact on the application intent than that of elementary school teachers.

In the case of H6 (Educational value → Attitude) for both elementary and secondary school teachers the perception of the educational value regarding Smart Education has a positive impact on the attitude towards Smart Education. The path coefficient value of elementary school teachers showed to have greater significance than that of secondary school teachers. This means that setting up policies that improve the perception of educational value for Smart Education to elementary school teachers will have a more positive impact compared to secondary school teachers.

In the case of H7 (Teacher efficacy → Attitude) for both elementary and secondary school teachers, Smart Education teachers efficacy had a positive impact on the attitude towards Smart Education. The path coefficient value of secondary school teachers was shown to have greater significance than that of elementary school teachers. This means that in the case of secondary school teachers, educational policies that increase the teacher’s efficacy towards Smart Education having a relatively greater impact will have a more positive impact on attitude than that of elementary school teachers.

In the case of H8 (Teacher efficacy → Resistance to class) for both elementary and secondary school teachers, teachers efficacy was shown to have a negative impact on Smart Education teaching pressure. The path coefficient value of elementary school teachers had a greater negative impact than that of secondary school teachers. In the case of elementary school teachers, educational policies that increase the teacher’s efficacy towards Smart Education will have a greater impact in reducing teaching pressure compared to that of secondary school teachers.

In the case of H9 (Teacher efficacy → Organization citizenship behavior) for both elementary and secondary school teachers, Smart Education teachers efficacy was shown to have a positive impact on organizational citizenship behavior. The path coefficient value of secondary school teachers showed greater significance than that of elementary school teachers. In the case of secondary school teachers, educational policies that increase the teacher’s efficacy towards Smart Education is more efficient at manifesting the organizational citizenship behavior of secondary school teachers compared to that of elementary school teachers.

CONCLUSIONS AND PROPOSAL

Through the path coefficient group comparison above, it is possible to confirm that it is necessary to provide educational policy according to the circumstances and characteristics of the group. In other words, even if a superior educational method and policy are planned, care must be taken to avoid the disappearance of an innovative educational method, or the inability to maximize its effectiveness due to forced and hurried implementation without an effective plan of action.

Based on the results of this research, the current affairs surrounding the introduction and utilization of Smart Education are as follows.

First, for the introduction and spread of Smart Education in the case of elementary school teachers, if educational policies that raise the attitude, education value, and teacher’s efficacy towards Smart Education are implemented, more efficient utilization of Smart Education relative to secondary school teachers can be expected. Also, by reducing the teaching pressure towards Smart Education for elementary school teachers, it is possible to increase the utilization of Smart Education for elementary school teachers relative to secondary school teachers.

Second, for the introduction and spread of Smart Education, in the case of secondary school teachers, educational policies that focus on increasing the subjective norms, organizational citizenship behavior, and teachers' efficacy will effectively increase Smart Education utilization relative to that of elementary school teachers.

Third, for the introduction and spread of Smart Education, teacher's efficacy is very important for both elementary and secondary school teachers, therefore there is a need for drawing up a proposal in order to increase teacher's efficacy through educational policy and also to work hard to win the support of society in general. As is characteristic of an educational professional, if a teacher's efficacy is increased, the teacher does not only offer unbarred loyalty to the organization but also develops a high level of organizational citizenship behavior. In other words, teacher's efficacy not only increases a teacher's professionalism but also develops public education as a whole, and it is undeniable in that it also plays a critical role in developing school organization culture.

This study aimed to collect the opinions of teachers who actually have a role in the successful introduction and utilization of Smart Education. However, since the application intent of Smart Education was focused on the individual teacher's perception and psychological capacity, there could possibly be various additional variables. This study plans to address these issues in a follow up study.

First, based on the results of this study, a comprehensive discussion of the various possible influential factors on Smart Education application intent is necessary. For the application of Smart Education, the teacher's application intent was focused on the individual teacher's perception and psychological capacity. The reason the focus was placed on the teacher's perception and psychological capacity is that it was seen that teacher's application intent towards Smart Education primarily seemed to be decided upon by the teacher individual's perception and psychological capacity. But, in a school organization, because the teacher's perception and psychological capacity is not an independent element, there will in fact be various influencing factors.

REFERENCES

Ashton, P. (1984). Teacher efficacy: A motivational paradigm for effective teacher education. *Journal of teacher education, 35*(5), 28-32.

Bandura, A. (1997). *Self-Efficacy: The excercise of control*. NY: W. H. Freeman & Company.

Bateman, T. S., & Organ, D. W. (1983). Job satisfaction and the good soldier: The relationship between affect and employee "citizenship". *Academy of management Journal, 26*(4), 587-595.

Belogolovsky, E., & Somech, A. (2010). Teachers' organizational citizenship behavior: Examining the boundary between in-role behavior and extra-role behavior from the perspective of teachers, principals and parents. *Teaching and Teacher Education, 26*(1), 914-923.

Brady, K. P., Holcomb, L. B., & Smith, B. V. (2010). The use of alternative social networking sites in higher educational settings: A case study of the e-Learning benefits of Ning in education. *Journal of Interactive Online Learning, 9*(2), 151-170.

Bullock, D. (2004). Moving from theory to practice: An examination of the factors that preservice teachers encounter as they attempt to gain experience teaching with technology during field placement experiences. *Journal of Technology and Teacher Education, 12*(2), 211-237.

Chin, W. W. (1998). Issues and opinion on structural equation modeling. *MIS Quarterly, 22*(1), 7-16.

Cho, S. (2009). Smartphones used for foreign language learning. *Multimedia Assisted Language Learning, 12*(3), 211-228.

Choi, S., Kim, K., Lee, C., & Seul, Y. (1999). Effective use of multimedia computer courseware in English language teaching and learning. *Multimedia Assisted Language Learning, 2*(1), 179-256.

Cochrane, T., & Bateman, R. (2010). Smartphones give you wings: Pedagogical affordances of mobile Web 2.0. *Australasian Journal of Educational Technology, 26*(1), 1-14.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New Jersey: Lawrence Erlbaum.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly, 19*(2), 189-211.

Davis, R., & Wong, D. (2007). Conceptualizing and measuring the optimal experience of the e-Learning environment. *Decision Sciences Journal of Innovative Education, 5*(1), 97-126.

Ellsworth, J. B. (2000). *Surviving Change: A Survey of Educational Change Models*. Syracuse University, Syracuse, NY: ERIC Clearinghouse on Information and Technology.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, Mass: Addison-Wesley.

Fornell, C., & Cha, J. (1994). Partial least squares. In R. P. Bagozzi (Ed.), *Advanced methods of marketing*

research (pp. 52-78). Cambridge, England: Blackwell.
Gangadharbatla, H. (2008). Individual differences in social networking site adoption. In C. Romm-Livermore & K. Setzekorm (Eds). *Social networking communities and e-dating services: Concepts and Implications*(pp. 1-17). Hershey, PA: IGI.
Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of educational psychology, 76*(4), 569-582.
Goddard, R. D., Hoy, W. K., & Hoy, A. W. (2000). Collective teacher efficacy: Its meaning, measure, and impact on student achievement. *American Edztcaliortal Research Journal, 37*(2), 479-507.
Greenberg, J., & Baron, R. A. (2008). *Behavior in organizations*. Upper Saddle River, NJ.
Greenhow, C., & Robelia, B. (2009). Informal learning and identify formation in online social networks. *Learning, Media & Technology, 34*(2), 119-140.
Haenlein, M., & Kaplan, A. (2012). A beginner's guide to partial least squares analysis. *Understanding Statistics, 3*(4), 283-297.
Hur, J. (14 May. 2012). Half of mobile phone subscribers use a smartphone. *Hankookilbo* [Online],< http://news.hankooki.com/lpage/economy/201205/h2012051421092821540.htm>. (27 Jul. 2012)
Hysong, S. J., & Miguel, A. (1998). *The relationship between self-efficacy and performance: A meta-analysis*. Working Paper, Rice University.
Jang, D., & Cho, S. (2002). The factors influencing on intra-organizational innovation resistance of users and the moderating effects of self-efficacy. *Journal of Consumer Studies, 13*(3), 245-262.
Jo, J., & Lim, H. (2012). A conceptual model of smart education considering teaching-learning activities and learner`s characteristics. *The Journal of Korean association of computer education, 15*(4), 41-49.
Kang, B., & Kang, J. (2009). The study on factors affecting the use intention of traceability system. *The Journal of Internet Electronic Commerce Research*, 9(2), 409-438.
Keenan, A. P., & Lee, Y. K. (2006). The influence of system characteristics on e-learning use. *Computer & Education, 47*(3), 222-244.
Keil, M., Tan, B. C. Y., Wei, K. K., Saarinen. T., Tuunainen, V., & Wassenaar, A. (2000). A cross-cultural study on escalation of commitment behavior in software projects. *MIS Quarterly, 24*(2), 299-325.
Kersaint, G., Horton, B., Stohl, H., & Garofalo, J. (2003). Technology beliefs and practices of mathematics education faculty. *Journal of Technology and Teacher Education, 11*(4), 549-577.
Kim, D., & Kim, S. (2011). Factors influencing users' resistance to location based SNS application for smart phones. *Korean journal of broadcasting, 25*(3), 133-166.
Kim, H., & Kim, H. (2012). A framework for developing learning activities for smart education and an instructional model. *The Journal of Korean association of computer education, 15*(4), 25-39.
Kim, I. (1998). *The theory and practice of multimedia English education of 21 century*. Seoul: Parkmungak.
Kim, M., & Han, G. (2006). A study on factors affecting the satisfaction and intention to use ICT in elementary, junior and commercial high schools. *The Journal of Korean Teacher Education, 23*(3), 143-166.
Kim, M., Cho, H., Han, J., & Han, G. (2009). Factors influencing elementary school teachers' intention of accepting the robot-in-education program. *The Journal of Korean Teacher Education, 26*(1), 427-449.
Kim, T., Oh, M., & Kim, M. (2010). An empirical investigation of the critical factors influencing learner intention: EBS vs private e-Learning contents providers` cases. *Journal of Korean Association for Educational Information and Media, 16*(3), 363-383.
Kim, Y., & Son, J. (2011). A study on design of K-12 e-learning system for utilization smartphone. *Journal of Korean Society for Internet Information, 12*(4), 135-143.
Lee, J. (2011). A dynamic modeling on the adoption of smart learning by system dynamics. *The Journal of Korea Society of IT Services, 9*(1), 89-92.
Lee, M. (2001). A critical analysis on the mandatory computer education for elementary school children. *The Journal of Elementary Education, 14*(2), 279-301.
Lee, S. (2010). Smartphone and university education. *Engineering education and technology transfer*, *17*(2), 10-13.
Lee, S., & Jung, A. (2010). A study on the learning and teaching processing for the e-learning contents using smart phone. *The Institute of electronics engineers of Korea conference collection of dissertations, 11*(1), 593-594.
Lee, Y. (2012). The influence of smartphones on the off-task behavior of college students. *The Journal of Yeolin Education, 20*(1), 221-250.
Lee, Y., Kozar, K. A., & Larsen, K. (2003). The technology acceptance model: Past, present,. and future. *Communications of the Association for Information Systems,12*(5). 752-780.
Lim, K. (2011). Research on developing instructional design models for enhancing smart learning. *The Journal of Korean association of computer education, 14*(2), 33-45.
Marcinkiewicz, H. R., & Regstad, N. G. (1996). Using subjective norms to predict teachers. *Journal of Computing in Teacher Education, 13*(1), 27-33.

Marcinkiewicz, H. R., & Regstad, N. G. (1996). Using subjective norms to predict teachers' computer use. *Journal of Computing in Teacher Education, 13*(1), 27-33.
Mun, C., & Kim, J. (2011). Interaction and flow as the antecedents of e-learner satisfaction. *The journal of Korean association of computer education, 14*(3), 63-72.
Ncube, K. (1998). *Science and mathematics centres: Their development and current status.* Paper presented at the Swaziland regional workshop on Developing Teacher Leadership for Curriculum Innovation in Mathematics and Science, Manzini.
Newby, T., Stepich, D., Lehman, J., & Russell, J. (2000). *Instructional Technology for Teaching and Learning: Designing Instruction, Integrating Computers, and Using media*. OH: Prentice-Hall.
Noh, K., Ju, S., & Jung, J. (2011). An exploratory study on concept and realization conditions of smart learning. *The Journal of Digital Policy and Management, 9*(2), 79-99.
Oh, Y., & Jung, J. (2006). A qualitative study on the teachers' culture of vocational high school. *The journal of educational administration, 24*(1), 69-96.
Oreg. S. (2003). Resistance to change: Developing an individual differences measure. *Journal of Applied Psychology, 88*(4), 680-693.
Organ, D. W., Podsakoff, P. M., & MacKenzie, S. B. (2006). *Organizational citizenship behavior: Its nature, antecedents and consequences*. Thousand Oaks: Sage Publication.
Park, S. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Educational Technology & Society, 12*(3), 150-162.
Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education, 37*(2), 163-178.
Potosky, D. (2002). A field study of computer efficacy beliefs as an outcome of training: the role of computer playfulness, computer knowledge, and performance during training. *Computers in Human Behavior, 18*(3), 241-255.
Ram, S. (1987). A model of innovation resistance. *Advances in Consumer Research 14*(1), 208-212.
Schon, D. A. (1987). *Educating the reflective practitioner*. Presentation to the 1987 meeting of the American Educational Research Association.
Singhal, M. (1997). The internet and foreign language education: Benefits and challenges. *The Internet TESOL Journal, 3*(6). 391-408.
Tenenhaus, M., & Esposito Vinzi, V. (2005). PLS regression, PLS path modeling and generalized procrustean analysis: a combined approach for PLS regression, PLS path modeling and generalized multiblock analysis. *Journal of Chemometrics, 19*(1), 145-153.
Teo, H. H., Chan, H. C., Wei, K. K., & Zhang, Z. (2003). Evaluating information accessibility and community adaptivity features for sustaining virtual learning communities. *International Journal of Human-Computer Studies, 59*(5), 671-697.
Teo, T. (2010). A path analysis of pre-service teachers' attitudes to computer use: applying and extending the technology acceptance model in an educational context. *Interactive Learning Environments, 18*(1), 65-79.
Thomas, H. (2010). Learning spaces, learning environments and the dis "placement" of learning. *British Journal of Educational Technology, 41*(3), 502-511.
Tondeur, J., Valcke, M., & Van Braak, J. (2008). A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. *Journal of Computer Assisted Learning, 2*4(6), 494-506.
Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of educational research, 68*(2), 202-248.
Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(1), 186-204.
Warburton, J., & Terry, D. J. (2000). Volunteer decision making by older people: A test of a revised theory of planned behavior. *Basic and Applied Social Psychology, 22*(1), 245-257.
Yang, S. (2012). Exploring college students' attitudes and self-efficacy of mobile learning. *The Turkish Online Journal of Educational Technology, 11*(4), 148-154.
Yuan, y., & Lee, C. Y. (2012). Elementary school teachers' perceptions toward ICT: The case of using magic board for teaching mathematics. *The Turkish Online Journal of Educational Technology, 11*(4), 108-118.
Yue, K., De Silva, D., Kim, D., Aktepe, M., Nagle, S., Boerger, C., Jain, A., & Verma, S. (2009). Building real world domain-specific social network websites as a capstone project. *Journal of Information Systems Education, 20*(1), 67-76.
Zimmerman, J. (2006). Why some teachers resist change and what principals can do about it. *NAASSP Bulletin, 90*(3), 238-252.

EFFECTIVENESS OF LAPTOP USAGE IN UAE UNIVERSITY UNDERGRADUATE TEACHING

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ABSTRACT
Laptop use for undergraduate students is increasingly becoming commonplace, and is often deemed a necessity. Students are using laptops for academic as well as non-academic activities. Researchers are debating the effect of this trend on students' educational and learning outcomes, thus, there is a need for investigation to determine how efficient the use of laptops is in the educational process. The main purpose of this study is to investigate the effectiveness of the use of laptops in enhancing learning at the undergraduate level. This is achieved by collecting data from a random sample of students at the United Arab Emirates University's Colleges of Engineering, Science, and Information Technology. The data are also analyzed to explore if students perceive that instructors should have control over the use of laptops in their classes, students' Information Technology (IT) knowledge and the effect of the use of laptops in class on the consultation of text books.

1. INTRODUCTION

Laptops have become standard tool used by most universities' students. Furthermore, it is mandatory in many undergraduate colleges around the world for students to utilize them in their study. The number of universities with plans for campus-wide computer adoption is quickly growing (Weaver & Nilson, 2005; Brown, Burg, & Dominick, 1998). E-learning as well as design and simulation programs are main drivers of the development in this field. In United Arab Emirates University (UAEU), it is a mandatory that each student, regardless of his/her major, to have a laptop; the campuses are equipped with wireless network connectivity in all academic and non-academic facilities. The university policy is promoting the use of laptops in lectures in the aim of developing a more interactive type of classes and enhancing lecture delivery. Therefore, the UAEU campus will be selected for implementing this study. Educators all over the world are having mixed feeling about students having full access to internet and laptops in class (e.g., Meierdiercks, 2005; Young, 2006). In his study, Fried (2008) reported the effect of laptop programs throughout what known as ubiquitous computing environment on schools' campus on the student learning. Fitch (2004) and Stephen (2005) in their study found out that faculty-student interaction is promoted throughout using of laptop and it improved in class participation which encourages active learning. Driver (2002) reported that class satisfaction and enhancing group project could be achieved by using laptops coupled with web-page activities. Granberg & Witte (2005) did not find major differences in students' grades when laptops were used as compared to their grades when laptops weren't used. Fried (2008) discussed the shortcoming of studies addressing the benefits gained by the students using laptops. He limited his discussion to two main reasons: first, the lack of having objective tools to assess the actual level of learning and benefit and orienting the focus on the level of student participation. The second reason that most studies concentrated on classes which are designed for using such technology and how professors tuned their classes to make use of the new technology. This is why the study suggested the idea of the comprehensive use of laptops in class is not used all over the universities. Meanwhile, many educators raised the issue that usage of laptops is a source of distraction for students in class and it should be carefully monitored. Indeed, some studies, such as the one done by Levine (2002a) & (2002b), suggested that instructors should have special software to control the students' use of laptops during class time. Kay & Lauricella (2011) investigated and compared beneficial and challenging laptop behaviours in higher education classrooms. Kay & Lauricella (2011) and Lindorth & Bergquist (2010) reported beneficial behaviours such as note-taking activities, in-class laptop-based academic tasks, collaboration, increased focus, improved organization and efficiency, and addressing special needs. Challenges observed by Kay & Lauricella (2011) are as follows: students' distracting laptop behaviours, instant messaging, surfing the web, playing games, watching movies, and decreased focus. However, Kay & Lauricella (2011) reported beneficial behaviours more often than challenging behaviours by a factor of 2:1. They concluded that actively integrating meaningful laptop activities into the classroom will increase the frequency of beneficial laptop behaviours. Indeed, a number of researchers have concluded that if faculty do not make an active attempt to meaningfully integrate technology into the classroom, distractions and decreased performance are inevitable (Baron et al., 2008; Hall & Elliot, 2003; Kolar, Sabatini,& Fink, 2002; MacVay, Snyder, & Graetz, 2005; Weaver & Nilson, 2005).

Whitefield (2012) emphasized that educators should not assume that all students are the same, use technologies the same way, or that they learn in the same way. Watulak (2012) warns us that there are some students who feel disconnected between their participation in a pro-technology discourse of the educational and their own personal technological practices. Educators need to be mindful of these types of students and offer a range of learning opportunities for all kinds of students that will allow them to succeed (Whitefield, 2012).

The present study addresses primarily the question of the effectiveness of laptop use on the educational earning of university students in United Arab Emirates University students in particular, in traditional lecture classes' environment. In addition to that, the study explores if students perceive that instructors should have control over the use of laptops in their classes, students' IT knowledge and the effect of the use of laptops in class on the consultation of text books.

2. Methodology

This study has been conducted in a sample of undergraduate female students from the United Arab Emirates (UAE) University's Colleges of Engineering, Science, and Information Technology. Indeed, the university official statistics indicates that 74.9% of the students registered at the UAE University, during the 2010/2011 academic year, are female students (3,082 male students and 9,197 female students).

A questionnaire (Appendix A) was developed to determine the effectiveness of the use of laptops in the class room. Prior to the distribution of the questionnaire, reliability was calculated using the Cronbach's alpha coefficient which revealed that the questionnaire has an overall reliability of 0.77which indicates that the test is deemed reliable.

The questionnaire was distributed to 143 female students in the colleges of Science, Engineering and Information Technology to asses primarily the effectiveness of the use of laptops in the class room. Laptops were deemed to be effective in increasing educational learning if:
1) Their use enhanced faculty-student interaction
2) They were used for academic purposes by students
3) They weren't used much for non-academic purposes
4) They helped students to perform class-related work and projects more efficiently
5) They improved work organization
6) They helped students in increasing their concentration in class
7) Their use improved the learning experience for students with special needs.

The above criteria for educational effectiveness were presented in the questions one to seven in the questionnaire in the respective order. The students were allowed to answer each question on a Likert scale from one to five; one being strongly agreed and five strongly disagree.

In order for the use of laptops to be considered effective in enhancing the learning experience, a standard of at least 70% of the students should answer questions one to seven with the exception of question three with agree and strongly agree and at least 70% of students answering to question three with disagree and strongly disagree was preset. We selected 70% as a standard for positive responses due to our judgement of the adequacy of this percentage to evaluate the results of our study. In fact, 80% was deemed to be very high which would have led us to exclude true satisfactory responses. On the other hand, 60% would have been too low therefore resulting in including some false satisfactory responses.

In addition to assessing effectiveness, it was of interest to explore whether students think that instructors should have a high control over the use of laptops in their classes. Question eight explored this issue and it was considered that instructors must have a say on the use of laptops in their classes if 70% of the students answered to this question with agreed and strongly agreed. Students' IT knowledge was another area of interest for the researchers in this study and students were considered to have a strong IT knowledge if 70% of them answered to question nine with agreed and strongly agreed. The last issue that was explored in this study is the effect of the use of laptops in class on the consultation of text books and laptops were considered to decrease use of textbooks if 70% of students answered to question 10 with agreed and disagreed.

3. Results and Analysis

This research focuses on the study of the effectiveness of laptop use in traditional lecture classes' environment in UAE University's Colleges of Engineering, Science and Information Technology. Also this research explores if students perceive that instructors should have control over the use of laptops in their classes, students' IT knowledge and the effect of the use of laptops in class on the consultation of text books. In this section, we present the results of a survey distributed to the students in the colleges of Science, Engineering and Information Technology to asses primarily the effectiveness of the use of laptops in the class room.

A random sample of 143 students from the above colleges filled the questionnaire. The distribution of students by their college is shown in the following table:

College	Number	Percent
IT	55	38.5
Science	30	21
Engineering	58	40.5
Total	**143**	**100**

3.1 Students Responses

The report below shows the response to each question and the designated percentages.

Q1. I can understand the lecture better and interact more effectively with the instructor when I view the lecture on the laptop.

	Frequency	Percent	Cumulative Percent
Strongly agree	28	19.6	19.6
Agree	48	33.6	53.1
Neutral	33	23.1	76.2
Disagree	28	19.6	95.8
Strongly disagree	6	4.2	100.0
Total	**143**	**100.0**	

The above table shows that only 53.1% of the students either strongly agree or agree with question number 1, while 23.8% either disagree or strongly disagree. 23.1% of the students are neutral.

Q2. I use my laptop for academic purposes only (ex: note taking, finding information online, viewing the lecture notes etc.)

	Frequency	Percent	Cumulative Percent
Strongly agree	30	21.0	21.0
Agree	46	32.2	53.1
Neutral	33	23.1	76.2
Disagree	27	18.9	95.1
Strongly disagree	7	4.9	100.0
Total	**143**	**100.0**	

The above table shows that only 53.1% of the students either strongly agree or agree with question number 2, while 23.8% either disagree or strongly disagree. 23.1% of the students are neutral.

Q3. I use the laptop for chatting, checking my e-mail, playing games, or watching movies

	Frequency	Percent	Cumulative Percent
Strongly agree	29	20.3	20.3
Agree	40	28.0	48.3
Neutral	36	25.2	73.4
Disagree	25	17.5	90.9
Strongly disagree	13	9.1	100.0
Total	**143**	**100.0**	

The above table shows that 48.3% either agree or strongly agree with question number 3, while only 26.6% of the students either strongly disagree or disagree. 25.2% of the students are neutral.

Q4. I am able to do my class-work more efficiently when I have access to a laptop.

	Frequency	Percent	Cumulative Percent
Strongly agree	32	22.4	22.4
Agree	57	39.9	62.2
Neutral	28	19.6	81.8
Disagree	20	14.0	95.8
Strongly disagree	6	4.2	100.0
Total	**143**	**100.0**	

The above table shows that 62.2% of the students either strongly agree or agree with question number 4 which is considered the highest level of agreement among the first seven questions. 18.2% of students either disagree or strongly disagree. 19.6% of the students are neutral.

Q5. I take better notes when I have access to a laptop.

	Frequency	Percent	Cumulative Percent
Strongly agree	17	11.9	11.9
Agree	31	21.7	33.6
Neutral	35	24.5	58.0
Disagree	52	36.4	94.4
Strongly disagree	8	5.6	100.0
Total	**143**	**100.0**	

The above table shows that only 33.6% of the students either strongly agree or agree with question number 5, while 42.0% either disagree or strongly disagree. 24.5% of the students are neutral.

Q6. I am more concentrated and focused when I can view the lecture notes on Power Point on my laptop.

	Frequency	Percent	Cumulative Percent
Strongly agree	25	17.5	17.5
Agree	49	34.3	51.7
Neutral	35	24.5	76.2
Disagree	20	14.0	90.2
Strongly disagree	14	9.8	100.0
Total	**143**	**100.0**	

The above table shows that only 51.7% of the students either strongly agree or agree with question number 6, while 23.8% either disagree or strongly disagree. 24.5% of the students are neutral.

Q7. I have a visual/hearing or any other kind of impairment and using a laptop enhances my learning experience in class.

	Frequency	Percent	Cumulative Percent
Strongly agree	15	10.5	10.5
Agree	39	27.3	37.8
Neutral	54	37.8	75.5
Disagree	27	18.9	94.4
Strongly disagree	8	5.6	100.0
Total	**143**	**100.0**	

The above table shows that only 37.8% of the students either strongly agree or agree with question number 7, while 24.5% either disagree or strongly disagree. 37.8% of the students are neutral.

Q8. Instructors should have the authority to forbid the use of laptops during class time

	Frequency	Percent	Cumulative Percent
Strongly agree	22	15.4	15.4
Agree	55	38.5	53.8
Neutral	34	23.8	77.6
Disagree	21	14.7	92.3
Strongly disagree	11	7.7	100.0
Total	**143**	**100.0**	

The above table shows that only 53.9% of the students either strongly agree or agree with question number 8, while 22.4% either disagree or strongly disagree. 23.8% of the students are neutral.

Q9. I am scientifically prepared to use IT as needed in my courses

	Frequency	Percent	Cumulative Percent
Strongly agree	38	26.6	26.6
Agree	72	50.3	76.9
Neutral	25	17.5	94.4
Disagree	6	4.2	98.6
Strongly disagree	2	1.4	100.0
Total	**143**	**100.0**	

The above table shows that 76.9% of the students either strongly agree or agree with question number 9, while 5.6% either disagree or strongly disagree. 17.5% of the students are neutral.

Q10. The laptop replaces my hard copy text book.

	Frequency	Percent	Cumulative Percent
Strongly agree	35	24.5	24.5
Agree	35	24.5	49.0
Neutral	30	21.0	69.9
Disagree	25	17.5	87.4
Strongly disagree	18	12.6	100.0
Total	**143**	**100.0**	

The above table shows that only 49% of the students either strongly agree or agree with question number 10, while 30.1% either disagree or strongly disagree. 21% of the students are neutral.

3.2 Statistical Evaluation of the Effectiveness of Laptops for In-class Learning Enhancement

As we mentioned in Section 2 of this paper, and to evaluate the effectiveness of laptops in enhancing the learning experience based on students feedback, a standard of at least 70% of the students answering questions one to seven with the exception of question three with agree and strongly agree and at least 70% of students answering to question three with disagree and strongly disagree should be preset. We will test if the average percentage of students, who answered strongly agree and agree for the first seven questions, is greater than 70% (except question 3).

To do this, the researchers entered the cumulative percentages again and tested the average percentage against %70. The null and alternative hypotheses are as follows:
H_0: Average percentage of students selected strongly agree or agree for question number one to question number seven is less than 70% ($x<70\%$).
H_1: Average percentage of students selected strongly agree or agree for question number one to question number seven is greater than or equal 70% ($x\geq70\%$).

Test statistics
Note that in this paper, the **Std. Error Mean** is the distance between a sample mean and the population mean or it is considered the level of error (dispersion) of the data from a population mean; **Std. Deviation** is the distance between a score and a population mean or it is a measure of dispersion within the data set; and **N** is the number of samples. Also note that the selection of a confidence level for an interval determines the probability that the confidence interval produced will contain the true parameter value. Common choices for the confidence level are 0.90, 0.95, and 0.99. These levels correspond to percentages of the area of the normal density curve. In this paper, we are using the **95% confidence interval of the difference** which covers 95% of the normal curve, i.e., the probability of observing a value outside of this area is less than 0.05. Because the normal curve is symmetric, half of the area is in the left tail of the curve, and the other half of the area is in the right tail of the curve. Also in this paper, the **mean difference** is a measure of statistical dispersion equal to the average absolute difference of two independent values drawn from a probability distribution; **Sig. (2-tailed)** is Two Tailed Significance Tests; **df** is degrees of freedom; and **t** is the value of the T-Test.

The researchers used the one-sample T-test to test the likelihood that the results do not fit the null hypothesis. The results presented in the below table show that the observed data set provides no strong evidence against the null hypothesis, i.e. based on the answers analyzed from the drawn sample, the researchers can't say that the use of laptops in the class room is effective. (Only 45% of students support this idea)

T-Test

One-Sample Statistics

Std. Error Mean	Std. Deviation	Mean	N	
4.85734	12.85131	45.4429	7	Percent

One-Sample Test

Test Value = 70						
95% Confidence Interval of the Difference		Mean Difference	Sig. (2-tailed)	df	t	
Upper	Lower					
-12.6717	-36.4426	-24.55714	.002	6	-5.056	Percent

The researchers also used the same test statistic to test questions from eight to ten. The null and alternative hypotheses and the results of the test are shown in the following sub-sections.

3.3 STATISTICAL EVALUATION OF QUESTION NUMBER 8

H_0: Average percentage of students selected strongly agree or agree for the question pertaining to the Instructors should have the authority to forbid the use of laptops during class time is less than 70% ($x<70\%$).
H_1: Average percentage of students selected strongly agree or agree for the question pertaining to the Instructors should have the authority to forbid the use of laptops during class time is more than or equal 70% ($x\geq70\%$).

Test statistics
The researcher used the one-sample T-test to test the likelihood that the results do not fit the null hypothesis. The results presented in the below table show that the observed data set provides no strong evidence against the null hypothesis, i.e. based on the answers analyzed from the drawn sample, the researcher can't say that the students support that Instructors should have the authority to forbid the use of laptops during class time. (Only 54% of students support this idea)

T-Test

One-Sample Statistics

Std. Error Mean	Std. Deviation	Mean	N	
4.183	50.027	53.85	143	Q8_coded

One-Sample Test

Test Value = 70						
95% Confidence Interval of the Difference		Mean Difference	Sig. (2-tailed)	df	t	
Upper	Lower					
-7.88	-24.42	-16.154	.000	142	-3.861	Q8_coded

3.4 Statistical Evaluation of Question Number 9

H_0: Average percentage of students selected strongly agree or agree for the question pertaining to the fact that the students are scientifically prepared to use IT as needed in their courses is less than 70% ($x<70\%$).

H_1: Average percentage of students selected strongly agree or agree for the question pertaining to the fact that the students are scientifically prepared to use IT as needed in their courses is more than or equal 70% ($x\geq 70\%$).

Test statistics

The researchers used the one-sample T-test to test the likelihood that the results do not fit the null hypothesis. The results presented in the below table show that the observed data set provides strong evidence against the null hypothesis, i.e. based on the answers analyzed from the drawn sample, the researchers accept the alternative hypothesis that says that students are scientifically prepared to use IT as needed in their courses. (77% of students support this idea).

T-Test

One-Sample Statistics

Std. Error Mean	Std. Deviation	Mean	N	
3.536	42.281	76.92	143	Q9_coded

One-Sample Test

Test Value = 70						
95% Confidence Interval of the Difference		Mean Difference	Sig. (2-tailed)	df	t	
Upper	Lower					
13.91	-.07	6.923	.052	142	1.958	Q9_coded

3.5 Statistical Evaluation of Question Number 10

H_0: Average percentage of students selected strongly agree or agree for the question pertaining to the fact that the laptop replaces their hard copy text book is less than 70% ($x<70\%$).

H_1: Average percentage of students selected strongly agree or agree for the question pertaining to the fact that the laptop replaces their hard copy text book is more than or equal 70% ($x\geq 70\%$).

Test statistics

The researchers used the one-sample T-test to test the likelihood that the results do not fit the null hypothesis. The results presented in the below table show that the observed data set provides no strong evidence against the null hypothesis, i.e. based on the answers analyzed from the drawn sample, the researchers can't say that the laptop has replaced their hardcopy text books. (Only 49% of students support this idea).

T-Test

One-Sample Statistics

Std. Error Mean	Std. Deviation	Mean	N	
4.195	50.165	48.95	143	Q10_coded

One-Sample Test

Test Value = 70						
95% Confidence Interval of the Difference		Mean Difference	Sig. (2-tailed)	df	t	
Upper	Lower					
-12.76	-29.34	-21.049	.000	142	-5.018	Q10_coded

3.6 Variability Analysis based on One-way ANOVA

In this section, the researchers will use one-way ANalysis Of VAriance (abbreviated one-way ANOVA) to test whether the students from different colleges have different opinion regarding the effectiveness of the laptop and difference in their response to questions 8, 9 and 10.

Generally there is only a single F statistic ($MS_{between}/MS_{within}$) in one-way ANOVA, and this is shown on the "Between Groups" row in the following tables, where MS is the mean squares. There is also only one p-value (labeled "sig."), because there is only one (overall) null hypothesis, namely H_0: $_1 = \ldots = _k$, and because the p-value comes from comparing the (single) F value to its null sampling distribution.

3.6.1 Variability Analysis of the Effectiveness of Laptops

One-way
Descriptive
Effectiveness

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
ENG	30	50.0000	26.19421	4.78239	40.2189	59.7811	0.00	85.71
IT	55	47.2727	28.28864	3.81444	39.6252	54.9202	0.00	100.00
SC	58	41.3793	27.24879	3.57794	34.2146	48.5440	0.00	100.00
Total	143	45.4545	27.47579	2.29764	40.9125	49.9965	0.00	100.00

ANOVA
Effectiveness

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1,764.890	2	882.445	1.172	0.313
Within Groups	105,433.625	140	753.097		
Total	107,198.516	142			

By looking in the F-table with α = .05 we see that $F_{2,140}(0.05) = 3.00$, the above table shows that F-ratio (1.172) is less than this critical value (3.00). In other words, this table shows that sig. (or p) = 0.313 is greater than 0.05, hence we conclude that this table shows that there is no significant difference between students opinion regarding effectiveness of laptops in the three different colleges.

3.6.2 Variability Analysis of Question Number 8

One-way
Descriptive
Q8_coded

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
ENG	30	50.00	50.855	9.285	31.01	68.99	0	100
IT	55	50.91	50.452	6.803	37.27	64.55	0	100
SC	58	58.62	49.681	6.523	45.56	71.68	0	100
Total	143	53.85	50.027	4.183	45.58	62.12	0	100

ANOVA
Q8_coded

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2,240.415	2	1,120.207	0.444	0.642
Within Groups	353,144.201	140	2,522.459		
Total	355,384.615	142			

The above table shows that F-ratio (0.444) is less than the critical value ($F_{2,140}(0.05) = 3.00$) extracted from F-table which indicates that there is no significant difference between students opinion, in the three colleges, regarding the question if instructors should have control over the use of laptops in their classes.

3.6.3 Variability Analysis of Question Number 9
One-way
Descriptive
Q9_coded

					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
ENG	30	70.00	46.609	8.510	52.60	87.40	0	100
IT	55	83.64	37.335	5.034	73.54	93.73	0	100
SC	58	74.14	44.170	5.800	62.52	85.75	0	100
Total	143	76.92	42.281	3.536	69.93	83.91	0	100

ANOVA
Q9_coded

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4,366.530	2	2,183.265	1.225	0.297
Within Groups	249,479.624	140	1,781.997		
Total	253,846.154	142			

The above table shows that F-ratio (1.225) is less than the critical value ($F_{2,140}(0.05) = 3.00$) extracted from F-table, hence we conclude that there is no significant difference between students opinion, in the three colleges, regarding the question if the students are scientifically prepared to use IT as needed in their courses.

3.6.4 Variability Analysis of Question Number 10

One-way
Descriptive
Q10_coded

					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
ENG	30	40.00	49.827	9.097	21.39	58.61	0	100
IT	55	54.55	50.252	6.776	40.96	68.13	0	100
SC	58	48.28	50.407	6.619	35.02	61.53	0	100
Total	143	48.95	50.165	4.195	40.66	57.24	0	100

ANOVA
Q10_coded

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4,151.435	2	2,075.717	0.823	0.441
Within Groups	353,191.223	140	2,522.794		
Total	357,342.657	142			

The above table shows that F-ratio (0.823) is less than the critical value ($F_{2,140}(0.05) = 3.00$) extracted from F-table. Hence, this table shows that there is no significant difference between students opinion, in the three colleges, regarding the question if the laptops replace their hard copy text books.

4. Final Remarks on the Effect of Laptop Use on Education Quality

This study results in interesting thoughtful results about the effectiveness of the use of laptops in enhancing learning at the undergraduate level. Laptops, of course, should make a student's life easier, hence, they make education easier because the course material can be presented in a more effective way. For example, a software tool can be demonstrated in front of a class using a live demo or a recorded video, rather than asking students to read a 500 page reference manual. However, while in-class usage of laptops should increase the effectiveness of education, instructors have been given an even harder challenge. The number of contact hours for courses has been gradually decreasing without decreasing the course content (Blazquez et al., 2010; Twigg, 2005; Webb, 2010). The most common justification used for this is that since instructors have more effective tools for delivery, so they should be able to cover more material in class in less time. This very interesting reasoning usually comes from someone who is not a teacher, an administrator perhaps. We, as educators working in academia, strongly disagree with this proposition. Of course, we don't have to write as much on the board as we had to before the increased availability of technology in the classroom. However our target audience has not evolved as fast as the computers and technology have in terms of processing information. The computers have become 6 orders of magnitude faster in the last 3 decades, i.e., from a 1MHz PC to 1GHz PC in less than 30 years. The number and speed of neurons in a human brain, however, is still the same which is close to 100 billion, and they all work at a few kHz speed each, since as far back as recorded human history can tell us. Also, students these days, have more distractions than we had when we were undergraduate students. Technology allows us to present material faster in some way, but if the purpose of a university education is to create a younger generation that is ready to meet the challenges of the future, we should not speed up this process. We should give the same amount of time and attention to presenting the material, while giving enough time to absorb the material rather than less. There should be fewer one-week intensive courses than four-month courses. If the same material is spread over more time, it gives enough time to everyone to learn and to reflect. Universities have become assembly lines in our opinion, in some cases money making machines, and teaching, once considered a noble profession, has been converted into a mechanized robotic process: instructors and students run from one class to another and are always tempted by short cuts. They never have enough time to teach or learn properly or to exercise their newly acquired skills. We propose that anytime saved from the use of laptops should be dedicated to other learning activities such as in-class problem solving and working more examples with the students, and it should not be used to add more material.

5. CONCLUSION

Results were presented of a survey study on laptop use by undergraduate female students, for both academic and non-academic purposes. The effectiveness of laptop use in learning was considered, as well as exploring if students perceive that instructors should have control over the use of laptops in their classes, students' IT knowledge and the effect of the use of laptops in class on the consultation of text books. This study has been conducted in a Middle Eastern public university, and results could differ in other regions and other universities due to many factors, including gender, cultural factors, and differences in student attitudes at public and private universities. The level of competition between students existing at a university could also influence the results. After a comprehensive analysis, the study resulted in the following conclusions:

- This study did not provide strong proof that the use of laptops in the class room is effective. The majority of students are not using laptops in class for class-related material. Rather, most use laptops in class for nonrelated material, implying that laptops are likely a source of distraction during class time. This suggests that the use of laptops in class should be improved to serve the courses more effectively. Overall, the students had a positive feeling about use of laptops in specific types of classes, believing that their use improves the level of interaction between students and instructors, thus enhancing the educational process.
- The students do not support that Instructors should have the authority to forbid the use of laptops during class time. Indeed, the students had mixed feelings, ranging from neutral to disagreement on the possibility of the instructor controlling the use of laptops in class.
- This study confirmed that students are scientifically prepared to use IT as needed in their courses.
- This study confirmed that laptops did not replace their hardcopy text books. In other words, the results did not show strong evidence that students' use of laptops results in abandoning the hardcopy textbooks or the use of libraries.
- Lastly but not the least, this study showed that there is no significant difference between students opinion regarding effectiveness of laptops in the three different colleges. Indeed, the survey results did not show differences in opinion between the three involved areas of study (engineering majors, sciences and information technology).

REFERENCES

Baron, A. E., Feyten, C. M., Venable, M., Hilbelink, A., Hogarty, K. Y., Kromrey, J. D., & Lang, T. R. (2008). Laptop computers in teacher preparation: Lesson learned from the university of South Florida implementation. Journal of Computing in Higher Education, 20(1), 95-117. doi: 10.1007/BF03033433

Blazquez, F., Arribas, J. R., Veganzones, C., Platero, C. A., & Ramirez, D. (2010). Adaptation of the Electric Machines Learning Process to the European Higher Education Area. International Journal of Engineering Education, 26 (1). pp. 40-51. ISSN 0949-149X

Brown, D. G., Burg, J. J., & Dominick, J. L. (1998). A strategic plan for ubiquitous laptop computing. Communications of the ACM, Vol. 41, No. 1, 26–35.

Driver, M. (2002). Exploring student perceptions of group interactions and class satisfaction in the web-enhanced classroom. The Internet and Higher Education, 5, 35–45.
Fitch, J. L. (2004). Student feedback in the college classroom: A technology solution. Educational Technology Research and Development, 52, 171–181.
Fried, C. B. (2008). In-class laptop use and its effects on student learning. Computers & Education, 50, 906–914.
Granberg, E. & Witte, J. (2005). Teaching with laptops for the first time: Lessons from a social science classroom. New Directions for Teaching and Learning, 101, 51–59.
Hall, M., & Elliot, K. M. (2003). Diffusion of technology into the teaching process: Strategies to encour-age faculty members to embrace the laptop environment. Journal of Education for Business, 78(6), 301-307. doi: 10.1080/08832320309598617
Kay, H. R. & Lauricella, S. (2011). Exploring the Benefits and Challenges of Using Laptop Computers in Higher Education Classrooms: A Formative Analysis. Canadian Journal of Learning and Technology, Vol. 37(1).
Kolar, R. L., Sabatini, D. A., & Fink, L. D. (2002). Laptops in the classroom: Do they make a difference? Journal of Engineering Education, 91(4), 397-401. Retrieved from http://findarticles.com/p/articles/mi_qa3886/is_200210/ai_n9115111/?tag=content;col1
Levine, L. E. (2002a). Using technology to enhance the classroom environment. T.H.E. Journal, 26(6), 16–18.
Levine, L. E. (2002b). Laptop classrooms present new teaching challenge. T.H.E. Journal, 30(5), 10.
Lindorth, T., & Bergquist, M. (2010). Laptopers in an educational practice: Promoting the personal learning situation. Computer & Education, 54(2), 311-320. doi:10.1016/j.compedu.2009.07.014.
MacVay, G., Snyder, K. & Graetz, K. (2005). Evolution of a laptop university: a case study. British Journal of Educational Technology, 36, 3, 513–524.
Meierdiercks, K. (2005). The dark side of the laptop university. Journal of Information Ethics, Vol. 14, No. 1, 9–11.
Stephens, B. R. (2005). Laptops in psychology: Conducting flexible in-class research and writing laboratories. New Directions for Teaching and Learning, 101, 15–26.
Tony Whitefield, "PEDAGOGY IN THE EVOLVING TECH ENVIRONMENT – WHAT HAS CHANGED?", Proceedings of International Conference on Information Communication Technologies in Education (ICICTE), pp. 283, Rhodes, Greece - July 5-7, 2012, ISBN: 978-99957-0-244-1.
Twigg, C. A. (2005, July). Improving Learning and Reducing Costs: New Models for Online Learning. Keynote address at the annual meeting for the Association for Learning Technology, Manchester, England.
Watulak, S. L. (2012). 'I'm not a computer person': Negotiating participation in academic discourses. British Journal of Educational Technology, 43(1), 109 – 118.
Weaver, B. E., & Nilson, L. B. (2005). Laptops in class: What are they good for? What can you do with them? New Directions for Teaching and Learning, no. 101, (pp. 3–13). Wiley Periodicals, Inc.
Webb R. (2010). A New Undergraduate Model for Broadly Based Spatial Science Curriculum at Queensland University of Technology: Diversity in Surveying Curriculum. Proceedings, FIG Congress. Sydney.
Young, J. R., (2006). The fight for classroom attention: professor vs. laptop. The Chronicle of Higher Education, Vol. 52, Issue 39, A27. Web Version: http://chronicle.com/free/v52/i39/39a02701.htm

Appendix A

Question No.	Question	(1) Strongly Agree	(2) Agree	(3) Neutral	(4) Disagree	(5) Strongly Disagree
1.	I can understand the lecture better and interact more effectively with the instructor when I view the lecture on the laptop.					
2.	I use my laptop for academic purposes only (ex: note taking, finding information online, viewing the lecture notes etc.)					
3.	I use the laptop for chatting, checking my e-mail, playing games, or watching movies					
4.	I am able to do my class-work more efficiently when I have access to a laptop.					
5.	I take better notes when I have access to a laptop.					
6.	I am more concentrated and focused when I can view the lecture notes on Power Point on my laptop.					
7.	I have a visual/hearing or any other kind of impairment and using a laptop enhances my learning experience in class.					
8.	Instructors should have the authority to forbid the use of laptops during class time					
9.	I am scientifically prepared to use IT as needed in my courses					
10.	The laptop replaces my hard copy text book.					

EFFECTS OF SEGMENTED ANIMATED GRAPHICS AMONG STUDENTS OF DIFFERENT SPATIAL ABILITY LEVELS: A COGNITIVE LOAD PERSPECTIVE

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ABSTRACT
This study investigated the effects of segmented animated graphics utilized to facilitate learning of electrolysis of aqueous solution. A total of 171 Secondary Four chemistry students with two different spatial ability levels were randomly assigned to one of the experimental conditions: (a) text with multiple static graphics (MSG), (b) text with continuous animated graphics (CAG) and (c) text with segmented animated graphics (SAG). Analysis of ANCOVA was conducted by using students' pretest scores as a covariate. The results showed that the SAG is more effective than the CAG and the MSG for improving learning across all levels of spatial ability. Low spatial ability students using the SAG mode performed significantly better as compared to low spatial ability students using the CAG and the MSG mode. The SAG mode seemingly compensates for low spatial ability students' insufficient visualization skills and limited cognitive capacities by offering them an external representation which simplifies information processing and saves valuable cognitive capacities for essential cognitive tasks.

INTRODUCTION

Multimedia has emerged as one of the main interests of researchers these days. The term "multimedia" refers to the use of text and graphics to convey certain information via computer. Static graphics, for instance, have long been widely used for promoting better comprehension of textual information (Levin, Anglin, & Carney, 1987), better retrieval and transfer of knowledge (Mayer, 1989). With the rapid advancement in technologies, static graphics have been evolved into animated graphics. Researchers in chemical education found that animated graphics can enhance learners' understanding of chemistry conceptions (Williamson & Abraham, 1995), provide scaffolding and facilitate "conceptual change" (Othman Talib, Matthews, & Secombe, 2005).

Static Graphics versus Animated Graphics

Do animated graphics offer more benefits than static graphics? This question has been debated for years and yet the results remain inconclusive and inconsistent. Some research studies reported an overwhelming result in favour of animated graphics (e.g., Rieber, 1990; Thompson & Riding, 1990), while some found no advantages of animated graphics over static graphics (e.g., Hegarty, Kriz & Cate, 2003; Mayer, Hegarty, Mayer, & Campbell, 2005; Boucheix & Schneider, 2009). Tversky, Morrison and Betrancourt (2002) even argued that positive impact of animated graphics found in some studies may be due to the lack of informational equivalence between animated and static graphics conditions.

Given the motion and trajectory attributes of animated graphics (Klein, 1987), animated graphics would make the invisible and touchable visually explicit, offering learners more relevant external representation that helps them accurately encode the changes into their memory system (Rieber, 1990). In effect, the construction of "runnable" mental model is facilitated (Mayer, 1989). On the other hand, animated graphics does not always lead to an accurate mental model (Hegarty, 2004), but sometimes even carry potential for misunderstandings, misinterpretations, and misconceptions. This is particularly true when the learners are not familiar with the content (Ruiz, Cook, & Levinson, 2009). Novices tend to perceive the animated features literally (Falvo, 2008).

Animated graphics are still preferable because it makes the transition more concrete whereby learners can directly visualize the changes that otherwise have to be mentally simulated from static graphics. In other words, animated graphics reduces processing demands by replacing "cognitive processes such as abstraction, imagination or creativity that some learners are short of" (Barak, Ashkar, & Dori, 2011, p. 840). By contrast, understanding static graphics may impose high cognitive demands because learners have to mentally infer the information and concurrently construct a mental model.

However, learning from animated graphics is still particularly problematic for novices (Mayer, 2005). Overconsumption of limited cognitive resources to understand content-rich and fast-paced animated graphics may induce cognitive overload (Hoffler & Leutner, 2007). Less working memory capacity is then available for necessary cognitive activities to make sense of the learning content (Mayer & Moreno, 2003).

Segmented Animated Graphics and Learning

Many authors found evidence that segmenting an animated graphics into meaningful chunks could better fit the human cognitive architecture and yields better learning performance (e.g., Fong, 2000; Moreno, 2007; Ahmad Zamzuri & Ahmad Rizal Madar, 2010; Fong & Lily, 2010).

Segmented animated graphics compensates for the inevitable working memory limitations by providing pause between each segment and learner-control features to move from segment to segment (Ahmad Zamzuri & Ahmad Rizal Madar, 2010). The pause between segments yields extra time for cognitive processes of selecting, organizing and integrating information (Mayer, 2005) which can hardly be done when a display continuously changes (Lowe, 2004). In terms of the cognitive load perspective, segmented animated graphics could prevent learners from overusing the limited working memory resources, thus optimizing their information-processing abilities for other learning tasks (Moreno, 2007). This situation might overcome the negative learning outcomes of animated graphics caused by the threat of extraneous cognitive overload as pointed out by Hoffler and Leutner (2007).

Thus, the present study attempted to investigate if segmented animated graphics are effective in enhancing learning of electrolysis among chemistry students, particularly those who are unable to visualize the underlying sub-microscopic processes.

Spatial Ability and Learning

A considerable body of research studies on chemical education has been dedicated to the investigation of role of spatial ability. Empirical works have frequently demonstrated that spatial ability is a factor in the success of students in chemistry tasks (Bodner & McMillen, 1986; Pribyl & Bodner, 1987). Most of the correlational studies of visuo-spatial skills and chemistry have reported that high spatial students, as compared to low spatial students, are more capable of understanding and performing chemistry tasks. In few studies conducted by Bodner and his colleagues, chemistry students with high spatial ability were better able to solve given compound-naming task, structure-drawing task, synthesis-writing task and reaction-completing task (Pribyl & Bodner, 1985), to identify crystal structures and solve stoichiometry problems (Bodner & McMillen, 1986), to solve molecular geometry and crystal structure test questions (Carter, LaRussa & Bodner, 1987).

The significant difference in the performance of high spatial ability and low spatial ability students in chemistry tasks suggests a difference in the quality of internal representations that they are able to construct (Hegarty & Waller, 2004; Mohler, 2008). That is, high spatial ability students are capable of constructing a more appropriate corresponding mental representation from what they visually perceive. This will eventually help them to spatially organize and represent the problem (Larkin & Simon, 1987), enable them to make inferences explicitly, and search for information easily (Wu & Shah, 2004), which in turn, lead to greater success in chemistry understanding and problem solving.

Another explanation is contributed by Miyake and Shah (1999) that individuals with higher spatial ability may possess more spatial working memory resources than those with lower spatial ability. On the other hand, low spatial learners do not possess sufficient cognitive spaces for spatial information, inhibiting development of mental representations, thus yielding an unsatisfactory learning performance.

The present piece of work addresses the very few studies conducted concerning cognitive off-loading effects of segmented animated on learning performance of low spatial learners. Thus, this research attempted to examine if segmented animated graphics can help low spatial learners to reduce the consumption of working memory space that could be useful for other learning tasks.

RESEARCH QUESTIONS

This study investigated the effects of three graphical presentation modes – (a) text with multiple static graphics (MSG), (b) text with continuous animated graphics (CAG) and (c) text with segmented animated graphics (SAG) on learning electrolysis among students with different spatial ability levels – high spatial (HS) and low spatial (LS). The study sought to address the following questions:

1. Are there significant differences in performance among students in the SAG, CAG and MSG groups?
2. Are there significant differences in performance among students of high spatial ability (HS) and low spatial ability (LS)?
3. Are there significant differences in performance among low spatial students in the SAG, CAG and MSG

groups?

RESEARCH METHODOLOGY

In order to answer the research questions, an experiment was conducted according to a 3x2 factorial quasi-experimental design including the between groups factor – modes of graphical presentation (SAG, CAG and MSG) and the within groups factor – levels of spatial ability (HS and LS).

Research Sample

The samples were randomly selected from two different urban secondary schools that were facilitated with computer laboratories. A total of 171 Secondary Four chemistry students from five intact classes were participated in the experiment. None of these students had specific prior knowledge about electrolysis of aqueous solutions.

Treatment Conditions

There were three treatment groups – SAG, CAG and MSG in this study. Students in these treatment groups were exposed to exactly the same learning content, but the sub-microscopic processes of electrolysis were displayed in different graphical presentation modes as follows:

- MSG group (see Figure 1): A series of static graphics accompanied by relevant motion cues and text were presented simultaneously to explain the electrolysis process. For example, when explaining the movement of ions, the arrows and explanatory text were closely placed next to the static graphics. To proceed from frame to frame, the students clicked on the 'Next' button.

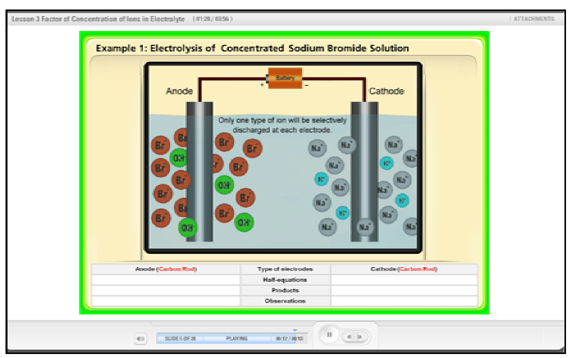

Figure 1. Screenshot of the MSG Mode

- CAG group (see Figure 2): Animated graphics were presented to demonstrate the whole molecular process of electrolysis continuously from the beginning to the end. Explanatory text, as similar to that of MSG group, was provided along with the animated graphics. For example, when explaining the movement of ions, the changes in position of ions over time came directly with the corresponding explanatory text.

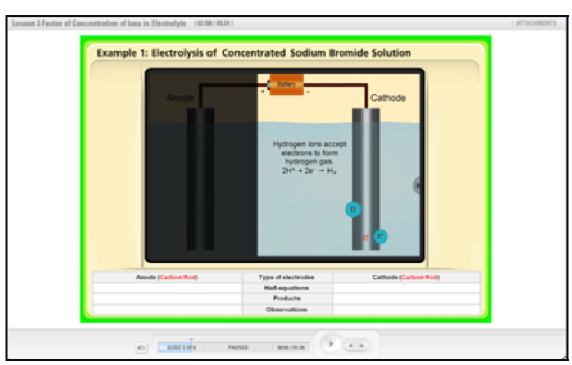

Figure 2. Screenshot of the CAG mode in motion (taken at 0.53s/0.64s)

- SAG group (see Figure 3 and Figure 4): The treatment that was given to this group is similar to that of CAG group, except that animated graphics was presented in a segmented instead of continuous manner. To proceed to the next segment, the students clicked on the 'Next' button.

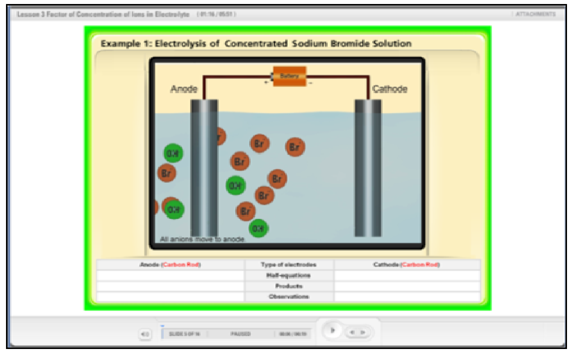

Figure 3. Screenshot of one segment of the SAG mode in motion (taken at 0.05s/0.13s)

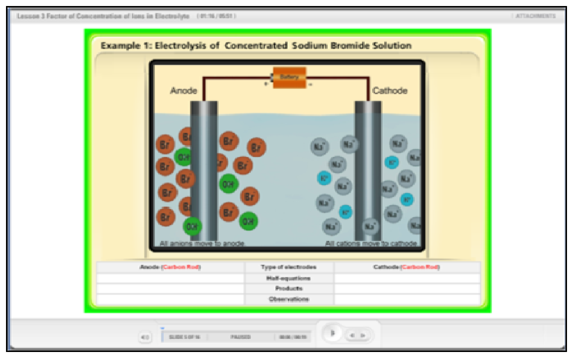

Figure 4. Screenshot of one segment of the SAG mode in motion (taken at 0.11s/0.13s)

Instruments

Two main instruments were used in this study, as follows:

- Electrolysis Performance Test: Learning was measured with a test consisting of fifteen multiple-choice questions, three structural questions and one essay-type questions. All these test items were written at lower and higher levels of Bloom's revised taxonomy (i.e., remembering, understanding, applying, analyzing and creating). The Cronbach Alpha analysis yielded a coefficient of 0.82 showing that the test instrument was reliable.
- Purdue Visualization of Rotation Test (ROT): This questionnaire was adopted from Bodner and Guay (1997), to examine students' spatial ability level. It consists of twenty test items that to be answered by the students within a time limit of ten minutes.

Research Procedure

Prior to the treatment, students' prior knowledge and spatial ability levels were measured with pretest and the ROT Test, respectively in their classes. Before the arrival of the students, the researcher and assistants installed one of the three versions of learning courseware into each computer in the computer laboratory. Students were brought to the laboratory and randomly assigned to any one of the three treatment groups – MSG, CAG and SAG. Students were free to choose their seating places in the laboratory, whereby each of them had one personal computer with pre-installed courseware. Throughout the study, students must be seated at the same place that was selected on the first day.

The treatment session involves two phases – introduction and learning. During the first lesson, students were introduced to the interfaces and functions of the various icons for 30 minutes, under the guidance of research assistants. Students learnt how to use the learning courseware and how to navigate the content. This was important to eliminate the potential effects of novelty. Students then started to learn the electrolysis concepts from the learning courseware. Students interacted with the contents three times a week (40 minutes per session). Chemistry teachers were given explicit instruction and they acted as facilitators for the whole session. The duration of the treatment was one week.

Following the treatment, students were given the posttest to measure their performance after the treatment. The results were recorded for further statistical analysis.

RESEARCH FINDINGS

In order to ascertain the equivalence between groups in term of prior knowledge, one-way analysis of variance (ANOVA) was conducted. There was no significant difference at the $p < 0.05$ significance level, as $F(2, 168) = 0.200$, $p = 0.819$, showing that the three treatment groups were homogeneous in terms of prior knowledge of the topic 'Electrolysis of Aqueous Solutions'.

To examine the appropriateness of pretest as a covariate in the later analysis of covariance (ANCOVA), a further investigation of the relationship between the pretest and the posttest was conducted using Pearson product-moment correlation. The result yielded a correlation coefficient of 0.755 ($p < 0.05$), indicating a strong correlation between the two variables. Thus, despite the three treatment groups were statistically homogeneous, this strong correlation signified the appropriateness of using pretest score as covariate. This was done to eliminate extraneous variations from the posttest score, thereby increasing measurement precision.

Performance of Students with Different Spatial Abilities in Various Treatment Groups

With the pretest score as covariate, the posttest scores were subjected to analysis of covariance (ANCOVA) to compare the effects of SAG, CAG and MSG modes on students' learning of electrolysis. The results, as in Table 1, showed a significant difference in the performance of students among the three treatment groups, $F(2, 167) = 88.197$, $p = 0.000$. As expected, the students using SAG mode performed significantly better than students using the CAG mode and the MSG mode, whereas those using the CAG mode performed significantly better than students using the MSG mode.

Table 1: ANCOVA Results for Posttest Scores by Treatment Groups with Pretest Score as Covariate

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	5163.807[a]	3	1721.269	210.100	0.000	0.791
Intercept	1023.137	1	1023.137	124.885	0.000	0.428
Pretest	3599.361	1	3599.361	439.341	0.000	0.725
Groups	**1445.138**	**2**	**722.569**	**88.197**	**0.000**	**0.514**
Error	1368.169	167	8.193			
Total	38008.000	171				
Corrected Total	6531.977	170				

[a]R Squared =0 .791 (Adjusted R Squared = 0.787)

Table 2: Mean performance (and SD) on the two spatial ability levels as a function of condition

	Treatment Conditions			
	SAG (n = 53)	CAG(n = 56)	MSG (n = 62)	Total (N = 207)
LS (n = 83)	14.04 (4.442)	9.76 (4.419)	6.94 (3.224)	10.10 (6.199)
HS (n = 88)	22.04 (4.574)	14.65 (3.629)	14.68 (4.650)	16.84 (5.429)
Total (N = 207)	17.96 (6.019)	12.46 (4.659)	10.81 (5.566)	

ANCOVA was also employed to find out whether the difference in performance of the HS and the LS students as shown in Table 2 are significant. After controlling for the pretest scores, the performance of HS and LS students were differed significantly, $F(1, 168) = 14.709$, $p = 0.000$. That is, the HS students performed significantly better than the LS students.

Using ANCOVA, the performance of LS students in SAG, CAG and MSG groups were also compared. The result, $F(2, 79) = 66.592$, $p = 0.000$, revealed a significant difference between the posttest scores of LS students across the three treatment groups. As expected, the LS students using SAG mode performed significantly better than LS students using CAG mode and MSG mode, whereas LS students using CAG mode performed significantly better than LS students using MSG mode.

DISCUSSION

Significantly better performance of SAG group provides evidence supporting the cognitive benefits of segmented animation, in accordance with cognitive theory of multimedia learning and cognitive load theory. This result concurs with study by a number of multimedia studies (e.g., Fong, 2000; Moreno, 2007; Ahmad Zamzuri & Ahmad Rizal Madar, 2010; Fong & Lily, 2010) reporting the greater effects of segmented animated graphics on facilitating conceptual understanding and knowledge transfer. The SAG mode with pause seemingly allows students to process the continuous flow of information chunk by chunk without perceptual and conceptual overload, hence optimizing their cognitive capacities for information processing (Fong & Lily, 2010). In other words, learners have sufficient time to organize the selected information from one segment into coherent mental models and integrate them with existing schemas effectively before moving to the next segment (Mayer, 2005). Construction of internal representation is thus facilitated, resulting in better comprehension. Furthermore, the SAG mode provides the students a minimal control of the learning space, stimulating them to invest cognitive resources for germane load. According to Paas, Renkl and Sweller (2003), with a substantial amount of germane load, knowledge elements being processed by working memory are most effectively stored in the long-term memory. Learners' ability to retrieve knowledge and transfer into application is thus maximized.

In a closer comparison of static and animated graphics, the finding implies that the CAG mode could reduce the students' processing demands by providing them with an explicit and dynamic external representation (Rieber & Kini, 1991). On the contrary, when interacting with the MSG mode, learners need to expend more efforts for germane load, such as inferring transition between frames and subsequently combining them into smooth event (Betrancourt, Dillenbourg & Clavien, 2008). Despite that a certain amount of germane load being added over intrinsic load is expected to maximize learning (Paas et al., 2003), but since memory capacity is limited, these so-called "good" processes may overload working memory and so inhibit learning (de Jong, 2010).

While presenting electrolysis process as a sequence of discrete parts via the SAG and MSG mode which is believed to be more congruent with learners' mental representations (Hegarty et al., 2003), the SAG group was likely to significantly outperform the MSG group. Perhaps, because of its two perceptual attributes beyond the MSG mode – motion and trajectory (Klein, 1987), the SAG mode offers learners a more relevant external representation, allowing learners to easily develop accurate mental models, thus saving more cognitive capacities for deeper learning of the knowledge domain.

The study also highlighted that there was a correlation between spatial ability and electrolysis learning process, that is, HS students significantly performed better than LS students. This could be a consequence of inadequate and irrelevant visual details being encoded in their mental representations (Hegarty & Waller, 2004) or limited cognitive capacities that are available for essential processing (Miyake & Shah, 1999) or both. Nevertheless, the learning of electrolysis among the LS students was most significantly promoted when they interacted with the SAG mode, as compared to the CAG and the MSG mode. The SAG mode seemingly compensates for their insufficient visualization skills and limited cognitive capacity by offering them an external representation which simplifies information processing on the one hand and devotes valuable cognitive capacities to essential cognitive tasks at the other hand (Moreno, 2007).

IMPLICATIONS OF THE RESEARCH STUDY

The information provided from the findings of this study has several theoretical implications. Firstly, the significant positive effect of the SAG mode over the CAG and MSG modes supported the so-called segmenting principle by Mayer's (2005). Secondly, the finding reinforces Sweller's cognitive load theory that segmenting an animated graphics could avoid additional cognitive activities that are unnecessary for comprehending the domain concepts or knowledge. The third theoretical implication of this study lies in the contribution of its findings to the growing body of knowledge. The significant differences of post scores among students using the SAG, CAG and MSG modes implied that segmented animated graphics can be most effective at promoting learning of abstract chemical processes especially for low spatial learners.

Furthermore, the study demonstrated that the integration of segmented animated graphics by chemistry educators within science lesson for secondary school students is practicable. Chunking an animated graphics can be done easily using some freely available tools in the market (e.g., Camtasia Studio 7.0 trial version, Window Movie Maker).

RECOMMENDATION FOR FUTURE RESEARCH

This study raised several interesting issues that are worthy of further research. First, future studies should investigate the robustness of the current findings by testing student performance under delayed conditions. Second, it would be particularly interesting to examine learners' engagement in the different treatment groups by using qualitative method, such as observations or interviews. Third, since this study involved only novice chemistry learners, further study that focuses on experienced learners is deemed interesting. Finally, the interaction effects of different graphical presentations can be extended to other learners' characteristics, such as locus of control, anxiety levels and field dependency. Fifth, further study focusing on the segment length, display speed, level of learners' control and pause between segments is indeed needed.

CONCLUSIONS

This study found that learning from segmented animated graphics is significantly better than learning from continuous animated graphics and multiple static graphics. Presenting an animated graphics chunk by chunk seemingly saves cognitive capacities for deeper cognitive processes. Segmented animated graphics is particularly helpful for low spatial learners who possess insufficient cognitive abilities for spatially related learning tasks. Segmenting an animated graphics seemingly allows low spatials to learn chunk by chunk, minimizing cognitive demands, optimizing their cognitive abilities for information processing and thus resulting in better learning. It is suggested that instructional designers should take into consideration the segmenting principle when using animated graphics to present learning materials, particularly among low spatial learners.

REFERENCES

Ahmad Zamzuri Mohamad Ali, & Ahmad Rizal Madar (2010). Effects of segmentation of instructional animation in facilitating learning. *Journal of Technical Education and Training, 2*(2), 15-29.

Barak, M., Ashkar, T., & Dori, Y. J. (2011). Learning science via animated movies: Its effect on students' thinking and motivation. *Computers and Education, 56*, 839-846.

Bétrancourt, M., Dillenbourg, P., & Clavien, L. (2008). Display of key pictures from animation: Effects on learning. In J. F. Rouet, R. Lowe & W. Schnotz (Eds.), *Understanding Multimedia Documents* (pp. 61-78). New York: Springer.

Bodner, G. M., & Guay, R. B. (1997). The purdue visualization of rotations test. *The Chemical Educator, 2*(4), 1-17.

Bodner, G. M., & McMillen, T. L. B. (1986). Cognitive restructuring as an early stage in problem solving. *Journal of Research in Science Teaching, 23*, 727-737.

Boucheix, J. M., & Schneider, E. (2009). Static and animated presentations in learning dynamic mechanical systems. *Learning and Instruction, 19*(2), 112-127.

Carter, C. S., LaRussa, M. A., & Bodner, G. M. (1987). A study of two measures of spatial ability as predictors of success in different levels of general chemistry. *Journal of Research in Science Teaching, 24*(7), 645-657.

de Jong, T. (2010). Cognitive load theory, educational research, and instructional design: Some food for thought. *Instructional Science: An International Journal of the Learning Sciences*, *38*(2), 105-134.

Falvo, D. (2008). Animations and simulations for teaching and learning molecular chemistry. *International Journal of Technology in Teaching and Learning, 4*(1), 68-77.

Fong, S. F. & Lily, L. P. L. (2010). Effects of segmented animation among Students of different anxiety levels: A cognitive load perspective. *Malaysian Journal of Educational Technology*, *10*(2), 91-100.

Fong, S. F. (2000). *The effect of animation on learning of procedural knowledge of meiosis among students with different psychological profiles.* Unpublished PhD Thesis, Universiti Sains Malaysia, Penang, Malaysia.

Hegarty, M. (2004). Diagrams in the mind and in the world: Relations between internal and external visualizations. In A. Blackwell, K. Marriott & A. Shimojima (Eds.), *Diagrammatic Representation and Inference* (Vol. 2980, pp. 121-132). Berlin: Springer-Verlag.

Hegarty, M., & Waller, D. (2004). A dissociation between mental rotation and perspective-taking spatial abilities. *Intelligence, 32*, 175-191.

Hegarty, M., Kriz, S., & Cate, C. (2003). The roles of mental animations and external animations in understanding mechanical systems. *Cognition & Instruction, 21*(4), 325-360.

Hoffler, T. N., & Leutner, D. (2007). Instructional animation versus static pictures: A meta-analysis. *Learning and Instruction, 17*(6), 722-738.

Klein, D. (1987). *Conditions affecting the effectiveness of animated and non-animated displays in computer-based instruction.* Paper presented at the annual meeting of the Association for the Development of Computer-Based Instructional Systems, Oakland, California.

Levin, J., Anglin, G., & Carney, R. (1987). On empirically validating functions of pictures in prose. In D. Willows & H. Houghton (Eds.), *The pyschology of illustrations* (pp. 51-80). New York: Springer-Verleg.

Lowe, R. (2004). Animation and learning: Value for money? In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds.), *Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference* (pp. 558-561). Perth, 5-6 December.

Mayer, R. E. (1989). Systematic thinking fostered by illustrations in scientific text. *Journal of Educational Psychology, 81*(2), 240-246.

Mayer, R. E. (2005). Principles for managing essential processing in multimedia learning: Segmenting, pretraining, and modality principles. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 169-182). New York: Cambridge University Press.

Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational*

Psychologist, 38(1), 43 - 52.
Mayer, R. E., Hegarty, M., Mayer, S., & Campbell, J. (2005). When static media promote active learning: Annotated illustrations versus narrated animations in multimedia instruction. *Journal of Experimental Psychology: Applied, 11*(4), 256-265.
Miyake, A., & Shah, P. (1999). Toward unified theories of working memory: Emerging general consensus, unresolved theoretical issues, and future research directions. In A. Miyake & P. Shah (Eds.), *Models of working memory: Mechanisms of active maintenance and executive control*. Cambridge, UK: Cambridge University Press.
Mohler, J. L. (2008). The impact of visualization methodology on spatial problem solutions among high and low visual achievers. *Journal of Instructional Technology, 24*(1), 1-9.
Moreno, R. (2007). Optimising learning from animations by minimising cognitive load: Cognitive and affective consequences of signalling and segmentation methods. *Applied Cognitive Psychology, 21*(6), 765–781.
Othman Talib, Matthews, R., & Secombe, M. (2005). Constructivist animation for conceptual change: An effective instructional strategy in understanding complex, abstract and dynamic science concepts. *Malaysian Journal of Educational Technology (MJET), 2*(3), 78-87.
Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist*, *38*(1), 1-4.
Pribyl, J. R., & Bodner, G. M. (1987). Spatial ability and its role in organic chemistry: A study of four organic courses. *Journal of Research in Science Teaching, 24*(3), 229-240.
Rieber, L. P. (1990). Using computer animated graphics with science instruction with children. *Journal of Educational Psychology, 82*(1), 135-140.
Ruiz, J. G., Cook, D. A., & Levinson, A. J. (2009). Computer animations in medical education: A critical literature review. *Medical Education 2009, 43*, 838-846.
Thompson, S. V., & Riding, R. J. (1990). The effect of animated diagrams on the understanding of a mathematical demonstration in 11- to 14-year-old pupils. *The British Journal Of Educational Psychology, 60*, 93-98.
Tversky, B., Morrison, J. B., & Betrancourt, M. (2002). Animation: Can it facilitate? *International Journal of Human-Computer Studies, 57*(4), 247-262.
Williamson, V. M., & Abraham, M. R. (1995). The effects of computer animation on the particulate mental models of college chemistry students. *Journal of Research in Science Teaching, 32*, 521-534.

ENGAGEMENT WITH AND PARTICIPATION IN ONLINE DISCUSSION FORUMS

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ABSTRACT
This article reports on a small-scale study that examined student engagement with and participation in a university online discussion forum site. The main aim of the study was to identify factors that encourage or discourage student participation in the forum. The study involved the tasks posted on the forum site with which students could engage and provide answers. The content of the discussion forums provided data for this study. The study used a post-graduate module with relatively high student numbers offered by an open and distance learning (ODL) institution of higher education in South Africa. A grounded theory approach was used for data analysis. The results show that participation does not mean that the discussion forums are being used effectively, and it certainly does not indicate that student learning is being enhanced. Discussion forum effectiveness and student interaction are increased by greater social presence on the part of lecturers, especially in the form of technical support, providing constructive feedback, and by setting clear expectations to help students understand what is expected of them.
Keywords: online discussion; student participation; virtual learning environment; discussion forums; student engagement; e-learning.

INTRODUCTION

The introduction of technology and the internet has provided new methods for learning and teaching, with many institutions of higher learning adopting e-learning techniques (Sharples, 2000; Farmer, 2004; Moore & Marra, 2005; Su, Bonk, Magjuka, Liu & Lee, 2005). A popular e-learning technique adopted by open distance learning (ODL) institutions is the online asynchronous discussion forum which is a technology-based technique through which the transfer of tacit knowledge is facilitated by ensuring interaction between students and lecturers (Sharples, 2000; Farmer, 2004; Valiathan, 2002). Advances in technology and students' advanced computer skills have made it possible for asynchronous online discussion forums to develop rapidly. Interaction between lecturers and students is now increasingly taking place online (Shana, 2009). Online discussion forums increase the opportunities for student participation and enhance the participation of students who may feel inhibited when required to engage in discussions in a traditional classroom setting (Kanuka, 2005). Kanuka (2005) maintains that discussion forums can improve students' critical thinking. This claim is supported by Perkins and Murphy (2006) who developed a model for measuring engagement in critical thinking in online discussions.

Discussion forums are clearly powerful tools but only if students engage with them. The current study involved the posting of a task in a university virtual learning environment, which is known as myUnisa. The University of South Africa (Unisa), an Open Distance Learning (ODL) institution in which this study was conducted, has an online student support program called myUnisa. Students can log in to myUnisa and discuss topics and issues that have been uploaded onto a discussion forum site by lecturers. The discussion forum site offers students an opportunity to engage in debate with the lecturers and fellow students anytime, anyplace, and anywhere. By providing the forum facilities, which are complete with topics for discussion, lecturers assumed that students would regularly engage in debate. However, it emerged that these online discussion forums were not being used effectively, by the students and the lecturers.

The rationale for the study was the identification of possible factors that discourage students from participating in the discussion forums. To address the rationale for the study effectively, this article draws on the literature concerned with the emerging elements of the best practices in discussion forum use, myUnisa as student support technology program and lastly, Salmon's five-stage model of online interaction (2004). Salmon's five-stage model is a useful reflective framework to consider for reviewing engagement of forum tasks for continuous improvement.

LITERATURE REVIEW

Elements of best practice

Clearly, there is significant value in the use of online discussion forums. However, collaboration and constructivist approaches to teaching do not just happen by making the technology available (Garrison, 2007).

Although online discussion forums have been widely used for about a decade, there is much emerging literature that is rich in effective strategies and tactics for their use. A framework of key concepts or critical elements is useful as a means of organising such strategies and tactics. The following section reviews some elements of best practices identified by Rose and Smith (2007) and Roper (2007) within this organising framework, such as giving clear directions, providing instructors' feedback, promoting motivation, setting expectations, organising discussions and determining the types of questions.

Giving clear directions

A lecturer must be sure to provide students with directions for online discussions that are simple, to the point and do not cause any confusion among the students (Rose & Smith, 2007). It should be made clear whether the discussion will be synchronous or asynchronous. If it is a synchronous discussion, the students will need to know where and when to meet; and if it is asynchronous, the students need to know if they must meet a deadline for responding to the questions posted.

Providing instructors' feedback

Not only are clear directions necessary, but feedback from lecturers is also needed. It is not enough for a lecturer to present an assignment. The students need to know whether they are addressing the issue in sufficient depth, whether their understanding of the issue is correct, and whether they need clarification on a certain aspect. Lecturers need to be able to shed light on the subject. The lecturer must be sensitive to the impact of their comments, as negative reinforcement is likely to result in disengagement with the use of the forum (Roper, 2007). A goal should be to ensure that the students continue to engage with the discussion groups.

Promoting motivation

Students should be motivated to contribute to the discussions (Rose & Smith, 2007). There are different ways in which this can be accomplished. To enhance participation, at the very beginning of a course a lecturer can find out what interests the students, and if possible, tie in their interests with the discussion and issue being presented on the forum. The lecturer also needs to address how students will be assessed on their participation in discussions. If a lecturer does not include this as part of the final grade, it may be very difficult to motivate students to participate in the discussion. Some students may not join in at all and other students may participate but give shallow and short responses instead of providing in-depth reflective responses that bring together their experiences with the material. It is not enough to inform students that they will be graded on their participation in the discussions: students must also know how they will be graded. There should be specific guidelines and rubrics that explain all of the assessment techniques that the lecturer will use (Rose & Smith, 2007).

Setting expectations

In addition to these factors, setting the correct expectations is essential. Lecturers should declare early in the course their expectations of students on how to participate and acquire the best out of the discussion forum. This declaration may consist of directions regarding how often students should post comments in the discussion forum site and how many they ought to post, what the pattern of their contribution should be, how the students should approach the subject and in general what is expected of them (Roper, 2007, p. 64). The expectations might be different taking into account the differences in the content of the courses. Hence, through subject-specific guidelines, students can follow the lecturers' guidance and try to achieve the goal of learning accordingly.

Organising discussions

The way that the discussions are organised plays an important role in the development process. One suggestion is to keep threaded discussions similar to an outline, "with each topic … given its own thread, separate from other conversations" (Rose & Smith, 2007, p.147). This helps students find the information that they are searching for, and when students need to return to the thread, they will know where to search for what they seek. This approach makes it much easier for students to retrieve the required information. It may also be wise to have students create different subjects for their posts for the same reason. This will help students create summaries of their discussions and will enhance their memory.

Social presence

Social presence is the extent to which students and teachers project themselves through the online forums as real people (Garrison, 2007). Social interactions enrich the learning community and underpin the development of a community of practice (Irwin & Berge, 2006). Social presence supports cognitive presence (Rourke, Anderson, Garrison & Archer, 2001) where shared goals form a community that can construct meaning through sustained communication. Tactics to enhance the development of social presence include the use of online introductions (Pelz, 2004) and the provision of social spaces (Heckman & Annabi, 2006). The tone of the discussions and students' belief that the forums provide a safe environment is also critical (Anderson & Elloumi, 2004). The tutor can model appropriate behaviour, provide effective use of online discussion forums as well as on etiquette guidelines; they can also moderate discussions and deal appropriately with unacceptable behaviour (Berge, 1995).

Determining the types of questions

Finally, the type of question that is posted in an online discussion will, to a great extent, help determine whether there will be student participation. Neal and Akin (2007) propose several types of questions. These include questions that ask for more evidence, questions that ask for clarification, open questions, linking or extension questions, hypothetical questions, cause-and-effect questions, and summary and synthesis questions.

The following section gives an overview of an online discussion forum provided on myUnisa followed by Salmon's five-stage model of online interaction.

myUnisa as a student support technology program

myUnisa is a web-based system for academic collaboration and study-related interaction. The system has been developed to supplement and enhance academic interaction and improve communication between the university and its students as well as to provide opportunities for engagement among students. One must be a *registered student* for the current academic year to gain access to myUnisa. myUnisa provides a discussion forum site for every module offered at Unisa. Discussion forums allow for 'structured' conversations between participants on a site. This means that the communications must be in a certain form, so that all participants can enjoy the maximum benefit. There are two kinds of discussions, namely a 'flat' discussion and a 'threaded' discussion. A flat discussion is one where the site participants (lecturers and students) can post replies to the main topic only. A threaded discussion allows the site participants to reply to the topic and to postings from other participants. A discussion forum is a tool that reduces the 'distance' in distance education. The lecturer can 'talk' to and with the students, and students can 'talk' to one another. Such interaction on the forum encourages the formation of learning communities.

Figure 1 below is marked with numbers to give a working knowledge of and the basic terminology relating to the discussion forum provided on myUnisa. It is essential for participants to know where to find the various resources they need on the forum. However, students will still need some form of individual technical help as general encouragement to overcome their fear of the technology.

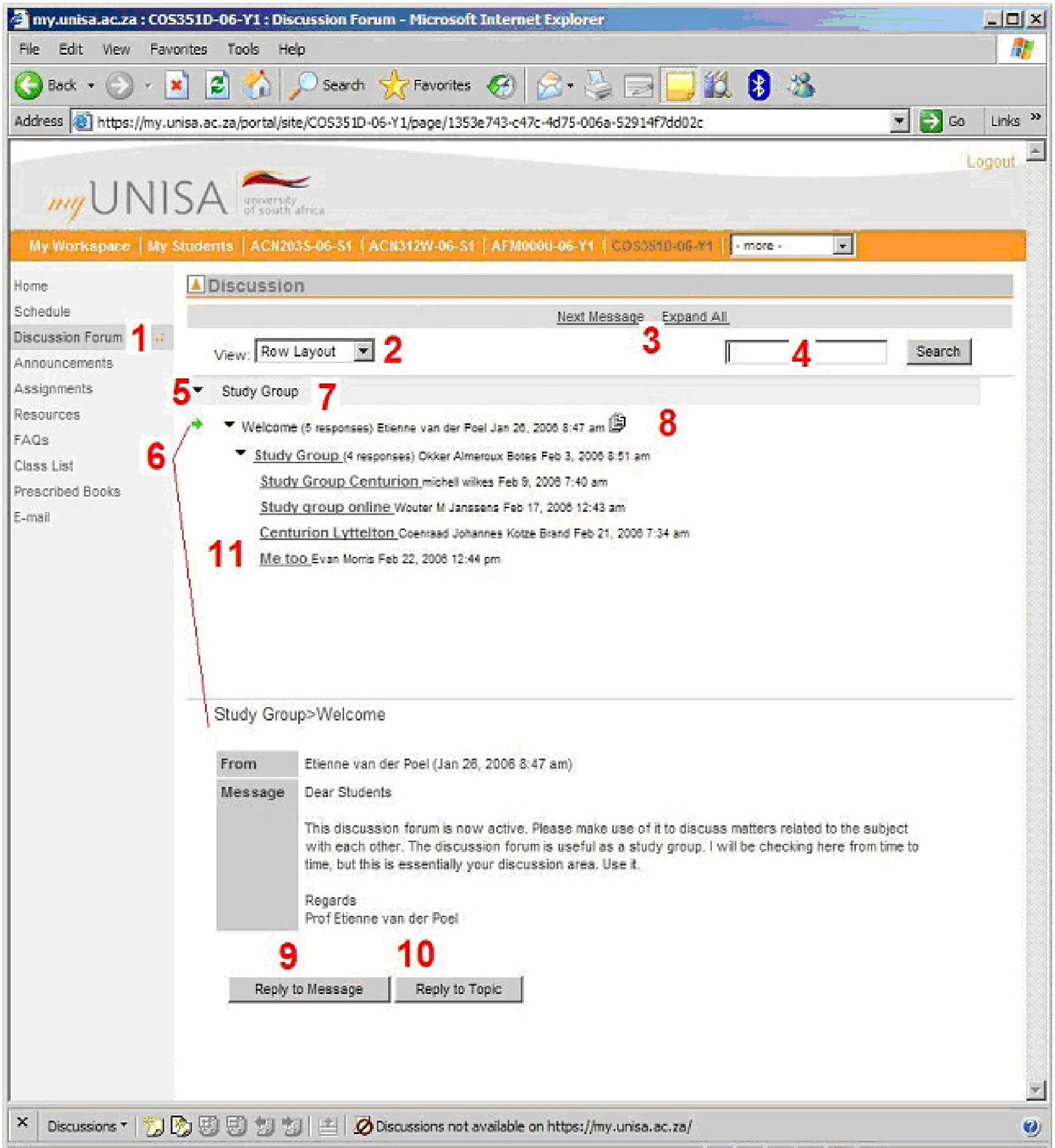

Figure 1: Discussion forum on myUnisa
(Source: http://www.unisa.ac.za/)

The icons

Students are given the following instructions in the use of the program, specifically with regard to the icons:

1. Select the discussion forum page by clicking on this link. Note that every subject has its own forum.
2. Changing the layout
   The discussion tool uses two frames to display discussion topics and replies. You can change the layout to a vertical (two-column) or horizontal (two-row) layout by using the 'view drop down list'. In the Column Layout, the left frame shows the hierarchy of categories, topics and replies. Clicking on a topic or reply shows the content of the message in the right frame. In the Row Layout, the top frame shows the hierarchy of categories, topics and replies; the content appears in the bottom frame.
3. There are tools to expand all message categories and topics or to page through the messages one by one.
4. There is a search engine to search for a specific message.
5. Black triangle – in front of the line with the topic title. Expand or collapse a topic or category to enable you to see all the postings. If the black triangle points to the right it indicates the collapsed view of that

specific category or topic and if it points down it indicates expanded view. This works in the same way as the + and – signs in a Windows folder.

6. Green arrow – in front of the Topic title. It points to the current message selected. This message is displayed below the list of categories or on the right (depending on row or column selection).
7. Category heading — top level of the hierarchy
8. Stack of papers — at the end of the same line as the topic title. List all the messages in a topic for easy printing.
9. This is the button to click if you want to start the reply to a message.
10. This is the button to click if you want to reply to a topic.

Salmon's five-stage model of online interaction

Salmon's (2004) five-stage model as presented in Figure 2 below is useful as a reflective framework tool which can assist students in identifying factors that discourage them from engaging effectively with the forum task.

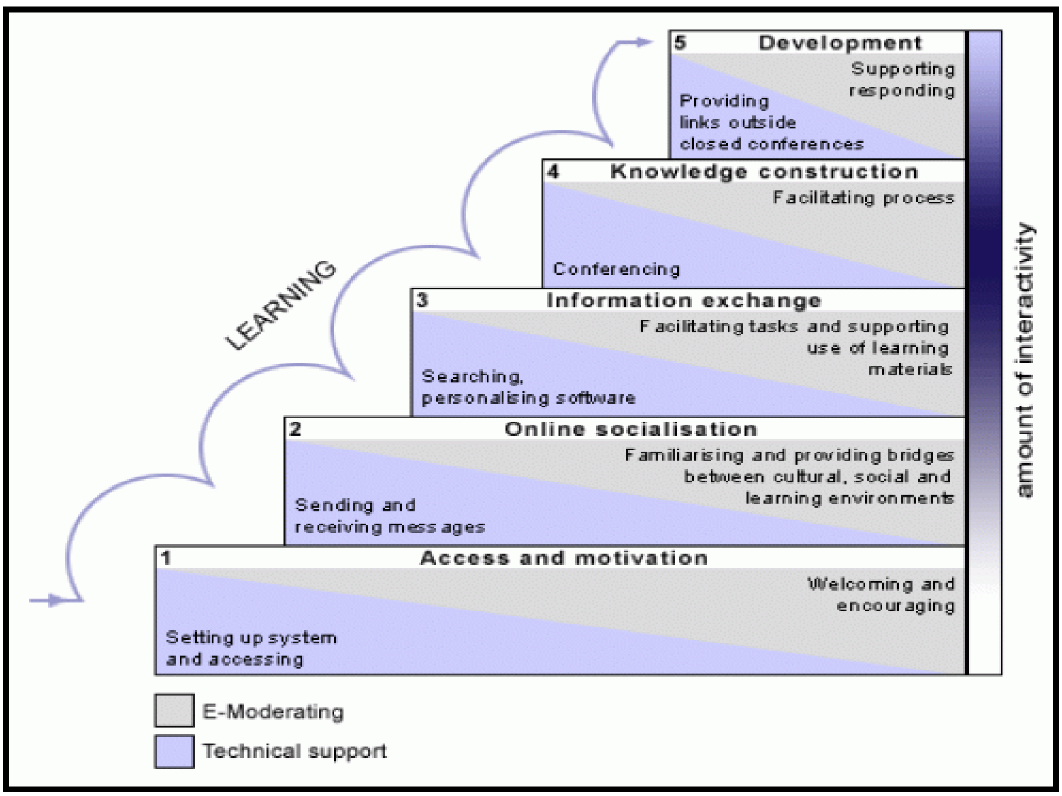

Figure 2: Salmon's five-stage model

(Source: http://www.atimod.com/e-moderating/5stage.shtml/)

Figure 2 shows that *Stage 1* is important in motivating students to participate in the forum. Students need information and technical support to get started online and strong motivation and encouragement to put in the necessary time and effort. Mastering the system can be fairly daunting to start with and requires ongoing support from lecturers. *Stage 2* emphasises the importance of the social presence of participants in the forum. Social presence as discussed in the previous sections refers to the extent to which students and the lecturer project themselves through online forums as real people (Garrison, 2007). Tactics to enhance the development of social presence include the use of online introduction (Pelz, 2004) and the provision of social spaces (Heckman & Annabi, 2006). Also, critical is the tone of the discussion and students' beliefs that the forums provide a safe environment (Anderson & Elloumi, 2004). A module lecturer needs to set the scene by promoting mutual respect, defusing any potential conflicts between individuals and helping participants with similar interests and needs find each other. When participants start to share a little of themselves online, they will be ready to move to the next stage. *Stage 3* introduces interaction between students and the learning content and other participants. At this stage, many participants are likely to need help from the lecturer in developing or refining their seeking, searching and selecting skills. A lecturer needs to provide guidance without inhibiting the free-flowing communication between students, as students derive an enormous amount of motivation and enjoyment from this personal communication. *Stage 4* expects participants to construct knowledge by drawing on real, personal situations and experiences through critical and practical thinking. A lecturer has an important role to play by enabling development of ideas through discussion and collaboration, summarising from time to time, ensuring that diverse views are given consideration and helping keep the discussion on track. This leads to *stage 5* where continuing independent learning takes place, building on the constructed ideas and reflecting on what has been learnt. Many students at this stage feel confident to confront lecturers and provide them with feedback to help improve the learning process.

METHODOLOGY

According to Yin (1994), a case study is appropriate to examine issues where investigators have little or no possibility of controlling events and the study is on contemporary phenomena in a real context. The case study approach was used in the collection of a data for this study. In using this method I sought to investigate a question where I had no possibility of controlling the events, the context being the real-life online interaction among the students themselves and the interaction between the students and the lecturer. Specific topics were uploaded by the lecturer and students were expected to work through the readings on that theme and post their comments. Comments could be in the form of questions, opinions or analysis.

Data sources

The research was conducted at Unisa, more specifically in the Department of Teacher Education, one of the biggest departments in the university. Unisa was selected because it offers distance learning programmes and has a large student body. Moreover, the university relies on print-based material and technology to communicate information to students. The study targeted the Post-Graduate Certificate (PGCE) module with relatively high student numbers in the Department of Teacher Education. These cohorts of students possess a first degree and it was believed that they were familiar with the university environment and would provide valuable information.

Data analysis method

As part of their performance contract agreement signed with their immediate line managers, lecturers are expected to post tasks on the forum and this is viewed as part of support provided to the students. The primary focus of the research on which this article is based was to identify factors that discourage or encourage student engagement with, and participation in, the online discussion forums. A forum task set up by the lecturer was observed and assessed over a period of three months (February – April). The forum task involved the first semester. As a way of encouraging the students to participate, the lecturer explained the reason for the forum task and the benefits it would offer them. Several threads were created on myUnisa to allow students to communicate online (see Figure 1 above).

I attempted to uncover all the themes by analysing the discussion forum posts through qualitative data analysis. Qualitative data was processed using a grounded theory approach (Strauss & Corbon, 1994), that is open, axial, and selective coding so that information relevant to the research could be extracted. In addition, a small-scale quantitative analysis was also performed to calculate the percentage of times each theme appeared in the discussion forum.

FINDINGS AND DISCUSSIONS

To carry out the analysis, participation was observed over a period of three months (February – April) for first semester registration. January was excluded considering that students were still trying to make sense of the study materials received. The months of May and June are reserved for semester examinations according to the Unisa year planner. Again, it must also be acknowledged that access to internet might have contributed negatively to the participation rate. Table 1 represents data collected from the discussion forum whereas Figures 3 and 4 reported the same data in a split format for better understanding and discussion purposes.

Table 1: Participation in the discussion forum

Number of students (N)	N = 2500				N = 2500		
Responses	**Basic (F*)**	**% of F***	**Substantive (F*)**	**% of F***	**Reasons for poor participation**	**F***	**% of F***
February	153	**6.1%**	328	**13.1%**	Technical problem	306	**12.2%**
March	231	**9.2%**	297	**11.9%**	Unclear expectations	206	**8.2%**
April	306	**12.2%**	184	**7.4%**	Providing feedback	408	**16.3%**

F* represents frequency

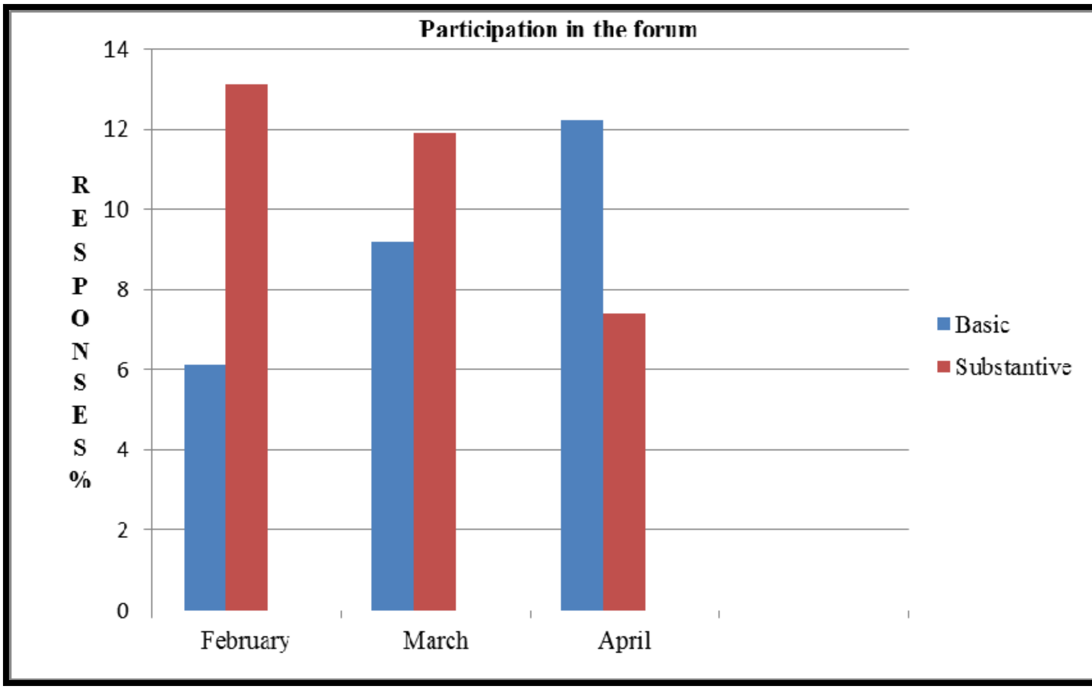

Figure 3: Participation in the forum

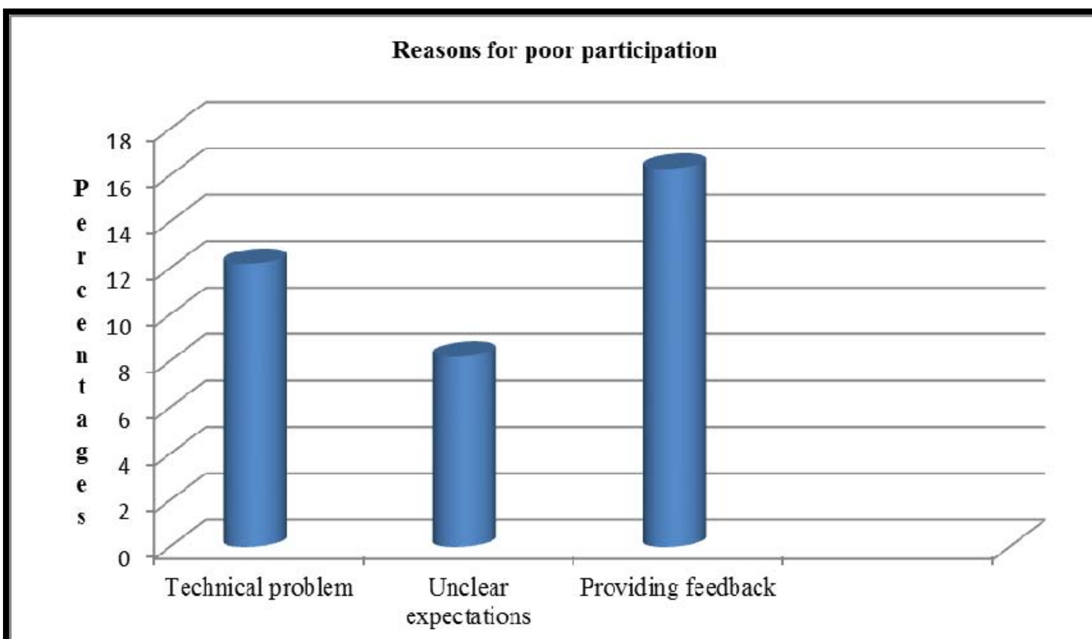

Figure 4: Reasons for poor participation

As a first step in data analysis, posts were categorised into themes. As can be seen in Table 1 and Figure 3, posts relating to the course content (responses to the activities uploaded in the forum by the lecturer) were divided into those that appeared to be **basic**, exhibiting little or no thoughts (for example: "I agree with the comment", "Yes you are correct") and those ones that were more **substantive**, indicating at least some level of thought, reflection, research and engagement in debate. Even though no attempt was made to ascertain their 'correctness', however, such posts are believed to be of great value in the student learning process. Lastly, posts that had an element of complaint and dissatisfaction were also identified and categorised as **reasons for poor participation**. As can be seen in Table 1 and Figure 4, themes that emerged from analysis included the following: *technical problem, unclear expectations* and *providing feedback.* These were common themes that featured strongly throughout the interactions. The percentages relate to proportion of times the themes emerged during all the student interactions. These percentages were calculated from the number of students registered for the module in the first semester.

As can be seen in Figure 3, in February only 6.1% of the responses were identified as basic while 13.1% were substantive. In March, the responses categorised as basic posts rose to 9.2% and substantive responses declined to 11.9%. The same happened in April: basic responses rose further to 12.2% and substantive responses declined further to 7.4%. A possible reason for the increase in the level of posts categorised as basic and the decline of posts categorised as substantive may have been insufficient motivation and unclear expectations.

Reflecting on stage 1of Salmon's (2004) five-stage model, students should be motivated to contribute to the discussions. At the very beginning of a course, a lecturer needs to find out what interests the students and, if possible, needs to tie in their interests with the discussion and issue being presented on the forum. Occasionally an external event, perhaps in the news, would prompt participation in the forum. If any assessment is to be conducted, it is important to clarify to the students how their participation in the forum will be assessed. If a lecturer does not include this part, it may be very difficult to motivate students to partake in the discussion forum. However, it is not enough to inform students that they will be assessed on their participation in the forum: the students must know how they will be assessed and what value the assessment will add in their studies. There should be specific guidelines that inform students how the assessment will be conducted as they participate in the forum. Balaji and Chakrabarti (2010) found that setting clear expectations encouraged students to complete discussions. As can been seen in Figure 4, unclear expectations as one of the reasons for poor participation featured strongly in the findings, with almost 8.2% posts.

Reflecting on stage 1 again, students might need some form of individual technical help especially when 'the system' does not respond as expected. Access to technical support needs to be made available, for example through a telephone helpline, particularly when the student is struggling to get online on his or her own. Since myUnisa crashes quite often due to the increased number of students who use the tool to submit assignments, this kind of support, if made available to students, will help a great deal. The results shown in Figure 4 validate this fact. Almost 12.2% of posts complained about technical support and assistance to enable them to participate in the discussion.

Another factor that appeared quite often in the forum is insufficient feedback with 16.1% complaints posted in the forum (Figure 4). Reflecting on stage 4 of Salmon's five-stage model, it is important for the lecturer to provide feedback and a summary of the work undertaken. Offering feedback provides evidence to the students that the lecturer is interested in their comments. In this research it appeared that the module lecturer only posted once between opening and closing posts. This was insufficient to encourage participants, especially those lurking, to interact with the content. As Andresen (2009) stresses, increased posting by the lecturer causes learners to perceive the lecturer as being more enthusiastic and having more expertise. However, lecturers must be sensitive to the impact of their comments, as negative reinforcement is likely to result in disengagement with the use of the forum. A goal should be to ensure that the students continue to engage with the discussion groups. One strategy for doing this is to synthesise student opinions so that contrasting opinions are shown. It is important to encourage the students who engage with the process.
As the number of student comments increases, it becomes necessary to synthesise this information so that it can become a resource. One strategy for doing this is to remove all comments and place them in a new file with the lecturer's comments. By using this approach it is possible to show the students that different perspectives are valued. Although this may take a relatively longer time, it should be emphasised that the lecturer is creating a resource for the next time the module is delivered.

CONCLUSION

In conclusion, I suggest that the discussion forum offers an excellent way in which lecturers can engage effectively with students studying through distance education. However, lecturers should not assume that if they post a task on a forum students will automatically engage with it. Lecturers need to be proactive, recognise the students' work and provide feedback. While this might be perceived as additional work, it should be noted that synthesising students' comments and adding commentary could provide a valuable resource for students to use in the same module in future.

CONTRIBUTION TO KNOWLEDGE

Although this research has tended to validate the findings of other research studies, it has suggested some action for lecturers to take to increase engagement and make online discussion forums more effective. It has also made some contributions to the knowledge about the integration of Salmon's (2004) five-stage model in analysing participation in the discussion forum. Salmon's five-stage model has not been widely used in researching online discussion forums. Its use in this study is therefore a methodological contribution to the online discussion literature. Another contribution to knowledge is that the integration of Salmon's five-stage model can also be used as a way of assessing students' online contributions, while students may use it as a way to understand what is expected of them as participants in online discussion forums.

REFERENCES

Anderson, T. & Elloumi, F. (2004). *Theory and practice of online learning*. Athabasca, Canada: Athabasca University.

Andresen, M. A. (2009). Asynchronous Discussion Forums: Success Factors, Outcomes, Assessments, and Limitations. *Journal of Educational Technology & Society*, 12(1), 249–257.

Balaji, M.S. & Chakrabarti, D. (2010). Student interactions in online discussion forum: empirical research from 'Media Richness Theory' perspective. *Journal of Interactive Online Learning*, 9(1), 1–22.

Berge, Z. L. (1995). The role of the online instructor/facilitator [Electronic Version]. *Educational Technology*, 35(1), 22-30.

Farmer, J. (2004). Communication dynamics: discussion boards, weblogs and the development of communities of inquiry in online learning environments. In *Beyond the comfort zone: Proceedings ASCILITE Perth*.

Garrison, D.R. (2007). Online community of inquiry review: social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks*, 11(1): 61—72.

Heckman, R. & Annabi, H. (2006). Cultivating voluntary online learning communities in blended environments [Electronic Version]. *Journal of Asynchronous Learning Networks*, 10(4), 51—66.

Irwin, C. & Berge, Z. (2006). Socialization in the online classroom [Electronic Version]. *e-Journal of Instructional Science and Technology* 9(1).

Kanuka, H. (2005). An exploration into facilitating higher levels of learning in a text-based internet learning environment using diverse instructional strategies. *Journal of Computer-Mediated Communication*, 10(3).

Moore, J.L. & Marra, R.M . (2005). A comparative analysis of online discussion participation protocols. *Journal of Research on Technology in Education*, 38(2), 191–212. myUnisa. http://www.unisa.ac.za/default/discussion forum/ (accessed 20 December 2011).

Neal, D. & Akin, L. (2007). CREST+ model: writing effective online discussion questions. Texas Women's University, Lifelong Learning, Faculty Presentation, 15 March 2007.

Pelz, B. (2004). (My) Three principles of effective online pedagogy [Electronic Version]. *Journal of A Asynchronous Learning Networks* 8(3): 33—46.

Perkins, C. & Murphy, E. (2006). Identifying and measuring individual engagement in critical thinking in online discussions: an exploratory case study. *Educational Technology & Society*, 9(1), 298–307.

Roper, A.R. (2007). How students develop online learning skills. *Educause Quarterly*, (1), 62-64.

Rose, R. & Smith, A. (2007). Chapter 9 online discussions. In Cavanaugh, C. and R. Blomeyer (Eds.), *What works in k-12 online learning* (pp. 143—160). Washington, DC: International Society for Technology in Education.

Rourke, L. Anderson, T., Garrison, D.R. & Archer, W. (2001). Assessing social presence in asynchronous text-based computer conferencing [Electronic Version]. *Journal of Distance Education*, 14(2).

Salmon, G. (2004). *E-moderating: the key to teaching and learning online*. 2nd edition. London: Routledge. http://www.atimod.com/e-moderating/5stage.shtml/.

Shana, Z. (2009). Learning with technology: using discussion forums to augment a traditional-style class. *Journal of Educational Technology & Society*, 12(3), 214—228.

Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. *Computers & Education* 34(2000), 177—193.

Strauss, A., & Corbin, J. (1994). *Grounded theory methodology*. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research*. Thousand Oaks, CA: Sage.

Su, B., Bonk, C.J., Magjuka, R.J., Liu, X & Lee, S.H. (2005). The importance of interaction in web-based education: a program-level case study of online MBA courses. *Journal of Interactive Online Learning*, 4(1), 1—19.

Valiathan, P. (2002). *Blended Learning Models. Learning Circuits: ASTD's Source for E-Learning*. Retrieved 19 October 2007 from http://learning-circuits.org/2002/aug2002/valiathan.html.

Yin, R.K. (1994). *Case study research: Design and methods*. Thousand Oaks, CA: Sage.

ENGLISH LANGUAGE INSTRUCTORS' PERCEPTIONS ABOUT TECHNOLOGY-BASED LANGUAGE LEARNING AT NORTHERN BORDER UNIVERSITY IN SAUDI ARABIA

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ABSTRACT
This study used qualitative research methods to explore English language teachers' perceptions about the use of technology for language learning at Northern Border University (NBU) in Saudi Arabia. Data collection relied on interviews. Stream of behaviour chronicles was also used as a strategy of non interactive data collection.14 non native English language instructors from Northern Border University participated in this study. Instructors identified three areas (a) availability of technology, (b) training to use technology, and (c) to overcome technical obstacles to use technology in classrooms. They were also determined to use technology for language teaching in the future. Implications of these findings for learners and educators are discussed.

INTRODUCTION
Instructional technology has become a vital part of modern global educational system. Saudi Arabia is also a part of it. Recently, King Abdullah's educational revolution has made it a very important state in the Middle East. Many colleges have been upgraded. Similarly, many new universities have been established. In 2002 there were only seven universities but now these are 33 included public and private universities. Government of Saudi Arabia is taking special initiatives to educate its people in every possible way. Highly educated faculty have been hired from around the world. Latest instruments, labs, and equipments have been provided to university students. Every year, a large sum of money is allocated for research activities. Even then, many educational issues need further research at all levels.

English language teaching is also one of the significant subjects for Saudi learners that needs further research consideration. Each university has it own English language center. In the beginning English was taught according to old methodology using black boards and grammar translation method. Now a days, university language labs are equipped with modern technology included software programs, internet, computers, and audio visual aids.

Northern Border University (NBU) is one of the newest universities in Saudi Arabia. Many types of equipment such as projectors and computers have been provided to faculty to teach different courses. The use of technology for teaching English as a foreign language is next plan of the university. There were examples of failure of audio labs. So, the researchers decided to explore the perceptions of English language teachers. One of the researchers, taught in Saudi Arabia from school to university level for nine years. The second researcher is currently teaching at NBU. Therefore, both researchers are well aware of Saudi educational system, culture, and norms.

Teachers play a major role in students' learning process. The purpose of this research study is to explore English teachers' views about the use of technology for language teaching. Little is known English teachers' beliefs for language teaching in Saudi Arabia. This study seeks to identify teachers' beliefs about technology based language learning (TBLL). The results of this study might be helpful for policy makers, school districts and rural educators.

The study will investigates what does technology mean to teachers? What concerns do they have about the use of technology for language teaching? What assumptions do they have about TBLL?

LITERATURE REVIEW
Positive effects of technology on foreign language learners' achievement have been reported (Stepp-Greany, 2002). Ajayi (2009) documented that asynchronous discussion board was an important tool to teach. The computer net-worked environment supports the language learning and exposes to authentic reading material

(Levine, Ferenz, & Reves, 2000).Good use of technology in classroom helps students in their literacy development (Ramchandran, 2004). The number of institutes, using technology in classrooms, is growing (Kargozari & Ghaemi, 2006). According to Huang, Dedegikas, and Walls (2011), multimedia technology combined with appropriate instructional design can create a good learning environment that leads to effective language learning. In another study Ghaemi, Khodbakhshzade and Kargozari (2012) found that audio/voice conference was one of the best tools to teach speaking skill especially IELTS speaking. Hermes and King (2013) recently conducted a qualitative research study and found that technology based language learning was helpful to learn and practice the language at initial stages.

The use of computer based technologies for language learning is supported by the findings of many studies. Chinnery (2006) found that mobile technologies offered manifold use of language learning. Moreover, these technologies were easily available. He also found that mobile technology was typically less expensive than PCs. Levine et al. (2000) found that in order to develop critical literacy skills for foreign language learners, computer-based technologies were more useful than the conventional method of reading. From the point of view of students' writing skill, Ramchandran (2004) found that with the use of technology in classroom most of the students wrote good research papers. He also found that the use of computer and internet improved their collaborative writing. Conroy (2010) found that a program for language analysis, called concordancer, was an effective activity for language learning and writing improvement. He also found that the internet tools and techniques were very beneficial for language learning especially Google assisted language learning (GALL). He found that the Google search was an important tool for language learning and writing improvement. According to him, Google search or concordancer was also a valuable tool to correct the mistakes. Gilgen (2005) found that PDA and laptop devices helped students in their reading and writing. He also found that traditional activities had less attention of the students. On the other hand, chatting through typing was a very popular activity. Kargozari and Ghaemi (2011) found that after using a combination of web based writing instruction and traditional writing instruction, the students improved their writing skill. There was also a significant decrease in their spelling, grammar, and punctuation mistakes.

In reviewing the importance of computer-based teaching, Gilgen (2005) observed that designing critical pedagogy is very important in order to teach students a foreign language through computer assisted language learning. His findings included the instructors who used technology had better results than those who did not use it. Kung and Chuo (2002) found that teaching through websites was effective and interesting. Levine et al. (2000) showed that the teacher' role in EFL computerized class was just a facilitator.

Regarding students satisfaction, Ramchandran (2004) found that the students who used the technology appreciated the use of it. In another study, Conroy (2010) showed that the students used concordancer and Google search independently in order to improve their writing skill and most of them were interested in using concordancer in future. Levine et al. (2000) found that students' behaviour was diligent in computerized EFL classes. In addition, Kung and Chuo (2002) found that the majority of the students owned computers and most of them had on-line access. Therefore, the students used the internet frequently. They spent plenty of time online but very few visited ESL websites. Kung and Chuo (2002) showed that the students' behaviour was positive towards learning through ESL websites, and they were satisfied with the use of ESL websites. Many of them were determined to use ESL websites in order to improve their language skills. Huang et al. (2011) found that most of the students were fully or partly satisfied with online learning. They benefited from the real life dialogues and grammar. The online discussion exercises were also helpful. The majority of the students were happy with appropriateness of multimedia and computer-based technology. However, some of them were not satisfied with pronunciation and explanation of vocabulary through technology. Further more, students and tutors felt that the on-line workload was more than in the conventional classroom. Gilgen (2005) found that the students were satisfied with the use of mobile technology for language learning. Liaw (2006) found that the students were very excited using the computers for reading and writing in English. They used online dictionary and concordancer for reading skill and they liked these tools.

The research is very clear about the importance of electronic discussion. Warschauer (1996) found that the students had greater equality of participation in the electronic discussion. He showed that the students could express themselves freely, comfortably, and creatively during electronic discussion. He also found that the students of some nationalities were more interested in electronic discussion and their attitude was positive towards learning language through technology. Warschauer (1996) also found that the electronic discussion included more formal language which was absent from face to face discussion.

Several problems have been identified with the use of technology for ESL. Kung & Chuo (2002) observed that most of the students were not familiar with the use of ESL websites. They also found that the students spent too much time to explore ESL websites. Warschauer (1996) examined that electronic discussion involved more complex language than the face-to-face discussion. Gilgen (2005) supported that PDA and laptop devices were not helpful for listening and speaking activities. Liaw (2006) concluded that technical difficulties had created problems in learning such as break down of computers. He also found that most of the students first time used computers for reading and writing. Liaw (2006) also found that the use of online dictionary was complicated for the students. According to Conroy (2010), before training very few students were familiar with concordancer and GALL.

Tanveer (2011) also supports the use of internet for language learning. In his research study both the students and the teachers were satisfied with use of internet for language learning. In another quantitative research study Yaratan and Kural (2010) presented the perceptions of teachers and found that shortage of time and lacks of technology in classrooms were two main factors identified by language teachers.

Ismail, Almekhlafi and Al-Mekhlafy (2010) found various perceptions of language teachers about using technology in classrooms. They reported teachers' perceptions such as barriers to technology use, types of technology, teachers' and students' use of technology and incentives for teachers. According to Toyoda (2001), perceptions vary from person to person. Although most of teachers agree to use technology for language teaching but their use of technology might be different depending on their beliefs (Kim, 2008).

METHODS

RESEARCH DESIGN

For this study, we used a qualitative research approach to understand and describe teachers' perceptions. We chose this methodological approach because it enables researchers to interpret and make judgement about immeasurable data (O'Tool and Beckett, 2010, p.28). This research study was conducted in a particular setting which was Northern Border University (NBU). Therefore, we relied on case study design for the purpose of our enquiry.

PARTICIPANTS

Fourteen language instructors, two with PhD degree and twelve with master degree, participated in this study. Most of them had more than five years English language teaching experience. All were non-native speakers of English language. Saudi educational system is gender based. Therefore, all the participants were male language teachers at NBU.

DATA COLLECTION AND ANALYSIS

Before conducting the research informed consent was taken from all the participants. We interviewed teachers, one by one, between January and April 2012. Every teacher had enough time to speak about his perceptions. They were told in advance that the interviews were about the use of technology for language teaching at NBU. Stream of behaviour chronicles was also used to know what participants say and do. Thus, one o the researcher observed participants.

We also used field notes. We analyzed all the data and then wrote it in themes. After that, all the participants had a look on themes in order to know their exact perceptions. When we started discussion we made sure that all the participants were aware of technology. For example one of the participants said, "I know that pen is also a technology but, here, I mean digital technology included mobiles, tablets and computers". We identified and described three main themes.

AVAILABILITY OF TECHNOLOGY

Computers and projectors have already provided to teaching staff. However, all the teachers raised the issue of availability of technology and internet for language teaching. A sampling of teacher comments is as under;
One participant said," I think we don't have language labs, without language labs we can't improve students listening skills".

Another said, "We need internet for classes. The use of internet is very helpful for language teaching especially youtube, google, and online dictionaries. Definitely, I'll use it in the future".
Talking about software one of the teacher said, " Our language classes need some language teaching soft wares to improve students' all four skill".

TRAINING TO USE TECHNOLOGY

Three teachers told that they had already used technology for language teaching at their previous institutes. Rest of the eleven teachers raised the issue of training to use technology for language teaching. A sampling is as under In terms of language labs, one teacher said, " It is very important to us to know how to use language labs and how to maximise the benefits of language labs. I have seen many language labs were closed because teachers were unable to use them".

One teacher pointed out student training as well. He said, " students training is also vitally important. In this way they can use soft wares and internet for learning at home. Teachers just provide them guidance".
An other teacher said, "we our graduate courses don't teach us how to use technology for language teaching. So, training using technology is basic to succeed in 21st century".

TECHNICAL DIFFICULTIES
The third issue raised by all the teachers, was technical difficulties. They talked about technical difficulties and how to overcome these obstacles. Some examples of their comments are as under;

One teacher's comments, "I like to teach English through technology but when I think about installation of soft wares I back up, if some one helps us by installation g soft wares then obviously we will use it".

Another teacher said, " power outage is uncommon in Saudi Arabia but if during our class it happens then our use of technology will be in vain".

FUTURE USE OF TECHNOLOGY
Some of the teachers had already used technology for language teaching and they were willing to use technology. Rest of the teachers who didn't use technology were also anxious to use it for English as a foreign language teaching. They felt the need of use of technology is basic requirement in 21st century.

One of the teacher said, "I never use technology for language teaching but it is a new technique and I'm curious to use it".

The other said, "I think in this century we need technological literate learner. So, we should need teachers who are well aware of use of technology".

An other said, " I would like to use technology and internet for language teaching. I'm interested in learning out comes of technology enhanced language learning".

DISCUSSION

This study was conducted to explore the perceptions of English language instructors at NBU. The findings present a detailed picture of teachers' beliefs about using technology for language teaching. It is clear that all the participants were determined to use technology for language teaching. Even some of them were not certain about the effectiveness of technology based language learning. They were clear about their own roles as English teachers and facilitators.

All the participants highlight the availability of digital technology to teach English language, which is being provided step by step just like other universities in Saudi Arabia. After the availability of technology, there is also need to train the staff i.e how to use this technology effectively. The results provide evidence supporting previous findings that the role of technology for foreign language teaching is very important and there are also barriers to use technology (Ismail et al. 2010).

We identified four main beliefs of English language teachers about teaching language through technology at NBU which are availability of technology, training for teachers and dealing with technical difficulties. Most importantly, all were anxious to use technology to teach. Some of them were interested to know the effectiveness of technology based language learning and some of them were willing to use to gain a new experience.

In terms of implications for research, our study was limited to NBU. We do not know about other than English faculty members' beliefs about using technology for teaching. We also do not know the perceptions of English teachers at other universities in Saudi Arabia. In future studies, the effectiveness of using technology for English language acquisition in Saudi Arabia would be helpful. How Saudi students use technology to acquire English language has not been explored.

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REFERENCES

Ajayi, L. (2009). An exploration of pre-service teachers' perceptions of learning to teach while using asynchronous discussion board. *Educational Technology & Society*, *12* (2), 86–100.

Chinnery, M.J. (2006). Emerging technologies going to the MALL: mobile assisted language learning. *Language, Learning & Technology*, *10*(1), 9-16.

Conroy, M.A. (2010). Internet tools for language learning: University students taking control of their writing. *Australasian Journal of Educational Technology*, *26*(6), 861-882.

Ghaemi, H., Khodbakhashzade, H., & Kargozari, H. (2012). IELTS speaking instruction through audio/video conferencing. *World Journal on Educational Technology, 4* (1), 18-28.

Gilgen, R. (2005). Holding the world in your hand: Creating a mobile language learning environment. *EDUCASE Quarterly*, *28*(3).

Herms, M., & King, K. A. (2013). Ojibwe language revitalization, multimedia technology, and family language learning. *Language Learning & Technology, 17*(1), 125-144.

Huang, X., Dedegikas, C., & Walls, J. (2011). Using multimedia technology to teach modern Greek language online in China: Development, implementation, and evaluation. *European Journal of Open, Distance and E Learning, 2011*(1).

Ismail, S. A. A., Almekhlafi, A.G. & Al-Mekhlafy, M. H. (2010). Teachers' perceptions of the use of technology in teaching languages in United Arab Emirates' schools. *International Journal for Research in Education, 27*(10), 37-56.

Kargozari, H.R. & Ghaemi, H. (2011). Web based writing instruction and enhancing EFL learners' writing quality. *Turkish Online Journal of Distance Education*, *12*(3).

Kim, H. K. (2008). Beyond motivation: ESL/EFL teachers' perceptions of the role of computers. *CALICO Journal, 25* (2), 241-259.

Kung, S.C., & Chuo, T.W. (2002). Students' perceptions of English learning through EFL/ESL websites. *TESL-EJ, 6*(1).

Levine, A., Ferenz, O., & Reves, T. (2000). EFL academic reading and moderntechnology: How can we turn our students into independent critical readers? *TESL-EJ*, *4*(4).

Liaw, M. (2006). E-learning and the development of inter cultural competence. *Language, Learning & Technology*, *10*(3), 49-64.

O'Tool, J. & Beckett, D. (2010). *Educational research: Creative thinking and doing. Victoria*: Oxford University Press.

Ramchandran, S. (2004). Integrating new technologies into language teaching: Two activities for EAP classroom. *TESL Canada Journal*, *22*(1).

Stepp-Greany, J. (2002). Student perceptions on language learning in a technological environment: Implications for the new millennium. *Language Learning & Technology, 1*(6), 165-180.

Tanveer, M. (2011). Integrating E-learning in Classroom-based Language Teaching: Perceptions, Challenges and Strategies. International Conference, "ICT for Language Learning" 4th edition. Retrieved from http://www.pixel-online.net/ICT4LL2011/common/download/Paper_pdf/IEC141-252-FP-Tanveer-ICT4LL2011.pdf

Toyoda, E. (2001). Exercise of learner autonomy in project-oriented CALL. *CALL-EJ Online, 2(2),* 1- 11. Retrieved from http://www.clec.ritsumei.ac.jp/english/callejonline/5-2/toyoda.html.

Warschauer, M. (1996). Comparing face-to-face and electronic discussion in the second language classroom. *CALICO Journal, 13*(2), 7-26.

Yaratan, H. & Kural, C. (2010). Middle school English language teachers' perceptions of instructional technology implementation in North Cyprus. *The Turkish Online Journal of Educational Technology, 9(*2), 161-174.

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EXAMINING FACTORS AFFECTING COLLEGE STUDENTS' INTENTION TO USE WEB-BASED INSTRUCTION SYSTEMS: TOWARDS AN INTEGRATED MODEL

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ABSTRACT
With accelerated progress of information and communication technologies (ICT), web-based instruction (WBI) is becoming a popular method for education resources distributing and delivering. This study was conducted to explore what factors influence college students' behavioral intentions to utilize WBI systems. To achieve this aim, a WBI system was developed and employed in a vocational college in Taiwan to support undergraduate courses learning. Drawing on the concepts from Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), and Social Cognitive Theory (SCT), this study proposes a nomological framework and develops an instrument for measuring college students' intention to use the WBI platform. The empirical results indicate that students show great readiness and positive intentions towards the system for their web-based learning activities and expose a possible benefit from its use in the long term. The research findings can provide instrumental suggestions for web-based instruction practices and may serve as instrumental guidelines for WBI systems to be effectively designed to advance college students' interests and activations in the virtual learning environment.
Keywords: Web-based instruction (WBI), Partial least squares (PLS), Technology acceptance model (TAM), Theory of reasoned action (TRA), and Social cognitive theory (SCT)

INTRODUCTION

Today, the ubiquity and prevalence of web-based applications in school and at home make learning and teaching through the Internet a popular method in education (Ferdig, 2005). The use of the Internet and Web technologies as an instructional tool has been regarded as an alternative education form which provides a solution for current instructional problems and creates an innovative learning environment (Fish & Gill, 2009; Tutkun, 2011). As such, various sorts of web-based instruction (WBI) platforms are developed for distributing and delivering education resources.

With the application of WBI, instructional delivery and communication between teachers and students can be performed synchronously or asynchronously. WBI systems can provide a variety of instructional aids and communication methods, and offer great flexibility for the time and place of instruction. As a result, this new type of web-based application may better accommodate the needs of learners or instructors who are geographically dispersed and have conflicting schedules (Cavas et al., 2009; Dabaj, 2009). While the Internet is becoming a new medium for learning material delivering and skills/knowledge learning, the mechanisms concerning web-based instruction are not completely understood, and the underpinning theoretical backgrounds are also not well established (Shin et al., 2012). The underdevelopment in this area necessitates researchers in several disciplines to join together to clarify what underlying factors would actually influence students' intention to use WBI systems and what the influence level of each factor concerning students' perceptions would be in such a virtual learning environment.

As the wide spread of WBI courses continues to influence students all over the world, it is critical to understand the factors to improve teachers' instruction and students' learning. The integration of Internet and Web technologies with online learning has shifted the focus from a teacher-centered classroom toward a learner-centered environment which empowers the learners with the control over the course contents and the learning processes (Fotos & Browne, 2004). In this regard, students' perceptions on the use of WBI systems need to be carefully examined. This study contributes to the body of knowledge by identifying the underlying factors influencing students' propensities towards the use of WBI systems and deliberately constructing a comprehensive conceptual framework to validate the influence level of each latent variable on students' behavioral intentions to use a WBI platform.

LITERATURE REVIEW

Three streams of theoretical works including Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), and Social Cognitive Theory (SCT) underpin this study's conceptual development. First, TRA provides the support for the determination, influenced by the individual's attitude and/or subjective norm (i.e., social influence in this study), on students' behavioral intention to use WBI. Next, TAM serves as an initial foundation for examining the relationships among students' perceptions on usefulness and ease of use, and behavioral intention towards the use of WBI systems. Finally, SCT present a sound theoretical base for the measuring of the cognitive factor to behavioral intentions to use WBI systems. Based on these three streams of works and other prior literature, this study develops a comprehensive model and the corresponding measures of the critical constructs of the research framework.

Theory of Reasoned Action (TRA) posits that an individual's performance of a specified behavior is determined by his or her behavioral intention to perform the behavior, and behavioral intention is jointly determined by the individual's attitude and subjective norm concerning the behavior in question (Ajzen & Fishbein, 1980). According to TRA, the intention to perform has direct influence on the actual behavior because people usually behave according to their intention to do it in an appropriate context and time. Therefore, TRA is regarded as an intention model per se which views the intention as the immediate determinant of the action. In addition, the individual's perceptions and beliefs, social influences may affect behavior. In TRA, social influence is named "subjective norm", defined as a "person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975). It is identified as a direct determinant of behavioral intentions in this theory. From this perspective, students may choose to use WBI systems not only because that they perceive learning via web-based environment would be useful or enjoyable, but also for the essential reason that they perceive the pressure from the people who are important to them, such as teachers, classmates, and parents.

Developed by Davis (1989), Technology Acceptance Model (TAM) is derived from Fishbein and Ajzen's Theory of Reasoned Action (TRA) to explain and predict the individual's acceptance of IT. It proposes that perceived usefulness (PU) and perceived ease of use (PEOU) of IT are the two important determinants in predicting individuals' acceptance and use of IT. As TAM is developed for tracing the impacts of external factors on internal belief, attitudes, and intentions, IS researchers have conducted plenty of studies that utilized TAM as a base to identify other determinants and relationships specific to particular IT usage in various contexts. For the past two decades, prior literature (e.g., Agarwal and Karahanna, 2000; Venkatesh & Davis, 2000) have proved that TAM is a powerful model in studies of the determinants of emerging information technology acceptance.

Social cognitive theory (SCT) is based on the concept that personal factors, environmental factors, and behavior are reciprocally interrelated (Bandura, 1986). An individual would explain, choose, and influence environment with cognitive factors in addition to being affected by environments. Behavior can then be influenced by environment; in the meantime, environment can be changed by behavior. As a consequence, cognitive and personal factors affect behavior, and in turn, are influenced by behavior (Bandura, 1986). According to SCT, self-efficacy is identified to be the key factor to judge whether or not an individual can complete a task successfully with his/her own capabilities. Self-efficacy can be achieved when the learner possess the confidence to perform certain tasks. Moreover, Bandura (1986) argued the beliefs of people's efficacy are a crucial influencing factor on how individuals determine whether they have sufficient capabilities to perform tasks or interpretations of experiences. In this study, self-efficacy is defined as a college student's self-confidence in his or her ability to learn via WBI systems.

Drawing on concepts from the interrelated literature streams including theory of reasoned action (TRA), technology acceptance model (TAM), and social cognition theory (SCT), this study develops a comprehensive model to aid in understanding college students' propensities towards the use of WBI. Accordingly, the related causal relationships among the underlying factors of the research model are hypothesized to guide the exploration of the influence level of each latent variable on college students' behavioral intentions to use the WBI platform. The research model is depicted as the following Figure 1.

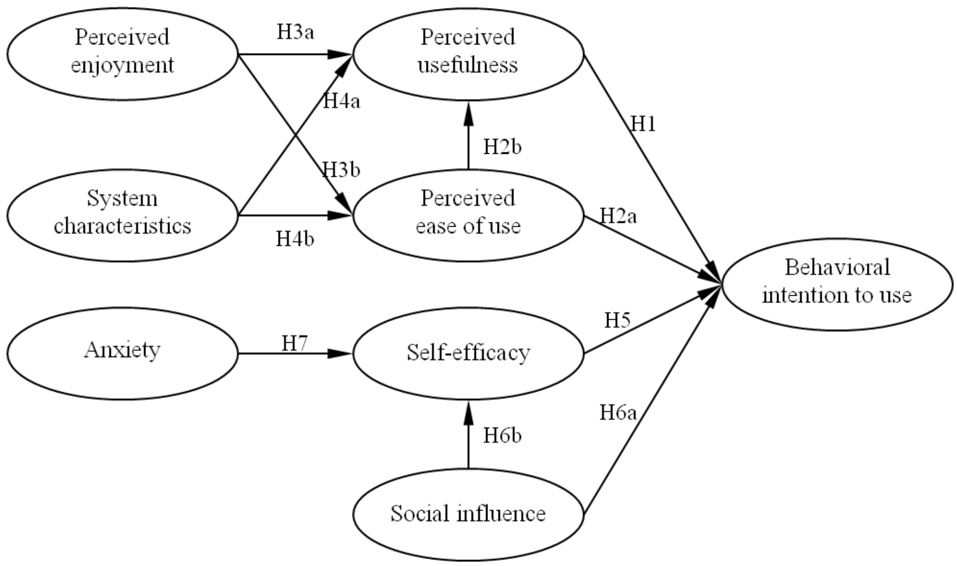

Figure 1: Research Framework

As Davis (1989) pointed out, the original TAM consists of perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (BI), and actual system use (AU). PU and PEOU are the two most important determinants for system use. The ATU directly predicts users' BI which determines AU. Thus, people evaluate the consequences of their behavior in terms of PU and base their choice of behavior on desirability of the usefulness. Davis (1989) also suggested that PEOU might actually be a major independent factor to PU. TAM also postulates that PEOU is an important determinant of attitude toward using a system. It was then discovered that both PU and PEOU are important determinant of system usage.

In addition, many researchers also suggested that TAM needs to integrate with additional variables to provide an even stronger model in modeling adoption behavior (Legris et al. 2003). Davis et al. (1992) suggested that technology use intentions are predicted by PU and PEOU. Although the original formulation of TAM included attitude as a construct mediating the effects of beliefs on intentions, subsequently attitude was dropped from the specification of TAM (Agarwal & Karahanna, 2000). Venkatesh and Davis (2000) proposed an extended TAM, i.e. TAM2, which includes social influence processes and cognitive instrumental processes, whereas it omits ATU due to weak predictors of either BI or AU. Because TAM is used as the baseline model of this study, the hypothesized relationships in TAM are also verified in the context of WBI. Based on the foregoing discussions, the following hypotheses are proposed:
H1: Perceived Usefulness (PU) has a direct effect on Behavioral Intentions (BI) to use WBI systems.
H2a: Perceived Ease of Use (PEOU) has a direct effect on Behavioral Intentions (BI) to use WBI systems.
H2b: Perceived Ease of Use (PEOU) has a direct effect on Perceived Usefulness (PU).

Davis et al. (1992) found that people's intentions to use computers in the workplace can be affected by the degree of enjoyment they perceived in their experience of using the computers, which means that perceived enjoyment (PE) can fully mediate the effects on usage intentions. Liaw and Huang (2003) developed a conceptual model which integrated individual computer experience with perceptions to understand individual attitude toward search engines as a tool for retrieving information. The findings of this study indicated that PE has a positive effect on PU; in other words, the more the users perceived to be enjoyable in using search engines, the more they will perceive the usefulness of using search engines as tools for information searching.
Concerning the environment of WBI, in comparing a traditional training approach with a web-based training program, Venkatesh (1999) found that users who have more enjoyable experiences during training are more likely to perceive the system to be easier to use. In turn, the higher users perceived to be ease of use leads to

enhanced behavioral intention to use. Venkatesh (2000) further conceptualized perceived enjoyment as an antecedent of PEOU, whose effect increases over time as users gain more experience with the web-based system. However, the specific effect of PE on PEOU has been largely overlooked in a web-based context. Moon and Kim (2001) examined a conceptually similar but distinct construct, perceived playfulness, as an antecedent of WWW usage, suggesting a significant effect of perceived playfulness in determining the use of WBI systems. According to the survey conducted by Taylor and Gitsaki (2004), students reported that the use of the Web had made the course more enjoyable which results in their willingness of continuing to use the Web as learning tool to assist learning activities. Building upon the above research findings, the following hypotheses are proposed:
H3a: Perceived Enjoyment (PE) has a direct effect on Perceived Usefulness (PU).
H3b: Perceived Enjoyment (PE) has a direct effect on Perceived Ease of Use (PEOU).

The construct of system characteristics have been posited to directly influence users' perceptions on information systems (IS), since TAM was proposed by Davis et al. (1989). A variety of general IT system characteristics have been proposed and examined. According to Davis et al. (1989), system characteristics can directly influence users' perceptions on usefulness and ease of use concerning an information system. Subsequent research has validated the role of system characteristics in predicting user beliefs and technology acceptance in other contexts (Pituch and Lee, 2006). Investigators have echoed that there exists a significant relationship between system characteristics and measures concerning perceived usefulness. For example, in TAM related research (Ke et al., 2012; Venkatesh and Davis, 2000; Ramayah & Lee, 2012), system characteristics (SC) have been examined to be an external variable towards users' adoption of IT through the mediation of PU and PEOU. Davis (1993) suggested that system characteristics can be fully mediated by TAM model on usage behavior. Based on the prior research, the following hypotheses are thus formulated:
H4a: System Characteristics (SC) of WBI systems have direct effect on Perceived Usefulness (PU).
H4b: System Characteristics (SC) of WBI systems have direct effect on Perceived Ease of Use (PEOU).

Compeau and Higgins (1995) defined computer self-efficacy (SE) as one's beliefs about the ability to use computers effectively. In the study, self-efficacy is operationalized as "the confidence in one's ability to perform certain learning tasks using in web-based environment". Taylor and Todd (1995) suggested that self-efficacy has significant indirect influences on behavioral intentions. Compeau et al. (1999) developed a model to test the influence of computer self-efficacy on computer usage and the finding showed that self-efficacy has significant positive influence on use. In addition, prior works (Compeau et al., 1999; Isman & Celikli, 2009; Venkatesh, 2000) have also indicated that computer self-efficacy influences performance or behavior, including attitude and behavioral intention; and other studies have found that computer self-efficacy and perceived ease of use are related (Pituch & Lee, 2006). Ma and Liu (2005) found that Internet self-efficacy has a significant impact on behavioral intentions to use web-based electronic medical records. Based on the previous studies, the following hypothesis is proposed:
H5: Self-Efficacy (SE) has a direct effect on Behavioral Intentions (BI) to use WBI systems.

According to TRA, the direct effect of social influence to behavior intentions is attributed to individual's belief about one or more important referents would think he/she should perform certain behavior even though the behavior is not favorable for themselves (Ajzen & Fishbein, 1980). In addition, within the concept of SCT, self-efficacy is based on the reciprocal relationship between cognitive and behavioral concept which can be influenced by environmental factors, such as social pressure and peer influence (Bandura, 1986). Such influencing factors from an individual's reference group-the people to whom he/she looks to obtain guidance on behavioral expectations-can be expected to influence both self-efficacy and outcome expectations (Alenezi et al., 2010; Yang et al., 2011). Thus, learners might also need to acquire positive behavioral expectations from their friends, classmates and/or instructors to strengthen self-efficacy in a WBI environment. Moreover, Compeau and Higgins (1995) suggested that if the information from the reference group is credible, the social influence may also exert an influence on the behavioral intention to use the information technology. As a result, the individual's judgments about the likely consequences of the behavior will be affected. Based on the above discussion, the following hypotheses are proposed:
H6a: Social Influence (SI) has a direct effect on Behavioral Intentions (BI) to use WBI systems.
H6b: Social Influence (SI) has a direct effect on Self-Efficacy (SE).

In MIS related research, the findings concerning the influence of anxiety to system usage were mixed. Pare and Elam (1995) conducted a study regarding the adoption of personal computer and concluded that anxiety has a negative effect for user to utilize system software. Compeau et al. (1999) tested the influence of anxiety on computer usage and the result showed that there is no significant influence exists. In the WBI environment, students can benefit from the non-threatening environment to support their learning. In other words, the web-based instruction technology may provide students a more comfortable environment which would effectively

reduce negative effect, anxiety, and result in the confidence reinforced to improve their proficiency. In accord with SCT (Bandura, 1986), efficacy beliefs are the primary influence on behaviors. Thus, it makes logical sense to model anxiety as an antecedent to self-efficacy (Alenezi et al., 2010; Thatcher & Perrewe, 2002). Based on the prior literature, the following plausible hypothesis was proposed:
H7: Anxiety has a direct effect on Self-Efficacy (SE).

METHODOLOGY

A cross-sectional field survey was conducted with data collected from a vocational college in Taiwan. The empirical stage of this study was beginning from developing the relative constructs of student's intentions to use WBI and generate the relative measures as broad as possible. Then, an iterative interview process was applied for scales refinement. Next, the partial least squares (PLS) method, a component-based structural equation modeling technique, was applied to structure and validate the casual relationships between the underlying determinants (perceived enjoyment, system characteristics, and social influence), affection factor (anxiety), belief (perceive usefulness, ease of use, and self-efficacy), and the behavior intentions to use WBI systems. By considering the tangible expected outcomes of their perceptions and intentions, the researchers in this study expect to be able to assess the nomological and predictive validities of psychometric properties of these latent variables. The questionnaire included items worded with proper negation and a shuffle of the items to reduce monotony of questions measuring the same construct.

Previous research was reviewed to ensure that a comprehensive list of measures were included. Those for perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intentions (BI) to use were adapted in our model from previous studies on TAM. The construct of system characteristics (SC) was derived from the prior work of Ke et al. (2012), Pituch and Lee (2006) and Ramayah and Lee, (2012). The scales for self-efficacy (SE) were based on the reserch of Compeau and Higgins (1995), Isman and Celikli (2009) and Thatcher and Perrewe (2002). The construct of social influence (SI) was adapted from Alenezi et al. (2010) and Yang et al. (2011). The measures for perceived enjoyment (PE) were captured using three items derived from Yi and Hwang (2003), and anxiety (ANX) were derived from Alenezi et al. (2010), Huang and Liaw (2005) and Thatcher and Perrewe (2002).

As mentioned above, the initial measurement item list of related constructs in questionnaire was generated from the previous literature review. Then, an iterative personal interview process (including faculties, teaching assistants, and representative students) was conducted to refine the instrument. These interviews enabled the researchers to gauge the clarity of the items presented in the survey instrument, to assess whether the instrument was capturing the desired phenomena, and to verify that important aspects had not been omitted. Changes were made and several iterations were conducted; the process was continued until no further modification was needed. Feedback served as a basis for correcting, refining and enhancing the experimental scales. Some scales were eliminated, because they were found to represent essentially the same aspects as others with only slight wording differences. Some scales were modified because the semantics appeared ambiguous or irrelevant to the perceived acceptance of the web-based instruction system of interest.

The finalized survey questionnaire consisted of three major parts. The first part recorded respondents' demographic information. The second recorded their perception on each variable of the research model in this study. The demographic variables assessed were respondents' gender, age, major, and experience of web usage. The third part asked each participant to indicate his or her degree of agreement on the scale items related to each of the constructs of research model. Data were collected using a seven-point Likert scales with the anchors 1 means strongly disagree; 4 is for neutral; and 7 indicate strongly agree, respectively.

This study was conducted in the vocational universities located in the southern part of Taiwan. Sample data was collected from the students in these universities. The subjects for this study were students who have the experience to use the WBI systems. Students who enrolled in courses supported by the WBI systems were coded and randomly selected from the administration affairs system of the targeted universities. These courses such as Introduction to management, Chinese, e-commerce, management information systems, English as foreign language learning are all compulsory for the students in the night school of this college. Totally, 1000 out of 1688 students enrolled in these courses were randomly selected. These courses are required as part of their undergraduate bachelors degree. Students taking the courses are of different majors including nursing, business management, IT and management information systems, healthcare management, and biotechnology.

The data was gathered by means of a self-administered questionnaire. These randomly selected students were self-administered the 34-item questionnaire after the final examination to ensure that they have actually used the WBI system. For each question, respondents were asked to circle the response which best described their level of agreement. Because the participation of this study was voluntary, some of the randomly selected students disagreed to participate. Thus, the questionnaires were distributed to the ones who agreed to participate. Finally, a total of 258 questionnaires out of the 568 distributed were collected, giving response rate of 45 percent. Fifty-five participants gave incomplete answers and their results were dropped from the study. This left 218 sets of data with a 38 percent valid return rate. The profile of respondents is shown as in Table 1.

Table 1: The profile of respondents

Variable	Classification	Frequency	%
Gender	Male	86	48%
	Female	132	52%
Major	Nursing	61	28%
	Business management	66	30%
	IT/IS	39	18%
	Healthcare management	32	15%
	Biotechnology	20	9%
Learning Condition	Part time	152	70%
	Full time	66	30%
Experience of Web usage (Year)	Less than 1	29	13%
	1 to3	57	26%
	3 to 6	88	40%
	6 to 10	39	18%
	More than 10	5	2%
Average Age		21.79 Years	-

RESULTS

The statistical analysis strategy of this study involved a two-phase approach including the psychometric properties of all scales were first assessed through confirmatory factor analysis (CFA) and the structural relationships were validated by the bootstrap analysis. To ensure the phenomena captured, in this study, representing the constructs of the conceptual framework, the validity and reliability of the instrument were assessed by PLS method. PLS-Graph version 3.0 was applied for the statistical analysis. The assessment of item loadings, reliability, and discriminant validity is performed for the reflective constructs through a confirmatory factor analysis. Then, in the second phase, the structural model is assessed to confirm to what extent the causal relationships specified by the proposed conceptual framework are consistent with the available data.

For the assessment of measurement properties, the analytical process is performed in relation to the attributes of individual item reliability, construct reliability, average variance extracted (AVE), and discriminant validity of the indicators as measures of latent variables. The assessment of item loadings, reliability, convergent validity, and discriminant validity is performed for the latent constructs through a confirmatory factor analysis. Reflective items should be uni-dimensional in their representation of the latent variable, and therefore correlated with each other. Item loadings should be above .707, showing that more than half of the variance is captured by the constructs (Hair et al., 1998). In the measurement model of this study, all of the items developed and operationalized definitions of constructs are based on the review of refereed theories, relative literature and researches in related field. The experts in the disciplines of web-based instruction and e-learning were also invited to review all of the items of the instrument to reassure the content validity. The alpha-coefficients were used to represent for each of the constructs in the model proposed. In order to assure the confirmatory nature in the study, validity and reliability of the scales should be confirmed adequately. As shown in the following Table 2, all items have significant factor loadings above the threshold value, 0.707.

All constructs in the model exhibit good internal consistency as evidenced by their composite reliability scores. The composite reliability coefficients of all constructs in the proposed conceptual framework are adequate, ranging from 0.89 for the construct of social influence to .96 for behavioral intentions to use the WBI system. To assess discriminant validity (Chin, 1998), (1) indicators should load more strongly on their corresponding construct than on other constructs in the model and (2) the square root of the average variance extracted (AVE) should be larger than the inter-construct correlations. The percent of variance captured by a construct is given by its average variance extracted (AVE).

Table 2: Results for the Measurement Model

Construct	Scale item	Loading	Mean	SD
Perceived usefulness (PU)	PU1: Using the WBI system would enhance my effectiveness in learning.	0.84	4.53	0.99
	PU2: Using the WBI system in the course would increase my learning productivity.	0.88	4.46	1.01
	PU3: Using the WBI system would improve my learning performance in the course.	0.89	4.51	1.15
	PU4: Using this WBI system would enable me to accomplish learning more quickly.	0.88	4.50	1.08
	PU5: I find the WBI system is useful in the course.	0.84	4.61	1.13
Perceived ease of use (PEOU)	PEOU1: Learning to operate the WBI system was easy for me.	0.80	4.78	1.17
	PEOU2: I find it was easy to get the WBI system to do whatever I want.	0.86	4.40	1.12
	PEOU3: It was easy for me to become skillful at using the WBI system.	0.84	4.33	1.08
	PEOU4: My interaction with the WBI system was clear and understandable.	0.87	4.60	1.16
	PEOU5: I find the WBI system was easy to use.	0.86	4.66	1.11
Perceived enjoyment (PE)	PE1: I find using the WBI system enjoyable.	0.95	4.51	1.21
	PE2: The actual process of using the WBI system to learn the course is pleasant.	0.95	4.55	1.24
	PE3: I have fun using the WBI system to learn the course.	0.94	4.55	1.20
System characteristics (SC)	SC1: The WBI system enables interactive communications among students and between instructor and students.	0.84	4.80	1.11
	SC2: The communication tools in the WBI system are effective (email, chat room, etc.).	0.87	4.86	1.03
	SC3: The WBI system allows me to control over my learning activities.	0.87	4.92	1.12
	SC4: The WBI system offers flexibility in learning as to time and place.	0.86	5.01	1.14
	SC5: The WBI system allows me to practice repeatedly.	0.85	4.84	1.04
	SC6: The WBI system enables repeated exposure to the target learning tasks.	0.85	4.94	1.09
Social influence (SI)	SI1: My friend would think that I should use the WBI system.	0.87	4.39	1.16
	SI2: My classmates would think that I should use the WBI system.	0.87	4.42	1.16
	SI3: My teachers would think that I should use the WBI system.	0.80	4.85	1.31
	SI4: I will have to use the WBI system because my teachers require it.	0.82	4.63	1.33
Anxiety (ANX)	ANX1: I feel apprehensive about using the WBI system to learn The course.	0.84	3.67	1.32
	ANX 2: It scares me to think that I could cause mistakes I cannot correct by hitting the wrong key or operating inappropriately when using the WBI system.	0.93	3.71	1.40
	ANX 3: Using the WBI system is somewhat intimidating to me.	0.88	3.84	1.31
	ANX 4: Connecting speed of the Internet affects my willingness to use the WBI system.	0.81	3.95	1.36
Self-efficacy (SE)	SE1: I am confident of using the WBI system even if there is no one to show me how to do it.	0.90	4.28	1.28
	SE2: I am confident of using the WBI system even if I have only the instructions for reference.	0.89	4.45	1.18
	SE3: I am confident of using the WBI system even if I have never used such a system before.	0.88	4.29	1.13
	SE4: I am confident of using the WBI system as I have just seen someone using it before.	0.87	4.54	1.23
Behavioral intention to use (BI)	BI1: Assuming that I have the chance to take the course, I intend to use the WBI system to learn.	0.95	4.58	1.35
	BI2: I intend to use the WBI system to learn the course frequently.	0.96	4.70	1.33
	BI3: I intend to take full advantage of the WBI system to learn the course.	0.92	4.53	1.39

To show discriminant validity, each construct square root of the AVE has to be larger than its correlation with other factors. As the results shown in the following Table 3, all constructs meet this requirement. Finally, the values for reliability are all above the suggested minimum of 0.7 (Hair et al., 1998). Thus, all constructs display adequate reliability and discriminant validity. All constructs share more variance with their indicators than with other constructs. Thus, the convergent and discriminant validity of all constructs in the proposed conceptual framework can be firmly assured.

Table 3: Inter-Correlation among Constructs.

Construct	# of Items	Construct							
		PU	PEOU	SC	SE	ANX	PE	SI	BI
PU	5	0.87*	0.56	0.63	0.53	-0.20	0.68	0.50	0.65
PEOU	5		0.85	0.64	0.75	-0.23	0.56	0.64	0.62
SC	6			0.87	0.63	-0.24	0.65	0.60	0.67
SE	4				0.89	-0.28	0.63	0.62	0.64
ANX	4					0.86	-0.26	-0.21	-0.27
PE	3						0.95	0.54	0.80
SI	4							0.85	0.54
BI	3								0.94
Composite Reliability		0.94	0.93	0.94	0.94	0.92	0.96	0.89	0.96

*Diagonal elements are the square roots of average variance explained (AVE).

In the second phase, the structural model is assessed to confirm to what extent the causal relationships specified by the proposed conceptual framework are consistent with the available data. The PLS method does not directly provide significance tests and confidence interval estimates of path coefficients in the conceptual framework. In order to estimate the significance of path coefficients, a bootstrapping technique was used. Bootstrap analysis was done with 200 subsamples and path coefficients were re-estimated using each of these samples. The vector of parameter estimates was used to compute parameter means, standard errors, significance of path coefficients, indicator loadings, and indicator weights. This approach is consistent with recommended practices for estimating significance of path coefficients and indicator loadings and has been used in prior IS studies.

Hypotheses testing will be performed by examining the size, the sign, and the significance of the path coefficients and the weights of the dimensions of the constructs, respectively. The estimated path coefficient and its associated significance level were examined. The statistical significance of weights can be used to determine the relative importance of indicators in forming a latent construct. One indicator of the predictive power of path models is to examine the explained variance or R^2 values. R^2 values are interpreted in the same manner as those obtained from multiple regression analysis. They indicate the amount of variance in the construct that is explained by the path model (Barclay et al. 1995). The magnitude and significance of these path coefficients provides further evidence in support of the nomological validity of the research model.

The path coefficients and explained variances for the proposed model in this study are shown in Figure 2. Factor loadings of indicators of all constructs can be read between the lines as loadings in a principal components factor analysis. T-statistics and standard errors were generated by applying the bootstrapping procedure. All of the constructs in this study were modeled as reflective and most of the constructs in the model were measured using multiple indicators, rather than summated scales. Perceived usefulness, perceived ease of use, self-efficacy, and social influence account for 56% of the variance explained in behavioral intentions to use WBI systems. Perceived enjoyment, system characteristics, and perceived ease of use together explain 55% of the variance in perceived usefulness, while perceived enjoyment and system characteristics explain 45% of the variance in perceived ease of use. The construct of self-efficacy was contributed by social influence and anxiety with the explained variance of 44%. An F test is applied to test the significance of the effect size for the model as it explains all dependant variable are significant (p=.000). Therefore, overall, the model has strong explanatory power for the construct of “behavioral intentions to use WBI”. The significant path coefficients, effect size, and the value of the R2 all provide supports for the proposed conceptual framework.

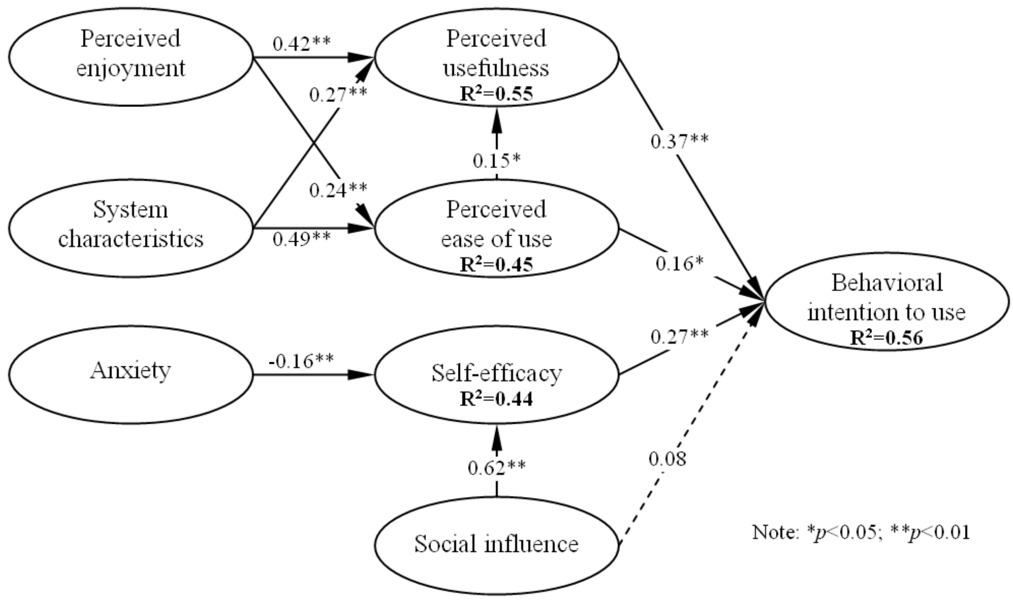

Figure 2: PLS analysis results

DISCUSSIONS AND CONCLUSION

The aim of this study is to exploring what factors influence college students' behavioral intentions to utilize web-based instruction (WBI) systems and, accordingly, to develop a comprehensive model to predict their intentions to use such systems. The empirical results of PLS analysis provide strong supports for the proposed Hypotheses H1, H2a, and H2b effectively drawn from the measurement of the TAM. This finding is consistent with that obtained by Davis et al. (1989). Hypotheses H3a, H3b, H4a, and H4b are also firmly supported by the significant path coefficients. That is the underlying determinants, PE and SC, would apparently influence student's perceptions on the usefulness and ease of use of the WBI system. System developers might have to collaborate with instructors to design and implement a WBI system with good interaction, flexibility, friendly interface, and a joyful learning cyberspace to facilitate student's willingness to use WBI. Contrary to our predictions, the path from SI to BI (H6a) is not significant. The interesting findings are worth of pursuing in our future study to clarify the insignificant predicting effect of SI to BI and the strong effect to SE as a mediator with respect to BI. Besides, hypotheses H5, H6b, and H7 are also strongly supported: SE has significant effects on BI (H5); and the constructs of SI and ANX are significant external predictors for SE (H6b and H7). These results suggest that college/university staffs (program directors and instructors) might then have to take more time and efforts to preach peer collaborative practices, help students lower the anxiety, and effectively cultivate their self-confidence to use WBI systems.

The importance of web-based instruction to education has increased considerably over the past few years. In order for the successes and effective implementations of WBI systems, it is vital for researchers to cumulate efforts from the continuations of rigorous scientific approaches, educational theories, and well-targeted procedures and techniques in the web-based instruction research fields. This empirical study was motivated by a broad interest in understanding student's behavior intentions toward the usage of web-based instruction systems. Before considering the implications it is important to acknowledge the limitations of this study. First, the sample has a bias toward the data source gathered from the respondents in only one college, which may not represent the opinions in other colleges and/or university in Taiwan. Second, the research was conducted in Taiwan, the findings in the study might not hold true in other countries. Thus, the valid instrument was developed using the large sample gathered from only one vocational college in Taiwan, a confirmatory analysis and cross-cultural validation using another large sample gathered elsewhere is required for improving the generalizablity of the instrument. Hence, other samples from different areas or nations should be gathered to confirm and refine, the factor structure of the instrument, and to assess its reliability and validity. These issues are worth of further pursuance in our future study.

Drawn from the empirically results, this study provide interesting insights into the applicability of some of the relative constructs, with respect to explaining cognitions, motivations, belief, and intentions of students in using the WBI system. The research findings suggested general adequacy and applicability of the proposed conceptual framework in the WBI settings. In addition, this study employed a rigorous scale development procedure to establish an instrument to weigh up student's behavioral intentions to use web-based instruction systems. Web-based instruction program directors, system developers and instructors can make the best of this WBI instrument for understanding of student's inclinations and take necessary corrective actions to improve. Besides making an overall assessment, the instrument can be adapted to compare student's perceptions and intentions for different web-based instruction systems with specific factors (i.e. learner interface, learning community, content, and personalization). The proposed conceptual framework might also be tailored to counterpart the specific research or practical needs of specific computer aided instruction (CAI) environment. The generality of the results can also serve as a useful refereed basis for the comparative analyses in the future. The contributions of this study include:

1. Integrating prior works concerning web-based instruction based on TRA, TAM and SCT.
2. Identifying the relative cognition, and belief constructs that will significantly influence student's behavioral intentions to use WBI.
3. Establishing a new model for measuring user's cognitions, belief, and intentions to use WBI.
4. Justifying the influence levels of underlying determinants for the intentions to use WBI.
5. Providing a useful instrument for web-based instruction system developer and instructors on planning and implementing WBI systems.

In conclusion, the main theme in this paper was to enrich our understanding of student's behavioral intentions toward web-based instruction system usage. Given the undeniable reality that IT is ubiquitous in all sorts of educational contexts, such research has value for theory development as well as for practice. Future research, in different samples and longitudinal studies, are necessary. The validity of a measure cannot be truly established on the basis of a single study. Measure validation requires the assessment of the measurement properties over a variety of samples in similar and different contexts. In the future, an instrument for measuring student's intentions to use a synchronous web-based instruction system should also be developed. More attention also can be directed toward understanding the antecedents and consequents of other web-based instruction systems.

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REFERENCES

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: cognitive absorption and beliefs about information technology usage. *MIS Quarterly, 24* (3), 665-694.
Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior,* Prentice Hall, NJ: Englewood Cliffs.
Alenezi, A.R., Abdul Karim, A.M., & Veloo, A. (2010). An empirical investigation into the role of enjoyment, computer anxiety, computer self-efficacy and internet experience in influencing the students' intention to use e-learning: A case study from Saudi Arabian governmental universities. *The Turkish Online Journal of Educational Technology*, *9* (4), 22-34.
Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, NJ: Englewood Cliffs.
Barclay, D., Higgins, C., & Thompson, R. (1995). The partial least squares approach to causal modelling: personal computer adoption and use as illustration. *Technology Studies*, *2* (2), 285-309.
Cavas, B., Cavas, P., Karaoglan, B., & Kisla, T. (2009). A study on science teachers' attitudes toward information and communication technologies in education. *The Turkish Online Journal of Educational Technology*, *8* (2), 20-32.
Chin, W.W. (1998). Issues and opinion on structural equation modelling. *MIS Quarterly*, *22* (1), vii-vxi.
Compeau, D.R., Higgins, C.A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: a longitudinal study. *MIS Quarterly*, *23* (2), 145-158.
Compeau, D.R., & Higgins, C.A. (1995). Computer self-efficacy: development of a measure and initial test. *MIS Quarterly*, *19* (2), 189-211.
Dabaj, F. (2009). The role of gender and age on students'' perceptions towards online education case study: Sakarya university, vocational high school. *The Turkish Online Journal of Educational Technology*, *8* (2), 120-123.
Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13* (3), 319-340.
Davis, F.D. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies*, *38*(3), 475-487.
Davis, F.D., Bagozzi, R.P., & Warshaw P.R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35* (3), 982-1003.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, *22* (14), 1111-1132.
Ferdig, R.E. (2005). Towards implementing technologies in education: Exploring the pedagogy and people of good innovations. *The Turkish Online Journal of Educational Technology*, *4* (2), 35-43.
Fish, W.W., & Gill, P. B. (2009). Perceptions of online instruction. *The Turkish Online Journal of Educational Technology*, *8* (1), 53-64.
Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Addison-Wesley, MA: Boston press.
Fotos, S., & Browne, C. (2004). The development of CALL and current options. In S. Fotos, & C. M. Browne (Eds.), *New Perspectives on CALL for Second Language Classrooms* (pp. 3-14). Mahwah, NJ: Lawrence Erlbaum Associates.
Hair, J.F., Jr., Anderson, R.E., & Tatham R.L. (1998). *Multivariate Data Analysis with Readings*, 5th Edition. Prentice Hall, NJ: Englewood Cliff.
Huang, H.M., & Liaw, S.S. (2005). Exploring users' attitudes and intentions toward the Web as a survey tool. *Computers in Human Behavior*, *21* (3), 729-742.
Isman, A., & Celikli, G.E. (2009). How does student ability and self-efficacy affect the usage of computer technology? *The Turkish Online Journal of Educational Technology*, *8* (1), 33-38.
Ke C.H., Sun, H.M., & Yang Y.C. (2012). Effects of user and system characteristics on perceived usefulness and perceived ease of use for the web-based classroom response system. *The Turkish Online Journal of Educational Technology*, *11*(3), 128-143.
Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information, & Management*, *40* (2), 191-204.
Liaw, S.S., & Huang, H.M. (2003). An investigation of user attitudes toward search engines as an information retrieval tool. *Computers in Human Behavior, 19* (6), 751-765.
Ma, Q., & Liu, L. (2005). The role of Internet self-efficacy in the acceptance of web-based electronic medical records. *Journal of Organizational and End User Computing*, *17* (1), 38-57.
Moon, J., & Kim, Y. (2001). Extending the TAM for a World Wide Web context. *Information, & Management 38* (4), 217-230.
Pare, G., & Elam, J. (1995). Discretionary use of personal computers by knowledge workers: testing of a social psychology theoretical model. *Behavior and Information Technology*, *14* (2), 215-228.
Pituch, K.A., & Lee, Y.K. (2006). The influence of system characteristics on e-learning use, *Computers & Education*, *47* (2), 222-244.
Ramayah, T., & Lee, J. W. C. (2012). System characteristics, satisfaction and e-learning usage: A structural equation model (SEM). *The Turkish Online Journal of Educational Technology*, *11* (3), 197-206.
Shih, Y.C., Huang, P.R. Hsu, Y.C., & Chen, S.Y. (2012) A complete understanding of disorientation problems in web-based learning. *The Turkish Online Journal of Educational Technology*, *11* (3), 1-13.
Taylor, R.P., & Gitsaki, C. (2004). Teaching WELL and loving IT. In S. Fotos, & C. M. Browne (Eds.), *New Perspectives on CALL for Second Language Classrooms*(pp. 131-147). Mahwah, NJ: Lawrence Erlbaum Associates.
Thatcher, J.B., & Perrewe, P.L. (2002). An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy, *MIS Quarterly*, *26* (4), 381-396.
Tutkun. O.F. (2011). Internet access, use and sharing levels among students during the teaching-learning process. *The Turkish Online Journal of Educational Technology*, *10* (3), 152-160.
Venkatesh, V. (1999). Creation of favorable user perceptions: Exploring the role of intrinsic motivation. *MIS Quarterly*, *23* (2), 239-260.
Venkatesh, V. (2000). Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, *11* (43), 342-365.
Venkatesh, V., & Davis, F.D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, *46* (2), 186-204.
Yang, D.J., Chiu, J.Z., & Chen, Y.K. (2011). Examining the social influence on college students for Playing online game: Gender differences and implications. *The Turkish Online Journal of Educational Technology*, *10* (3), 115-122.
Yi, M.Y., & Hwang, Y. (2003). Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. *International Journal of Human-Computer Studies*, *59* (4), 431-449.

EXAMINING THE INFLUENCE OF TECHNOLOGY AND PROJECT-SUPPORTED THINKING JOURNEY ON ACHIEVEMENT

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ABSTRACT
The purpose of this study was to investigate the influence of the technology and project-supported Thinking Journey on 11th grade high school students' achievements in the subject of electricity units. The participants were 68 high school 11th grade students from two different science classes. Control and experimental groups were selected at random. The data collection tools were the Electricity Achievement Test consisting of 39 multiple-choice questions and a semi-structured interview form. In the study, the experimental group was taught using the technology and project-supported Thinking Journey while the control group was taught using teacher-centered teaching methods. The Electricity Achievement Test was applied as pre-test and post-test to both experimental and control groups. The data were analyzed with independent group *t*-tests. Findings suggest that a significant difference was found between the experimental and control group students' Electricity Achievement post-test mean scores in favor of the experimental group with respect to sub-dimensions of Bloom's taxonomy. According to the analysis of the interviews, the experimental group students reported their satisfaction with the applications in the study.
Keywords: Technology-Supported Education, Project, Thinking Journey, Electricity Achievement, Students' Views.

INTRODUCTIO*N*
To allow individuals not only to make their knowledge permanent in the learning processes but also to transform their opinions into knowledge, as well as to make learning more attractive, new discussion areas have been formed covering "the systematic and reflective transfer process for the principles related to learning and teaching, instructional materials, instructional activities, information sources and evaluation plans" (Smith and Ragan, 1999). Besides these factors, the relationship between the teacher and the student is among the important factors influencing the learning process. Related to these factors, Yavuz (2006) asks these questions: "Will changes resulting from the rapid development of science and technology influence the teacher-student relationship found in educational institutions today as well as the place and importance of the teacher and of the student in educational environment and their duties and responsibilities in the education system? Will they be able to keep up with the abundant number of technological tools provided by the age of change and development and meet the constantly changing needs? Or will they proceed on their own ways without being influenced in any way by these factors? In addition, are teachers supposed to teach students everything? How much of information should be transferred? Should students receive the information simply from the teacher?"
In order to provide answers to these questions, a number of studies (Montgomery, 2000; Kelly,1980) have been conducted since Dewey (1938), and the student-teacher relationship has been examined. Besides the teacher-student relationship, other factors influence the learning process. For example, the existence of a student in the centre of learning or the creation of technology-supported learning environments is an important factor influencing the learning process (Phillips, 2005). In this respect, computer-supported and constructive-learning approaches have been developed in a way appropriate to the present modern era. Considering the investigations and studies conducted, it is seen that learning approaches placing the individual in the center by both activating the individual's world of thought and benefiting from technological opportunities are quite common (Ölmez and Güzeliş, 2007; Tarım et. al., 2006). 'Thinking Journey' is one of them. Thinking Journey is a format of teaching, effective in revealing pertinent knowledge of students (Schur and Galili, 2009). It is based on constructive learning approaches. It contains "an intensive dialogue between the teacher and the learner, as well as between the learners presents the tool, which reveals the cognitive needs of the learners required for their construction of valid knowledge" (Schur and Galili, 2009). "These works describe the connections between thinking processes and the ability to observe a phenomenon and its changes" (Yair, Yaron and Mintz, 2003). Besides, Thinking Journey invites students to develop multiple perspectives about scientific concepts. This is important for students in that they can compare situations. After a literature review, it was seen that this approach has rarely been studied. Because of this, this study tested the applicability of a new student-centered learning method.

The present study aimed at investigating the influence of the applications of Thinking Journey supported with the technology and a project that addresses the visual world of students and allows them to think. This study evaluated 11th grade high school students' achievement in the course of physics.

MATERIALS AND METHODS

Participants

The present study was conducted with 68 students from two different 11th grade science classes (each had 34 students) in Diyarbakır in the spring term of the academic year 2009–2010. Of the participants in the experimental group, 58.8% were female and 41.2% were male. In the control group, the number of male and female students was equal.

Data Collection Tools

In this study, the researchers developed the Electricity Achievement Test to determine the students' knowledge regarding electric-related subjects. Two physics education experts, two physics experts, and one measurement and evaluation expert examined content validity and analyzed the test according to Bloom's taxonomy. The test consisted 39 multiple-choice questions – 6 of which were directed to obtain data regarding the students' knowledge; 5 were directed regarding their comprehension; 17 were directed regarding application; and 11 were directed at metacognition level – and was found to have a reliability coefficient of r=.73. Furthermore, a semi-structured interview form was used for determining the students' views about the application process and the applicability of the study. The interviews were done by a recorder.

Data Analysis

Quantitative and qualitative research methods were used in this research in order to analyze the data of the study. In the qualitative part, the pre-test and post-test research design was used for both groups. The difference between the Electricity Achievement pre-test and post-test mean scores was statistically examined. For this purpose, the *t*-test for dependent and independent groups found in SPSS 15.0 was used. In the quantitative part, to obtain views of the 34 students of the experimental group, semi-structured interviews were done by the researchers. The data were obtained from the interviews held was transcript**.** Content analyze method, done by forming theoretical insignificant themes and sub themes.

Application Process

The experimental group was determined on a random basis. The study started with 36 students and completed with 34 fully attending students. The study was conducted with three course-hours in a week and lasted eight weeks. This duration did not include the course-hours during which the students were informed about the Thinking Journey, the "Project", and about the animation-simulation program, or the course-hours during which the Electricity Achievement pre-test and post-test were administered to the experimental and control group students. The study group students were divided into nine groups, each with three or four students. The groups were formed based on the students' choices. The study group students determined the electric-related subjects they wanted to study. Regarding the studies to be carried out by the study group in the course of physics, the course teacher was provided with a work-file covering the fourth and fifth chapters, as well as subjects related to electric circuits presented in the third chapter. In addition, the teacher was informed about the application process.

The researchers prepared the activities to be carried out each week and presented them to the course teacher. The applications were carried out in the three course-hours of the physics course in line with the Thinking Journey, one course-hour being supported with the project and the other supported with simulations and animations in the classroom (Table 1).

On the other hand, the same subjects were taught to the control group students on a teacher-centered basis in the same duration of time.

Table 1: Process steps in technology and project supported thinking journey applications

Process Steps	Duration
Giving information about the applications and forming the team for the project	2 course-hours (in class)
Teacher-student dialogue via simulation-animation presentation	2 course-hours (in class)
Collecting information for the projects	6 days (out of school)
Teacher-student dialogue via simulation-animation presentation	2 course-hours (in class)
Evaluation of the information gathered for the projects	6 course-hours (electricity

	laboratory)
Doing preparations for the reports and presentations	2 days (out of school)
Teacher-student dialogue via simulation-animation presentation	2 course-hours (in class)
Discussion on project subjects with other teams	2 course-hours (in class)
Teacher-student dialogue via simulation-animation presentation	2 course-hours (in class)
Transferring project works into the electronic environment	1 course-hour
Teacher-student dialogue via simulation-animation presentation	2 course-hours (in class)
Presentation	2 course-hours (in class)
Teacher-student dialogue via simulation-animation presentation	4 course-hours (in class)

Experimental Process Steps of the Thinking Journey Based on Teacher and Student Dialogue in Classroom Environment

1. Goals were set: The student's behavioral changes expected to occur at the end of the process were determined.
2. Pictures, videos, simulations, or animations related to the subject were presented via the projector.
3. A question like "What do you see or hear?" was directed. A dialogue was started between the teacher and the student**.**
4. Sequential presentations in relation to the subject were made. The students were then asked to state what they had seen and thought.
5. The teacher directed questions regarding the similarities and differences between the visuals. The questions directed and the visuals presented were organized in a way to have the students make related comparisons.
6. Questions were directed regarding how the students reflected on the visuals in the presentation, taking their own lives into consideration.
7. The students were asked to put themselves into the place of some of the visual objects in the presentation. The question of "How would it be?" was directed.
8. Following this dialogue, the focus was on the object again. The teacher gave examples from real life experiences to help make permanent students' learning.
9. In the last phase, research on the related subject was carried out using simulation and animation programs.

Experimental Process Steps of Project

1. The target behavior that students were expected to have by the end of the applications was determined.
2. The outline of the subjects to be focused on or the work to be handled was determined. Using the list, the students chose the subjects they would study.
3. The students chose friends to work with and were divided into groups of three or four.
4. The students were informed about how the reports to be prepared would be and about which subjects the reports would cover. For presentation, CD and PowerPoint were selected.
5. The students were given the sample work schedule and were asked to plan their work time. In this way, the time planned for the applications was used effectively.
6. The students were regularly controlled. They were asked to list the studies they conducted for the projects they would carry out and to list the materials they would use in these projects.
7. The evaluation phase was devised at the beginning of the application as process and product evaluation. The "Individual Activities Evaluation Form (Student Autonomy)" and the "Group Activities Evaluation Form" were used as process and product evaluation.
8. The students gathered information from various sources. The Internet and the library acted as sources for the project research.
9. All the data gathered were reorganized, and the data considered necessary were put into report form. In this phase, the students discussed the projects together with their friends from the other group.
10. Finally, the projects prepared were transferred into CDs and the students presented to the class.

Groups and Project Subjects

The distribution of the subjects with respect to the groups formed was:
Group 1: Serial and parallel connection of resistors, factors influencing the resistance of a conductor, calculation of the resistance of water, reading the value of a resistor via color codes.
Group 2: Various methods of producing electric currency, forming an electric field.
Group 3: Wheatstone bridge, short circuit.
Group 4: Electrical work and heat.
Group 5: Producing a generator, connection of generators, fields of their use.
Group 6: Producing a fuse, producing an engine, fields of use of fuses and engines.
Group 7: Producing a condenser, serial and parallel connection of condensers, fields of their use.

Group 8: Electric circuits, producing a mini lamp, connection of a voltmeter to the circuit, connection of an ammeter to the circuit, Ohm's law, measurement of resistance, fields of their use.
Group 9: Serial and parallel connection of lamps, duration of their consumption, conductors and non-conductors, fields of their use.

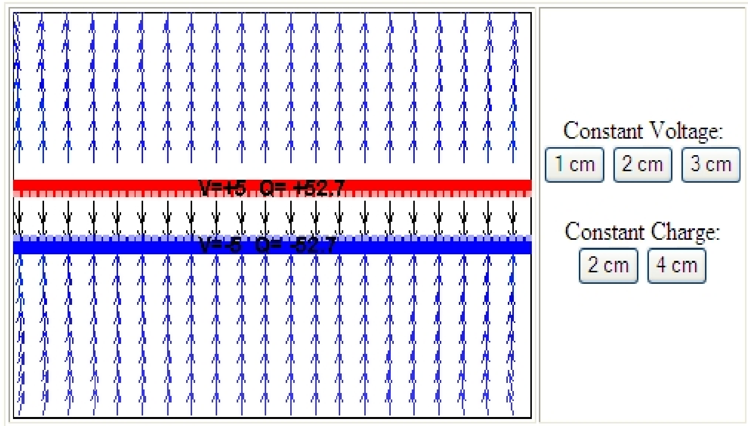

Figure 1: A sample application for condensers

Teacher: "*Let's look at the simulation above. We will make changes under constant voltage in one of them and under constant charge in the other. Now, what do you see?*"
Student 10: "*You change the charge distances between the plates.*"
Student 1: "*As the plates get away from each other, the potential increases, sir.*"
Teacher: "*All right, how will the charge change if we increase the distance between the plates under constant voltage?*"
Student 8: "*The charge on the computer seems to decrease.*"
Teacher: "*Let's look at the formula of C= k(A/d) =Q/V. Accordingly, let's think again looking at the simulation. How would the capacity change if I increase the distance, that is 'd'?*"
Student 3: "*It decreases because there is inverse proportion in-between.*"
Student 5: "*If the capacity decreases, the potential will increase due to inverse proportion.*"
Teacher: "*What would happen if I increase the distance between the plates while keeping the potential constant?*"
Student 5: "*The capacity will decrease again, but since it is in direct proportion to the charge, the charge will decrease as well.*"
Teacher: "*Well, what would happen if we put the plates closer to each other?*"
Student 5: "*Sir, just the opposite result to the previous one will occur.*"
Teacher: "*What do you mean?*"
Student 10: "*We see the capacity increase both in the simulation and in the formula.*"
Teacher: "*All right, can you give examples from our daily lives for the structure of the condenser?*"
No response.
Teacher: "*All right everybody, look out of the window? How is the weather outside at the moment?*"
(Student 11): "*Rainy.*"
Teacher: "*What do you think about whether the weather is conductive or not at the moment?*"
Student 11: "*Yes sir, the weather is conductive at the moment.*"
Teacher: "*Why do you think so?*"
Student 11: "*Well, the lightning flashes. There is flow of charge in lightning as well. In such situations, the air becomes conductive.*"
Teacher: "*Good, considering the fact that now the rainy weather becomes conductive, think what could happen outside at the moment?*"
Student 12: "*If the rainy weather is conductive, then electron flow occurs everywhere. In such a case, there would have to be lightning and thunderbolts everywhere. Now, there are no thunderbolts or lightning; then, the air is not conductive.*"
Teacher: "*All right, what do you think about the weather? Do you think it is conductive now?*"
Student 2: "*No, it is not. If it were, we would all get electric shock. Electric current everywhere would harm everything around.*"

Teacher: "*Good! The rainy weather is non-conductive if there is no electron flow, so is it dielectric? I said previously that in rainy weather, clouds are charged. The ground is also charged in opposite to the charge on clouds.*"

There were such ongoing dialogues between the teacher and the students.

Figure 2: A sample laboratory work related to the production of a condenser

Figure 2 shows an image showing an experimental group student's attempt to produce a condenser in the electric laboratory.

RESULTS

Table 2 presents the results of the analysis regarding the comparisons of the Electricity Achievement pre-test mean scores of the experimental and control groups in the study.

Table 2: Independent groups t-test results regarding the Electricity Achievement pre-test mean scores of the experimental and control groups prior to the experimental process (N=34)

Experimental	Group	$\overline{X}$	df	t	P
Knowledge	Control	1.94	1.179	-1.541	.128
	Experimental	2.38	1.181		
Comprehension	Control	1.03	.758	-1.724	.089
	Experimental	1.38	.922		
Application	Control	3.68	1.996	.563	.575
	Experimental	3.41	1.877		
Metacognition	Control	2.26	1.214	-1.234	.139
	Experimental	2.85	8.289		
Total	Control	8.85	2.630	-1.541	.128
	Experimental	10.12	3.998		

When Table 2 was examined, it was seen that there was no significant difference between the experimental and control groups' Electricity Achievement pre-test mean scores prior to the experimental process with respect to such sub-dimensions of Bloom's taxonomy as knowledge, application, and metacognition and with respect to the total scores ($P>0.05$).

Following the experimental process, the experimental and control groups' Electricity Achievement post-test mean scores were compared, Table 3 presents the results.

Table 3: Independent groups t-test results regarding the Electricity Achievement post-test mean scores of the experimental and control group after the experimental process (N=34)

Source of Variance	Groups	$\overline{X}$	df	T	P
Knowledge	Control	2.38	1.349	-4.338	.000
	Experimental	4.00	1.701		
Comprehension	Control	1.12	.946	-5.194	.000
	Experimental	2.65	1.433		
Application	Control	4.88	1.871	-5.515	.000

	Experimental	8.97	3.896		
Metacognition	Control	3.21	1.572	-4.424	.000
	Experimental	5.38	2.400		
Total	Control	11.59	3.526	-6.168	.000
	Experimental	21.12	8.289		

When Table 3 was examined, it was seen that following the applications, the experimental group was more successful than the control group with respect to all the steps of Bloom's taxonomy ($P<0.05$).
Before the applications were started, the experimental group was asked directed questions about their knowledge of physics and about whether they wanted to work in a field related to physics, yet no positive response was received from any of the students. The students stated that physics teachers could not easily find a job and reported that they generally preferred to be a doctor (faculty of medicine) or other professions with a higher possibility of finding a job. Moreover, to determine how the active learning applications in experimental group affected students' learnings and ideas about the process and applicability of the "Thinking Journey Supported with the Technology and Project" in detail, semi-structured interviews were conducted. The researchers analyzed the interviews held with the experimental group students following the applications content of the data. According to the results, the experimental group's views were gathered under ten headings: usefulness of the applications; the sections that the students most enjoyed during the applications; difficulties experienced during the applications; views about the application of the method in other courses; preference of the method; laboratory experience and effectiveness; reflections of what had been learnt via the method into real life; contribution of the method applied; attitudes towards the course and the subject; and the contribution of the method applied to social relationships. Following the examination of these headings, themes were determined, which were the main points of the students' views. Below are these themes, as well as the students' views about these themes:

Permanency: The experimental group students stated that the "Thinking Journey Supported with Technology and Project" applied was beneficial because it was more permanent than the teacher-centered method. One of the students reported his views about whether the "Thinking Journey Supported with the Technology and Project" was beneficial or not, as follows:

> *"Of course, I believe it is useful because this is my 11th year as a student and for the first time, we conducted an experiment related to physics in a laboratory environment; we saw the animations, and we talked about them. It was more permanent for me. At least, I did by seeing. I did it by myself, not worrying about my job. It was easier for me, and it was better to understand"* (Student A).

Concretizing: The students reported that supporting the electric subjects visually with the new method was beneficial because it was based upon the Thinking Journey. Regarding this subject, one of the students reported:

> *"Well, it is beautiful and sounds better and more reasonable. We believe it is beneficial. We reinforce the subjects by conducting experiments. For example, we see the sources. We learnt how to use a voltmeter and ammeter by seeing and touching"* (Student C).

Usefulness: The students stated that they were satisfied with the new method because they were provided with the opportunity to conduct experiments themselves in the laboratory environment and because they had the chance to talk during the in-class applications. In addition, the students reported that in the previous method (teacher-centered), they learnt something via the teacher's instruction, but with the new technique, they did something on their own, which was more effective. Regarding this subject, one of the students reported:

> *"Yes, sir, it was certainly beneficial. It was good to speak in class and discuss with friends. We also developed our computer use. Also, we are studying in a laboratory environment for the first time. This contributed to us as well"* (Student D).

Visuality: A majority of the students stated that the visual presentations influenced them and that they found this new method beneficial. They also pointed out that seeing certain activities and presentation types both in the computer environment and in the laboratory environment was more effective on them. Regarding this subject, one of the students reported:

> *"Well, it was useful for me. I liked it because if it is based more on formulas, we get bored more easily of that course. Now, because the subject is taught visually, we were entertained more. I can remember more things about the subject but because we are generally accustomed to formulas, well, actually, we can only deal with questions"* (Student G).

Simulations-animations: The students stated that they met simulations and animations for the first time and enjoyed them. Regarding this subject, one of the students reported:

> *"I liked the simulations and the animations that you demonstrated in the computer, they are very enjoyable"* (Student C).

Dialogue: Some of the students pointed out that they had the chance to speak in class and enjoyed stating their views in the class. Regarding this subject, one of the students reported:

> *"Sir, speaking in class and discussing with friends was very beautiful"* (Student J).

Interest in the course of physics: The students stated that following the experimental process, their interest in the course of physics had increased. Regarding this subject, one of the students reported:

> *"In the past, to tell the truth, I was never interested in physics. Yes, only the formulas. Well, we used to answer the same questions with a single formula. It was quite difficult. When we use only one single formula, well, it really becomes difficult. Thus, we at least saw in this way"* (Student E).

Cognitive contribution: The students stated that they were more successful in electric-related subjects. The students reported their views about the question of whether the new method applied contributed to them cognitively:

> *"Well, I, as a 7th grade student, never listened to the teacher in the course of physics. I don't remember listening to the lesson. I even don't remember the subjects we learnt during the lessons. Well, I don't remember exactly but the subjects were, I think, buoyancy of water, something like that. I didn't have much knowledge about electric. But now I have, and I liked it. It was pleasant. Now, for example, we know all the concepts, especially the lamps"* (Student H).

DISCUSSION

In the study, no significant difference between the experimental and control group students' Electricity Achievement pre-test mean scores prior to the experimental process was found at the significance level of 0.05 with respect to such sub-dimensions of Bloom's taxonomy as knowledge, application, and metacognition and with respect to the total scores. Based on these findings, it could be stated that the experimental and control group students had similar levels of achievement prior to the experimental process. This is considered important for an experimental study to provide healthy results. Other studies showed that experimental and control groups' similar levels of achievement prior to experimental processes are considered important (Güven and Gürdal, 2002; Güler and Sağlam, 2002; Aladağ, 2008).

When the comparisons made between the groups at the end of the applications were taken into consideration, a significant difference was found at the 0.05 level between the experimental and control group students' Electricity Achievement pre-test and post-test mean scores in favor of the experimental group with respect to the sub-dimensions of Bloom's taxonomy as knowledge, comprehension and metacognition, as well as with respect to the total mean scores. Dependent on these findings, it could be stated that the Thinking Journey Supported with Technology and Project was more successful than teacher-centered traditional methods**.** The experimental group students are guided on a thinking journey with carefully constructed, open ended questions. So, it could said that at the end of the study experimental group students improved their cognitive, behavioral, visual skills of their scientific world. Different from other studies in this study we supported Thinking Journey with projects, animation and simulations. This blended method helped the students to improve their thinking skills with touching to the teaching materials via projects and seeing them as a moving net via animations and simulations. The interactions in the Thinking Journey enabled students to observe the concepts from different perspectives. So the students could constructed their scientific concepts with open ended questions, projects and computer. In this way the students were walking in the learning environments with their thinking activities. The teacher only guided them not show them. Being in the center of the learning is very important for the students to transfer their thinking skills to use the knowledge. Schur et al. (2002) stated that this method "may enable the student to extend her/his view of the earth, and to show her/his that her/his initial perspective is just a particular case of the whole picture". In another study, Stein, Schur and Galili (2009) stated that Thinking Journey applications have a strong effect on the students' active learning of physical concepts. Schur and Galili (2009), Schur (1999) and Schur et al. (2002) found out the Thinking Journey they applied in the computer environment positively influenced students' success and motivation. Moreover, Yair, Schur and Mintz (2003) carried out a study named "A Thinking Journey to the Planets Using Scientific Visualization Technologies: Implications to Astronomy Education." In the study, they stated that the use of images, films, computer programs, and other means that make use of visual information is bound to increase in the future educational programs (Barab et al., 2001). In addition to, they stated that with Thinking Journey, students can construct their views of world in scientific situations and this can be enjoyable for them.

In their study on "Examining Teachers' Views about Methods and Techniques Applied in the Field of Education", Aydede et al. (2006) concluded that the majority of teachers believed student-centered and laboratory and technology supported methods and techniques increased students' participation and thus influenced students' success positively. A number of studies conducted revealed a positive influence of student-centered applications on students' success. Aladağ (2008) investigated the "Influence of the Project-Based Approach in Elementary School Mathematics Teaching on 4th Grade Students' Academic Achievement". At the end of the study, it was concluded that the achievement levels of the students receiving instruction via the project-based learning approach were higher than those of the students receiving instruction via traditional methods. Regarding the computer-supported learning, one of the methods increasing students' achievement and motivation, Kıyıcı and Yumuşak (2005) carried out a study called "Influence of Laboratory Experiments in the Course of Science Conducted with the Computer-Supported Learning on Students' Gains." At the end of the study, it was revealed that the students' gains in the computer-supported learning environment were higher than the students' gains in the traditional classroom environment. Especially for the science lessons, assignment of the laboratory experiments as a project subject was an effective method for healthy learning. Laboratory work influences reasoning, critical thinking, and an understanding of science and teaches students how to produce information (Akdeniz et al., 1999). In a study conducted by Güven and Gürdal (2002), the researchers investigated the influence of the method of conducting an experiment in the lesson unit of electricity on students' achievement. At the end of the study, the researchers found that the experimental group was more successful than the control group was.

The data obtained via the interviews held with the experimental group students following the applications of the "Thinking Journey Supported with the Technology and Project" were divided into categories and themes. When the content of these themes was examined, it was seen that the students were satisfied with the process as a whole yet experienced certain difficulties. First, the majority of the students stated that they considered the physics course quite difficult and that their thoughts changed following the applications carried out during the lessons, and they developed more positive attitudes towards physics. The experimental group students also reported that they found "Thinking Journey Supported with the Technology and Project" beneficial; that the method contributed more to them in terms of affective, and cognitive and psychomotor skills; and that the knowledge they acquired was permanent. From these result, it could be said that the students had positive ideas and views about the applications. Similar to this study, Korkmaz (2007), examined students' views towards student-centered learning methods. Korkmaz found that the methods and environment of teaching and learning had a positive effect on most of the students. In Korkmaz's study, the students stated that "student centered methods that were used in the course had positive impact on attendance of course, active learning, meaningful understanding, permanent in learning, and expression of opinions."

CONCLUSIONS

From the results of the study, it could be said that within technology and project supported Thinking Journey method the students were provided to compare, construct, develop multiple perspectives of the scientific concepts and make sense of the learning processes.
The following suggestions were put forward in line with the findings of the present study:

- The teacher should organize the learning environment in the physics course in a way to allow students to direct questions, to have self-confidence, and to express their thoughts comfortably.
- The applicability of this method could be tested in other science courses.
- The Thinking Journey could be applied in other physics-related subjects with the support of various instructional materials.
- Trainings given to science/physics teacher candidates could focus on the effectiveness of creative and critical thinking in education on healthy learning, and related importance could be given in the development of the course contents.
- It would provide a better view with more students.

REFERENCES

Akdeniz, A. R., Çepni, S.& Azar, A. (1999). Fizik öğretmen adaylarının laboratuar kullanım becerilerini geliştirmek için bir yaklaşim. III. Ulusal Fen Bilimleri Eğitimi Sempozyumu, Karadeniz Teknik Üniversitesi, Trabzon, 23-25 September, 1998. 118-125.

Aladağ, S. (2008). The effect of project based learning approach in teaching mathematics to the academic achievements of primary education students. *Turkey Journal of social Research,* 12 (2), 157-170.

Aydede, M. N., Çağlayan, Ç., Matyar, F.& Gülnaz, O. (2006). Examining the opinions of the science and techonology teachers concerning about learning methods. *Journal of Çukurova University Education Faculty,* 2 (32), 24-34.

Dewey, J. (1938). Experience and Education. New York: Macmillan.
Güler, M. H.& Sağlam, N. (2002). The effects of the computer aided instruction and worksheets on the students' biology achievement and their attitudes toward computer. *Journal of Hacettepe Education Faculty,* 23 (2), 117-126.
Güven, İ. & Gürdal, A. (2002). Ortaöğretim fizik derslerinde deneylerin öğrenme üzerindeki etkileri. V. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi, Ankara,http://www.fedu.metu.edu.tr/UFBMEK5/b_kitabi/PDF/Fizik/Bildiri/t116DD.pdf (28/04/ 2011).
Kelly, L. (1980). The Teacher -Student Relationship in Experiential Classes and the Student's Perception of Course Effectiveness. http://sbaweb.wayne.edu/~absel/bkl/.%5Cjels%5C2-1b.pdf 15.12.2011
Kıyıcı, G. & Yumuşak, A. (2005). The affects of computer assisted activity at science laboratory lesson on student's acquiry; example of acid – base concept's and titration topic. *The Turkısh Online Journal of Education Technology,* 4 (4), 1303-6521.
Korkmaz, İ. (2007). The students' opinions towards student centered-learning methods. *Journal of Selçuk University Social Sience Institute*, 17 (1), 393-402.
Montgomery, B. (2000). The student and cooperating teacher relationship. *Journal of Family and Consumer Sciences Education*, 18(2),7-15.
Ölmez, M.& Güzeliş, C. (2006). Elektrik ve elektronik mühendisliğinde projeye dayalı sayısal kontrol eğitimi: Bir metal ayırıcı ve sınıflandırıcı sistem tasarımı örneği. *Journal of Yasar University,* 2 (7), 641-649.
Phillips, A. H. (2005). Student-centered, Technology-enhanced Instruction in a 9th Grade Geography Class. *ARE,* 4(2). Retrieved 15.12.2011 from http://teach.valdosta.edu/are/vol4no2/PDF/PhillipsA-AM-ARE.pdf
Schur, Y. (1999). Constructivism and mediated learning experience as a basis for a process of conceptual change in students' concepts of earth. Unpublished Ph.D. Thesis, University of Witwatersrand, Johannesburg, South Africa.
Schur, Y., Skuy, M., Zietsman, A.& Fridjhon, P. (2002). A thinking journey based on constructivism and mediated learning experience as a vehicle for teaching science to low functioning students and enhancing their cognitive skills. *School Psychology International*, 23 (1), 36-67.
Schur, Y., Brand, R.& Yair, Y. (2002). Thinking journey To Mars. Tel Aviv: Open University.
Schur, Y.& Galili, I. (2009). Thinking Journey - a New Mode of Teaching Science. *International Journal of Science and Mathematics Education*, 7(3),627-646.
Smith, P. L.& Ragan, T. J. (1999). Instructional Design. Second Edition, USA.
Stein, H., Galili, I., & Schur, Y. (2009). Distinguishing between Weight and Gravitational force in Thinking Journey mode of teaching science. The paper presented at the 7th Biennial Conference of the European Science Education Research Association (ESERA), Istanbul, Turkey.
Tarım, K., Dinçartut, P.& İflazoğlu, A. (2006). Matematik öğretimi dersinde çoklu zeka destekli proje yaklaşımlı öğretimin öğrencilerin akademik başarılarına etkisi ve öğrenci görüşlerinin belirlenmesi. Gazi Education Faculty of Gazi University, 7th National Science and Mathematics Education Congress, 07-09 September, Ankara.
Yair, Y., Schur, Y.& Mintz, R. (2003). A thinking journey to the planets using scientific visualization technologies: Implications to astronomy education. *Journal of Science Education and Technology,* 12(1), 43-49.
Yavuz, S. (2006). Evaluation of the effect of project-based learning model on chemistry education students environmental knowledge and attitudes towards environment. Institute of Science, Hacettepe University, Unpublished Doctoral Thesis, Ankara.

EXPLORING THE REASONS FOR USING ELECTRIC BOOKS AND TECHNOLOGIC PEDAGOGICAL AND CONTENT KNOWLEDGE OF TAIWANESE ELEMENTARY MATHEMATICS AND SCIENCE TEACHERS

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ABSTRACT
This study highlights trends and features of E-books and their versatility of this tool in elementary educational settings. There has been little quantitative research employed to examine teachers' reasons for using or not using E-books. The purpose of this study was to examine elementary school mathematics and science teachers' reasons for using or not using E-books and to assess how the use of E-books relates to TPACK among Taiwanese teachers. The survey was developed based on an overview of discussions from prior research related to the benefits and drawbacks of using E-books. The results show the percentages for four reasons for using E-books were high, and low for four reasons for not using E-books. The teachers' perceptions of E-books' usefulness and ability to increase motivation and interaction were significantly different according to gender and the perceptions of E-books' ability to increase interaction were significantly different according to teaching experience. Elementary science teachers demonstrated significantly higher TPACK than elementary mathematics teachers. There was no significant difference found in TPACK according to gender, except for in teachers' technological knowledge. Teachers who had more years of teaching experience demonstrated significantly higher TPACK than the teachers who had fewer years of teaching experience. The results of this study can provide researchers, policy makers, and school administrators with a better understanding of elementary school teachers' perspectives.
Keywords: Electronic Books; TPACK; Elementary Mathematics and Science Teachers

INTRODUCTION

Changes in instructional technology have influenced many educational activities, especially in the fields of game-based learning and e-learning. In fact, instructors face a complex task in designing, developing, and evaluating e-learning courses, which include many different factors (Pearson & Trinidad, 2005; Thurmond et al., 2002; Trinidad, Aldridge, & Fraser, 2005). For this reason, program planners and instructors must consider several factors as they provide their learners with effective learning activities by using technology. Moreover, technology-assisted teaching has received increasing attention in the e-learning field and many related studies have investigated a variety of topics, including web-based learning, mobile-assisted learning, and ubiquitous learning (Bierman & Rupp-Serrano, 2010; Derting & Cox, 2008; Grant, 2004; Jang, 2009; Prey & Weaver, 2007).

The government in Taiwan has developed various learning opportunities for citizens to access new knowledge via e-learning platforms. It has established many online recourses and educational institutions, such as the National Science and Technology Program for e-Learning, and the Digital Opportunity Center (DOC). Taiwanese policy makers have identified distance education as an important way to encourage people to engage many different kinds of learning activities. The Taiwan E-book Association Web was officially established in 2011. Fortunately, as the demands of educational settings have expanded, various technology tools have become available to teachers and institutions. Therefore, education programs frequently re-evaluate teaching strategies and content delivery methods and test new ones in an effort to ensure that they are still valid in current educational environments. It is now possible to explore the multitude of technological tools emerging almost daily and the effective uses of E-book tools in the classroom (Buckley & Tritt, 2011 Mol, Bus, & de Jong, 2009).

Moreover, researchers have pointed out that E-books are one type of critical learning platform with considerable potential for students to learn new knowledge in web-based context (Lam & McNaught, 2009; Mock, 2004). Electronic books are one way to enhance the digital library with global 24-hours-a-day and 7-days-a-week access to authoritative information, and they enable users to quickly retrieve and access specific research material easily, quickly, and effectively (Anuradha & Usha, 2006; Buckley & Tritt, 2011). We are exploring an interactive E-book learning system and environment which can be designed to assist students to learn new knowledge and skills. Some famous interactive web-based applications include E-book software and devices, e.g., tablet PCs or web pads. The interactive applications allow users to interact with peers and teachers in online learning environments. Some studies have described how to integrate E-books into teaching and learning environments (Bierman& Rupp-Serrano, 2010 ; Crespo et al., 2011 ; Lam, et al., 2009; Shamir & Shlafer, 2011), and many researchers have suggested that E-books could be used to increase students' motivation and capture learners' responses quickly (Anuradha & Usha, 2006; Buckley & Tritt, 2011; Huang et al., 2012). However, several studies have pointed that both instructors and learners are not ready to use E-books to replace traditional textbooks (Huang et al., 2012).

Mishra and Koehler (2006) proposed the Technological Pedagogical and Content Knowledge (TPACK) framework and stated that the central construct of TPACK represents an emerging form of transformative knowledge through an integrative process generated from the existing instructional forms into new forms that potentially maximize the effectiveness of integrating technology into teaching. Researchers have widely adopted the model to develop TPACK surveys for examining teacher development of this particular type of knowledge (Archambault & Barnett, 2010; Chai, Koh, & Tsai, 2010, 2011; Koehler & Mishra, 2005; Sahin, 2011; Schmidt et al., 2009). The choice of E-books and TPACK development indicates a reciprocal relationship with unique functions requiring different technological and application knowledge to be used according to content and pedagogy in their context. Teachers with more web-related experience show higher self-efficacy with TPACK and more positive attitudes toward the use of the Wed than do teachers with less experience using web-related tools (Lee & Tsai, 2010). Teachers who report use of interactive whiteboards (IWBs) in their teaching show higher TPACK than teachers who report no use of IWBs (Jang & Tsai, 2012).

In this paper, we highlight trends and features of E-books and their versatility as tools in elementary educational settings. Most of previous research has been done with students, while few studies have investigated the use of E-books by elementary school teachers. There has been little research conducted employing quantitative measures to examine teachers' reasons for using or not using E-books, as well as whether the reasons are related to teachers' teaching subjects, gender, or teaching experience. In this study, we first reviewed prior empirical research on the advantages and drawbacks of using E-books and categorized these findings into single reasons for elementary school teachers to rate. The results of this study can provide researchers, policy makers, and school administrators with a better understanding of elementary school teachers' perspectives on these reasons. Therefore, this study used a survey to examine elementary school mathematics and science teachers' reasons for using or not using E-books and how the use of E-books relates to TPACK among teachers in Taiwan.

RESEARCH QUESTIONS

The research questions for this study are:

1. Why do elementary school teachers use or not use E-books?
2. Are there any significant differences among the reasons according to teaching subjects, teacher gender, or teaching experience in the group using E-books?
3. Are there any significant differences in the TPACK of teachers using E-books according to teaching subjects, teacher gender, or teaching experience?

RELATED LITERATURE

THE TRENDS OF E-BOOKS

Over the past decades, web-based learning has become a critical issue in education due to the large amounts of information and recourses available in online environments (Pearson & Trinidad, 2005; Thurmond, et al., 2002). Nowadays, mobile learning technologies have influenced many aspects of education, including the computing applications for teaching, such as tablet PCs, which provide new method for instructors to deliver content and motivate students to engage in various learning activities inside and outside the classroom (Derting & Cox, 2008; Mitra, 2007; Siozos et al., 2009).

The use of E-books has increased in many different levels of institutions, and some researchers are also found potential applications for public school settings (Bierman& Rupp-Serrano, 2010; Buckley & Tritt, 2011; Shepperd, Grace, & Koch, 2008). Moreover, software technologies of E-book play a critical role in enabling various mobile devices such as tablet PCs for teaching in the instructional process (Liaw, Hatala, & Huang, 2010; Siozos et al., 2009). E-books have become more popular with publishers, librarians, and teachers within the past two years. This is evident by the number of E-book initiatives. E-book readers can be divided into the following categories: E-book hardware, Personal Digital Assistants (PDAs), tablet PCs and E-book software (Lam & McNaught, 2009; Mitra, 2007).

DEFINITION OF E-BOOKS

Electronic books (E-books) are gaining popularity for personal reading and teaching in the education field.

Lemken (1999) defined interactive E-books as “mobile, physical devices to display electronic (i.e. digital) documents”. On the other hand, E-book functionality is defined as the ability to support instructor in developing teaching strategies integrating teaching multimedia and assisting teachers in guiding students to engage in interactive learning and access learning contents using E-book devices. (Crespo et al., 2011 ; Derting & Cox, 2008; Korat & Shamir, 2007).

An E-book is based both on emulating the basic characteristics of traditional books in an electronic format, as well as leveraging internet technology to facilitate easy and efficient use (Anuradha & Usha, 2006; Lam & McNaught, 2009). An E-book can take the form of a single monograph or multi-volume set of books in a digital format that allows viewing on various types of monitors, devices, and personal computers. It should allow searching for specific information across a collection of books and within a book. An E-book should utilize the benefits of the internet by providing the ability to embed multimedia data, to link to other electronic resources, and to cross reference information across multiple resources (Buckley & Tritt, 2011; Lam & McNaught, 2009).

An E-book collection should be accessible anytime, anywhere via the internet, requiring no device but a personal computer to access the content. An ideal E-book should provide content of value, the ability to view online, the ability to download to a PC or view offline, and the ability to view on a handheld device or personal digital assistant (Buckley & Tritt, 2011).

THE ADVANTAGES OF E-BOOKS

Today various types of teaching technology are adopted in the classroom such as personal computers and tablet PCs. These digital tools can be used as E-book devices to assist instructors to teach in the digital form. The advantages of E-books for teaching are straightforward and include several factors:

1. Increasing interaction

Many researches have revealed that interaction is a critical factor in developing an excellent e-learning environment. E-books facilitate written and visual communication between the participants who are at different places, enabling students to interact with other students and teachers; this kind of fast communication is an important factor in the improvement of the value of e-learning (Anuradha & Usha, 2006; Buckley & Tritt, 2011). Moreover, several researchers have pointed out that the use of E-books for social interaction constitutes an important role in the emergence of internet usage (Huang, et al., 2012; Nunez-Valdez, et al., 2012).

2. Promoting learning motivation

E-books have a huge impact on learner motivation. As such information technology becomes increasingly ubiquitous in e-learning, it is important to design them to optimally impact motivation (Mock, 2004). Buckley & Tritt (2011) mentioned that student motivation is reflected by the amount of time spent on the internet**,** benefits gained from social networking, and identification of personal learning needs.

3. Encouraging student participation

It is important task for instructors to encourage active participation and contribution of each group member to successfully promote collaborative learning via E-books (Anuradha & Usha, 2006; Siozos, et al., 2009). E-book applications have resulted in increased user participation and open multimedia contents, some of which is potentially useful for learning (Derting, & Cox, 2008). In addition, many researches have indicated that awareness of the collaborative learning context through E-book devices significantly increases student participation in learning activities and improves student learning performance (Derting, & Cox, 2008; Mock, 2004; Siozos, et al., 2009).

4. Usefulness -Facilitating the understand of abstract concepts

E-books create new opportunities for teachers and have revived the scholarly monograph. The emergence of E-books has given publishers new ways to serve customers by re-purposing content and creating living books, which incorporate text, audio, video, and other resources (Derting, & Cox, 2008; Lam & McNaught, 2009; Siozos, et al., 2009), and enhance students’ vocabulary, story and concept understanding (Korat, 2010).

THE DISADVANTAGES OF E-BOOKS

Several researchers have revealed that there are several challenges involving instructors experiences using E-books for teaching activities in the classroom such as how to efficiently solve problems related to using E-books, time issues, school funding and training for operating E-books (Crespo et al., 2011; Derting & Cox, 2008; Grant, 2004; Lam, et al., 2009 ; Liaw, Hatala, & Huang, 2010).

1. Technique

It is crucial not only to provide these electronic resources, but also to integrate them into school systems to streamline operations in teaching, as well as promote user adoption (Lam & McNaught, 2009; Mitra, 2007). Access challenges include the cataloguing and indexing of E-books, circulation models for the electronic environment, and preservation and archiving of E-books and the resources linked to them (Derting & Cox, 2008; Siozos et al., 2009).

2. Funding

The integration of E-Books into schools has not only created opportunities for students, but also created several challenges. Schools must develop innovative policies, procedures, and funding to accommodate the teaching contents to E-books. Funding and technological challenges also include E-book hardware and software technologies, digital rights management software, and user and staff training (Derting & Cox, 2008; Siozos et al., 2009).

3. Time

Since the internet knows no boundaries, teachers must also contend with challenges created by the emergence of the E-book. These include extra loading time (Lam & McNaught, 2009). Providing feedback on student assignments can be a very time consuming task whether students are in face-to-face classes or online (Huang, et al., 2012).

4. Facilitated operation

E-books pose special problems with services to teachers and their equipment with work stations permanently accessible to the people who attend them and the teamwork of teachers (Buckley & Tritt, 2011; Crespo et al., 2011; de Jong & Bus, 2002).

USING E-BOOKS TO DEVELOP THE TPACK OF TEACHERS

In the present study, TPACK was investigated within a particular type of technology-based learning environment, the E-book (Mock, 2004). The current success of the use of the educational technology reinforces the choices we have made, particularly the flexibility offered through the personalization of online environments and the ability of teachers to create learning communities (Grant, 2004; Grimshaw et al., 2007; Shamir & Shlafer, 2011).

On the technical side, the implementation choices for using the E-book devices have led to open sources and flexible platforms which are easy to maintain and extend. Moreover, it allows easy integration or interoperability with existing resources and platforms in classrooms (Shamir & Shlafer, 2011). Digital inking of E-books provides the option to handwrite comments on a student's electronic document. The ability to write on students' digital files in order to provide precise and efficient feedback may be the most time saving and effective use of this tool we have found to date. Feedback via E-books may be especially helpful when teaching online as digital inking simulates the handwritten comments students are accustomed to receiving. Hand written digital comments on a student's document may increase social presence, and can provide a more human touch to feedback and online interaction (Nunez-Valdez, et al., 2012; Sneller, 2007).

These observations align with the TPACK notion of a transformative learning experience and integrative teacher knowledge. Teachers with TPACK know how to incorporate the three different knowledge domains of technology, pedagogy and science (or mathematics) into different situations and themes (Jimoyiannis, 2010). For example, Jang (2010) found that science teachers used IWBs as instructional tools to share their subject matter knowledge and to express students' understanding. In addition, the IWBs helped the science teachers who encountered teaching difficulties in the traditional classroom to better implement their representational repertoires and instructional strategies. Therefore, we propose that E-books may be another current technology for teachers to use and develop their TPACK in elementary schools.

Thus this study used integrative views of TPACK with E-book technology to develop an instrument and survey teacher' reasons for using or not using E-books and the E-book-based TPACK of current elementary mathematics and science teachers in Taiwan.

METHODLOGY

SURVEY INSTRUMENT

The study used a questionnaire to collect data from instructors at elementary schools in Taiwan. We adopted a three-part survey in this study: a research-based background survey to collect demographic information and survey of the reasons for using E-books and not using E-books. The first part of this survey included three variables: gender, teaching experience, and teaching subjects in order to gather participants' background information. One open-ended question was included in the first part to gather more information about their use of other technologies.

In the second part of the survey, there were four closed-ended questions for teachers who reported they were using or not using E-books and one open-ended question for these teachers to describe other reasons not listed in the survey (see Table 1). The questions of the survey were developed based on an overview of the discussions from prior research related to the benefits and drawbacks of using E-books. Participants rated the survey items in this section on a 3-point rating scale from 1 (Disagree) to 3 (Agree). Since each reason can explain an individual point in relation to both benefits and drawbacks, each reason was rated separately. In order to ensure their readability and comprehensibility, the draft questions were reviewed by five teachers to correct any ambiguous language. The questionnaire was then sent two science education scholars and two educational technology specialists for content review.

The third part of the questionnaire was developed to examine teachers' TPACK. The TPACK instrument used in this study was developed by Jang and Tsai (2012) to examine teachers involved in information communication technology teaching environments. The items of the TPACK instrument were ranked on a 5-point Likert scale from 1 (not at all true) to 5 (very true). The only difference between the TPACK items in the two questionnaires was that the term "interactive whiteboards" was changed to "E-books." The questionnaire contained 30 TPACK items and consisted of four components: 1) 5 items for Content Knowledge; 2) 9 items for Pedagogical Content Knowledge in the Context (PCKCx); 3) 4 items for Technological Knowledge; and 4) 12 items for Technological Pedagogical Content Knowledge in the Context (TPCKCx). The survey involves a 5-point Likert-type set of ordered alternatives.

Table 1 Reasons for using or not using interactive E-books

	Reasons for using	**Descriptors of the reasons**
1.	Using E-books can enhance students' motivation and help them to concentrate on learning.	Motivation
2.	Using E-books can help teachers explain complex and abstract concepts.	Usefulness
3.	Using E-books can increase interactions between teachers and students.	Interaction increase
4.	Integrating E-books into teaching can help teachers become more flexible and enhance students' participation.	Easy of use
	Reasons for not using	
1.	School does not have enough funds to provide an E-book for instructors.	Lack of budget
2.	E-books are not used due to lack of time to design teaching materials in my course.	Lack of time
3.	E-books are not used due to lack of professional training for the E-books functions and operation.	Lack of training
4.	E-books are not used due to frequent unsolved problems in using it in the classroom.	Unsolved problems

PARTICIPANT

A quantitative survey study exploring the instructors' views related to use or not use of E-books would be beneficial in identifying the fundamental issues that are of concern to teachers using E-books for teaching. The TPACK questionnaire was mailed to elementary schools randomly selected across different parts (i.e., North, Middle, South, and East) of Taiwan, and return envelopes were provided for completed questionnaires. There were 825 questionnaires returned in total. After deleting the questionnaires with missing data on ratings of using E-books and TPACK items, 680 accurate questionnaires were return for factor analysis of the survey.

ITEM AND FACTOR ANALYSIS

Item analysis was conducted with the 30 items. The participants scoring in the top 27% and in the bottom 27% were divided into two groups for independent sample t-tests. The difference between each item's scoring and the critical ratio of each item in the two groups was examined. Product-moment correlation and tests of homogeneity of proportions were conducted to establish criteria for retaining or deleting items. The critical ratio of all 30 items was over 3 ($p<.05$). Hence, we kept all items at this stage. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was applied to the data prior to factor extraction to ensure the characteristics of the data set were suitable for exploratory factor analysis (Field, 2009).

In this instrument, KMO was .907, above the minimum value of .5. The diagonals of the anti-image correlation matrix were all over .5 (Thompson, 2004) supporting the inclusion of each item in the factor analysis. Given these overall indicators, factor analysis was further conducted with all 30 items. Through the first factor analysis (see Table 3), the items C01, C02, C03, C04, and C05 were related to CK. The items from C06 to C14 were related to PCKCx. Furthermore, the items C15, C16, C17, and C18 were related to TK. Moreover, the items from C19 to C30 were related to technological application of TPCKCx. Cronbach's Alpha was computed to assess the instrument's reliability suggested as .70. Results showed that all the four subscales as well as the total scale had very high internal consistency. Internal consistency of each component was: CK (α = .875), PCKCx (α = .908), TK (α = .896), TPCKCx (α = .968), and TPACK (α = .956). We found that the four components captured even better Taiwanese elementary school contexts.

DATA ANALYSIS

Percentages of the ratings for each reason for using E-books and not using E-books were computed (see Table 2). Independent samples t-tests were conducted for the groups using E-books according to teaching subjects and teacher gender, and ANOVA was performed the group using E-books according to teaching experience (see Tables 3-5). To address the third research question in this study, an independent samples t-test was used to explore the significant differences between elementary mathematics and science teachers' TPACK according to teaching subjects and gender (see Tables 6-7). ANOVA was performed to answer research question 3 and determine the differences between teachers' TPACK according to teaching experience (see Table 8). Data from the one open-ended question was provided to understand what other technologies elementary teachers used in teaching mathematics and science.

RESULTS

1. The reasons for using or not using E-books

Based on the data of the survey, 680 elementary science and mathematics teachers responded to the survey accurately. The group of teachers who used E-books consisted of 586 (86.2%) elementary school teachers whereas the group of teachers who did not use E-books had 94 (13.8%) elementary school teachers. We computed the percentages of reasons for both using and not using E-books on a rating scale ranging from 1 (Disagree) to 3 (Agree).

Table 2 Percentages on reasons for using and not using E-books

Reasons	Yes (%)	Unknown (%)	No (%)
Use reasons (N=586)			
Reason1: Motivation	84.6	14.7	0.7
Reason2: Usefulness	92.7	7.02	0.2
Reason3: Interaction increase	72.5	24.1.	3.4
Reason4: Easy of use	86.5	13.1	0.3
Not use reasons (N=94)			
Reason1: Lack of budget	44.4	19.8	35.8
Reason2: Lack of time	44.4	29.6	25.9
Reason3: Lack of training	32.1.	29.6	38.3
Reason4: Unsolved problems	38.3	32.1	29.6

The percentages for all reasons of using E-books were high (see Table 2), indicating that most elementary school mathematics and science teachers who have used or are using E-books in their teaching agreed with the reasons in the survey for why they chose to use E-books. Elementary school teachers who reported not using E-books appeared to agree on all reasons below 50%, indicating that all reasons for them not to use E-books did seem not apparent. Because few teachers did not use E-books, we focused on the reasons for using E-books among teachers according to gender, teaching subjects, and experience in this study.

1.1 The reasons for using E-books according to gender

Table 3 Means, standard deviation, and t-test on use reasons by gender

Reasons /Group	Male (n = 180)		Female (n = 406)		
	M	S.D.	M	S.D.	*t*
Motivation	4.26	.680	4.10	.680	2.593*
Usefulness	4.23	.610	4.31	.620	2.225*
Interaction increase	3.97	.780	3.84	.720	1.994*
Easy of use	4.26	.660	4.15	.660	1.790

*p<.05

According to Table 3, reasons 1, 2 and 3 are significantly different between male and female teachers. The results indicated that male teachers showed significantly higher ratings for the reason of "enhancing students' motivation and helping them to concentrate on learning" than did female instructors. Also, male teachers' ratings for the reason of "using E-books can help teachers explain complex and abstract concepts" were significantly higher for males than those female teachers. Additionally, male teachers showed significantly higher ratings for the reason of "using E-books can increase interactions between teachers and students" than did female instructors.

1.2 The reasons for using E-books according to teaching subject

Table 4 Means, standard deviation, and t-test on use reasons by teaching subject

Reasons /Group	Mathematics (n = 426)		Science (n = 160)		
	M	S.D.	M	S.D.	*t*
Motivation	4.13	.680	4.21	.680	-1.185
Usefulness	4.32	.620	4.40	.600	-1.373
Interaction increase	3.86	.750	3.91	.700	-.743
Easy of use	4.16	.660	4.25	.650	-1.521

According to Table 4, there were no significantly differences among these four reasons according to teaching subject.

1.3 The reasons for using E-books according to teaching experience

Table 5 Means, standard deviation, and ANOVA on use reasons by teaching experience

Reasons /Group	<5 (n = 52)		6-15 (n = 296)		16-25 (n = 184)		> 26 (n = 56)		
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	*F*
Motivation	4.03	.78	4.13	.67	4.22	.66	4.36	.56	2.293
Usefulness	4.26	.70	4.34	.61	4.35	.60	4.57	.50	1.798
Interaction increase	3.73	.69	3.85	.77	3.94	.68	4.14	.80	2.737*
Easy of use	4.04	.77	4.17	.64	4.23	.67	4.36	.49	2.172

Note. *$p < .05$

According to Table 5, reason 2, "using E-books can help teachers explain complex and abstract concept" was significantly different according to teaching experiences. Other than this, no significant results appeared among the other reasons based on teaching experience.

2. The TPACK of teachers based on teaching subjects, gender and experience

Table 6 Means, Standard Deviation, and t-test on TPACK by Teaching Subjects

Components /Group	Mathematics (n = 426)		Science (n = 160)		
	M	S.D.	M	S.D.	*t*
CK	21.53	2.29	21.72	2.66	-.846
PCKCx	37.70	3.72	38.26	4.44	-1.404
TK	16.23	2.27	16.83	2.19	-2.860**
TPCKCx	49.19	7.10	50.86	5.88	-2.651**
TPACK	124.65	12.67	127.66	12.67	-2.556*

Note. *$p < .05$, **$p < .01$.

In order to examine teachers' TPACK according to teaching subjects (i.e., science and mathematics), a t-test was conducted for teachers' TPACK for the two subjects (see Table 6). Results indicated that there were significant differences between teachers' TK, TPCKx, and TPACK among science and mathematics teachers. Elementary science teachers demonstrated significantly higher TK, TPCKCx, and TPACK than did elementary mathematics teachers.

Table 7 Means, standard deviation, and t-test on TPACK according to gender

Components	Male (n = 180)		Female (n = 406)		
	M	S.D.	M	S.D.	*t*
CK	21.57	2.63	21.59	2.29	-.077
PCKCx	37.50	4.45	38.01	3.68	-1.347
TK	16.78	2.40	16.22	2.17	2.807**
TPCKCx	50.04	6.74	49.47	6.86	.948
TPACK	125.90	13.90	125.28	12.19	.541

Note. **p* < .05, ***p* < .01

An independent sample t-test was conducted for teachers' TPACK by gender (see Table 7). There was no significant difference found in TPACK according to gender, except in teachers' TK. Male teachers demonstrated significantly higher TK than did female teachers.

Table 8 Means, Standard Deviation, and ANOVA on TPACK by Teaching Experiences

Components/ Group	<5 (n = 52)		6-15 (n = 296)		16-25 (n = 184)		> 26 (n = 56)		
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	*F*
CK	21.01	2.48	21.58	2.16	21.72	2.63	22.36	3.02	2.564
PCKCx	36.23	4.26	37.95	3.55	38.12	4.16	39.43	4.74	6.101***
TK	15.81	2.22	16.51	2.30	16.49	2.18	16.00	2.10	2.336
TPCKCx	47.65	7.12	49.77	6.91	49.90	6.57	51.93	6.82	3.312*
TPACK	120.72**	13.08	125.81	12.45	126.23	12.48	129.71	13.85	4.843**

Note. **p* < .05, ***p* < .01 ****p* < .001.

ANOVA was performed to examine the significant differences between teachers' TPACK according to their teaching experience (see Table 8). The analyses showed that teachers' PCKCx, TPCKCx, and TPACK were significantly different among teachers with various levels of teaching experience. Teachers who had more years of teaching experience demonstrated significantly higher PCKCx, TPCKCx, and TPACK than the teachers who had fewer years of teaching experiences.

DISCUSSION AND IMPLICATIONS

This research investigated reasons for using E-books through surveys and instructors' viewpoints of the present situations in elementary schools in order to explore user utility and potential issues. The findings of this study make significant contributions to the study of E-book use by examining elementary school teachers' perspectives on the reasons for using or not using E-books in Taiwan, as well as whether each reason differs among teachers according to teaching subject, gender, and teaching experience. The percentages of elementary school teachers' ratings for each reason in using E-books were high such as "enhancing students' motivation, explaining complex and abstract concepts, increasing interactions, and ease of use (Bierman& Rupp-Serrano, 2010; de Jong & Bus, 2002 ; Korat & Shamir, 2007).

As shown in Table 3, the teacher's perceptions with regard to E-books' usefulness, and ability to increase motivation and interaction were significantly different according to gender. The results indicated that male teachers gave significantly higher ratings of these reasons than female teachers. This result supports the findings of several previous studies of the gender issues of e-learning (Gonzalez-Gomez, et al., 2012; Huynh, Lee & Schuldt, 2005). The reason may be that higher percentages of male university students select academic majors related to science or information technology. Male teachers have more learning opportunities and experiences involving computing and internet technology.

The perceptions with regard to E-books' ability to increase interaction were significantly different according to teaching experience, but the other perspectives were not significantly different. This result is not surprising given that instructors who have more teaching experience are able to develop effective interaction between teachers and learners in the e-learning field (Crespo et al., 2011; Hadjerrouit, 2010). For the open-ended questions, the teachers' opinions related to E-books made very positive comments about the contribution of using E-books. Teachers usually use the online content delivery system to give exercises to the students and observe individual learning needs. Also, students can easily and efficiently report their work and documents via online content delivery systems. This function plays a critical role in increasing the interaction between instructors and students in the classroom.

Researchers have studied the development of TPACK with in-service science teachers (Guzey & Roehrig., 2009; Jang, 2010) and in-service mathematics teachers (Lee & Hollebrands, 2008). Little is known about elementary teachers' TPACK in these two subjects. This study explores the differences between mathematics and science teachers' TPACK. The result shows that elementary science teachers have significantly higher TPACK than do elementary mathematics teachers in Taiwan. Science teachers' TK and TPCKCx were higher than those of mathematics teacher. This finding indicates that science teachers' knowledge associated with the technology related components of TPACK is higher than the knowledge of mathematics teachers. A possible reason may be that science teachers integrate more technology-related tools into their teaching than do mathematics teachers. In this way, their technological knowledge, and the knowledge of integrating technology, content, and teaching strategies can be enhanced. Therefore, it is essential to further gather qualitative data to verify this predictive reason and better understand whether science teachers use more technologies than mathematics teachers do in teaching as well as how science teachers apply various technologies.

No significant difference was found in teachers' TPACK by gender, except for the TK dimension. This finding suggests that the TK knowledge of male elementary teachers was higher than the TK knowledge of female elementary teachers. Teachers' teaching experience has been studied in relation to the PCK development of science teachers (Friedrichsen et al. 2009). Experienced teachers have more opportunities and experiences in teaching different content and applying various teaching strategies. In our study, we discovered that experienced teachers had higher TPACK than did novice teachers. Experienced teachers' PCKCx and TPCKCx were higher than those of novice teachers. This finding corresponds to the results of prior empirical studies suggesting that teachers with more teaching experience should present better knowledge by using pedagogical strategies in teaching as compared to teachers with little teaching experience (Jang & Tsai, 2012).

CONCLUSION AND SUGGESTIONS

This study is unique in that it examines in-service elementary teachers' TPACK by integrating teachers' knowledge of students' learning situations as a context factor in the proposed model. The results provide significant contributions to the research of E-book use by examining elementary teachers' current use of E-books in Taiwan and their development of TPACK. Another significant contribution is that teaching subjects and teaching experiences can play crucial roles in teachers' TPACK. The results of this study can provide researchers, policy makers, and school administrators with a better understanding of current elementary school science and mathematics teachers' perspectives.

Currently, E-books are only being used in the context of the educational establishment (Woody, Daniel, & Baker, 2010). We want to consider other contexts, for instance, the library context, and other specific services for students. This could lead to more personalization and adaptation of this object (Korat & Shamir, 2007; Shamir & Shlafer, 2011). Future studies could develop a self-learning system and apply learning models via E-book platforms for in-service teachers, and explore students' understanding and academic performance of E-book collaborative learning in real classrooms. Researchers could cooperate with teachers and students executing learning activity to evaluate the improvement of E-book performance. Future studies could also cooperate with other content-based projects and include their content, learning models and learning activity designs in E-book systems.

REFERENCE

Anuradha, K. T., & Usha, H. S. (2006). Use of E-Books in an academic and research environment: A case study from the Indian institute of science program. *Electronic Library & Information Systems, 40*(1), 48-62.

Archambault, L. M., & Barnett, J. H. (2010). Revisiting technological pedagogical content knowledge: Exploring the TPACK framework. *Computers & Education*, *55*(4), 1656-1662.

Bierman, J., Ortega, L., & Rupp-Serrano, K. (2010). E-book usage in pure and applied sciences. *Science &Technology Libraries, 29*(1–2), 69–91.

Buckley, M., & Tritt, D. (2011). E-book approval plans: Integration to meet user needs. *Computers in Libraries, 31*(3), 15-18.

Chai, C. S., Koh, J. H. L., & Tsai, C.-C. (2010). Facilitating pre-service teachers' development of Technological, Pedagogical, and Content Knowledge (TPACK). *Educational Technology & Society, 13(4)*, 63–73.

Chai, C. S. Koh, J. H. L., Tsai, C.-C, & Tan, L. L. W. (2011). Modeling primary school pre-service teachers' Technological Pedagogical Content Knowledge (TPACK) for meaningful learning with information and communication technology (ICT). *Computers & Education*, 57, 1184-1193.

Crespo, R. G., Martinez, O. S., Lovelle, J. M. C., Garcia-Bustelo, B. C. P., Gayo, J. E. L., & de Pablos, P. O. (2011). Recommendation System based on user interaction data applied to intelligent electronic books. *Computers in Human Behavior*, *27*(4), 1445-1449.

Derting, T. L., & Cox, J. R. (2008). Using a Tablet PC to enhance student engagement and learning in an introductory organic chemistry course. *Journal of Chemical Education*, *85*(12), 1638-1643.
de Jong, M. T., & Bus, A. G. (2002). Quality of book-reading matters for emergent readers: An experiment with the same book in a regular or electronic format. J*ournal of Educational Psychology, 94*(1), 145–155.
Field, A. (2009). *Discovering statistics using SPSS*. Thousand Oaks, CA: SAGE Publications Ltd.
Friedrichsen, P. J., Abell, S. K., Pareja, E. M., Brown, P. L., Lankford, D. M., & Volkmann, M. J. (2009). Does teaching experience matter? Examining biology teachers' prior knowledge for teaching in an alternative certification program. *Journal of Research in Science Teaching, 46*, 357-383.
Gonzalez-Gomez, F., Guardiola, J., Rodriguez, O., & Alonso, M. (2012). Gender differences in E-learning satisfaction. *Computers & Education*, *58*(1), 283-290.
Grant, J. A. (2004). Are electronic books effective in teaching young children reading and comprehension?. *International Journal of Instructional Media*, *31*(3), 303.
Grimshaw, S., Dungworth, N., McKnight, C., & Morris, A. (2007). Electronic books: Children's reading and comprehension. *British Journal of Educational Technology*, *38*(4), 583-599.
Guzey, S. S., & Roehrig, G. H. (2009). Teaching science with technology: Case studies of science teachers' development of technology, pedagogy, and content knowledge. *Contemporary Issues in Technology and Teacher Education*, *9(1)*, 25-45.
Hadjerrouit, S. (2010). A conceptual framework for using and evaluating Web-based learning resources in school education. *Journal of Information Technology Education*, *9*53-79.
Heinrichs, S. C., & Noel Dowds, B. (2008). Internet activities to enhance course content: Assessment of instructional effectiveness at institutional and intra-personal levels of analysis. In A. M. Columbus (Ed.), *Advances in psychology research* (pp. 117-133). Hauppauge, NY: Nova Science Publishers.
Huang, Y. M., Liang, T. H., Su, Y. N., & Chen, N.S. (2012). Empowering personalized learning with an interactive e-book learning system for elementary school students. *Educational Technology Research and Development*, *60(4)*, 703-722.
Huynh, M. Q., Lee, J., & Schuldt, B. A. (2005). The insiders' perspectives: A focus group study on gender issues in a computer-supported collaborative learning environment. *Journal of Information Technology Education*, *4*237-255.
Jang, S. J. (2009). Exploration of secondary students' creativity by integrating web-based technology into an innovative science curriculum. *Computers & Education*, *52*(1), 247-255.
Jang, S. J. (2010). Integrating the interactive whiteboard and peer coaching to develop the TPACK of secondary science teachers. *Computers & Education*, *55*(4), 1744-1751.
Jang, S. J. & Tsai, M.-F. (2012). Exploring the TPACK of Taiwanese elementary mathematics and science teachers with respect to use of interactive whiteboards. *Computers & Education*, *59*(2), 327-338.
Jimoyiannis, A. (2010). Designing and implementing an integrated technological pedagogical science knowledge framework for science teachers professional development. *Computers & Education, 55*, 1259–1269.
Koehler, M. J., & Mishra, P. (2005). What happens when teachers design educational technology? The development of Technological Pedagogical Content Knowledge. *Journal of Educational Computing Research*, *32*(2), 131-152.
Korat, O., & Shamir, A. (2007). Electronic books versus adult readers: Effects on children's emergent literacy as a function of social class. *Journal of Computer Assisted Learning*, *23*(3), 248–259.
Lam, P., Lam, S., Lam, J., & McNaught, C. (2009). Usability and usefulness of e-books on PPCs: How students' opinions vary over time. *Australasian Journal of Educational Technology*, *25*(1), 30-44.
Lee, H., & Hollebrands, K. (2008). Preparing to teach mathematics with technology: An integrated approach to developing technological pedagogical content knowledge. *Contemporary Issues in Technology and Teacher Education*, *8*(4), 326-341.
Lee, M. H., & Tsai, C. C. (2010). Exploring teachers' perceived self efficacy and technological pedagogical content knowledge with respect to educational use of the world wide web. *Instructional Science, 38*, 1–21.
Lemken, B. (1999) E-book: The missing link between paper and screen. *Designing Electronic Books Workshop, CHI99 Conference,* Pittsburgh, PA.
Liaw, S., Hatala, M., & Huang, H. (2010). Investigating acceptance toward mobile learning to assist individual knowledge management: Based on activity theory approach. *Computers & Education*, *54*(2), 446-454.
Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A new framework for teacher knowledge. *Teachers College Record. 108*(6), 1017-1054.
Mitra, A. (2007). *Substituting the chalk board with a Tablet computer*. In G. Richards (Ed.). Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education (pp.1122-1125). Chesapeake, VA: AACE.
Mock, K. (2004). Teaching with Tablet PC's. *Journal of Computing Sciences in College, 20*(2), 17-27.

Mol, S. E., Bus, A. G., & de Jong, M. T. (2009). Interactive book reading in early education: A tool to stimulate print knowledge as well as oral language. *Review of Educational Research*, *79*(2), 979–1007.
Korat, O. (2010). Reading electronic books as a support for vocabulary, story comprehension and word reading in kindergarten and first grade. *Computers & Education*, *55*(1), 24-31.
Korat, O., & Shamir, A. (2007). Electronic books versus adult readers: Effects on children's emergent literacy as a function of social class. *Journal of Computer Assisted Learning*, *23*(3), 248–259.
Nunez-Valdez, E. R., Lovelle, J. M. C., Martinez, O. S., Garcia-Diaz, V., de Pablos, P. O., & Marin, C. E. M. (2012). Implicit feedback techniques on recommender systems applied to electronic books. *Computers in Human Behavior, 28*(4), 1186-1193.
Pearson, J., & Trinidad, S. (2005). An instrument for refining the design of e-learning environments. *Journal of Computer Assisted Learning*, *21*, 396-404.
Prey, J., & Weaver, A. (2007). Tablet PC technology: The next generation. *Computer, 40*(9), 32-33.
Sahin, I. (2011). Development of survey of technological pedagogical and content knowledge (TPACK). *The Turkish Online Journal of Educational Technology, 10*(1), 97-105.
Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers. *Journal of Research on Technology in Education*, *42*(2), 123-149.
Shamir, A., & Shlafer, I. (2011). E-books effectiveness in promoting phonological awareness and concept about print: A comparison between children at risk for learning disabilities and typically developing kindergarteners. *Computers & Education*, *57*(3), 1989-1997.
Shepperd, J. A., Grace, J. L., & Koch, E. J. (2008). Evaluating the electronic textbook: Is it time to dispense with the paper text? *Teaching of Psychology, 35*(1), 2–5.
Siozos, P., Palaigeorgiou, G., Triantafyllakos, G., & Despotakis, T. (2009). Computer based testing using "digital ink": Participatory design of a Tablet PC based assessment application for secondary education. *Computers & Education, 52*(4), 811-819.
Sneller, J. (2007). *The Tablet PC classroom: Erasing borders, stimulating activity, enhancing communication.* 37th ASEE/IEE Frontiers in Education Conference: Milwaukee, WI.
Thompson, B. (2004). *Exploratory and confirmatory factor analysis: Understanding concepts and applications*. Washington, D.C.: American Psychological Association.
Thurmond, V. A., Wambach, K., Connors, H., & Frey, B. (2002). Evaluation of student satisfaction: Determining the impact of a Web-based environment by controlling for student characteristics. *The American Journal of Distance Education*, *16*(3), 169-189.
Trinidad, S., Aldridge, J., & Fraser, B. (2005). Development and use of an online learning environment survey. *Journal of Educational Technology, 21* (1), 60-81.
Woody, W., Daniel, D. B., & Baker, C. A. (2010). E-books or textbooks: Students prefer textbooks. *Computers & Education*, *55*(3), 945-948.

FROM THE PERSPECTIVE OF COMMUNITY OF INQUIRY FRAMEWORK: AN EXAMINATION OF FACEBOOK USES BY PRE-SERVICE TEACHERS AS A LEARNING ENVIRONMENT

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ABSTRACT
Online and blended learning, developed with advances in technology, have gained relative importance in modern communities. In recent years, the concept of creating learning communities has been coined to increase effectiveness of these learning environments. Based on this concept, Garrison, Anderson, and Archer (2000) developed the Community of Inquiry Framework (CoI), which intends to create learning communities for students in online and blended learning environments to collaborate and interact with one another, and learning is based on educational experiences. CoI framework is based on three fundamental dimensions: social presence, cognitive presence, and teaching presence.

The purpose of this study is to examine the development of a CoI in face-to-face and blended learning contexts in relationship to students' academic success, satisfaction, and motivation. The study is conducted in an undergraduate course delivered in both face-to-face (control group) and blended (experimental group) formats. A pretest and posttest research model is used in the study. Additionally, content analysis is used to analyze students' postings on Facebook. The research group for this study consists of 109 students in the Department of Computer and Instructional Technology Education. According to the results of this study, there is no significant difference between academic success of students in control and experimental groups. Also, there is a significant difference in some categories of motivation, satisfaction, and CoI.

INTRODUCTION

Currently, the rapid and important developments in technology have affected modern society. These developments bring a necessity for society to better use, manage, understand, and evaluate technology. Education plays an important role to meet the diverse needs of learners and improve their performance levels. Therefore, educational institutions are expected to provide individuals with the use of technology to access information, produce new knowledge, and keep up with the new age. Distance education is a response to the needs and expectations of the community. The purpose of distance education is to educate people, who are aware of technological progress, critical thinking, problem-solving, and collaboration.

There are numerous variables that affect the formation of learning communities in blended and online learning environments. Those most commonly adopted are motivation and satisfaction (Lopez-Perez, Perez-Lopez, & Rodriguez-Ariza, 2011). Satisfaction is "an affective outcome indicating positive feelings and attitudes towards the quality of learning and learning environment" (Akyol, 2009, p. 7). Some studies show a relationship between student satisfaction and sense of community (Rovai, 2002; Shea, 2006; Shea, Li, & Pickett, 2006). Motivation is the energy and drive that lead students to learn, work effectively, and achieve their potential at school (Martin & Tracey, 2002). Also, motivation is an affective component and plays an important role in students' skills of critical thinking, learning strategies, and learning achievement (Tuan, Chin, & Shieh, 2005). It is stated a learning environment comprises teaching strategies, teaching methods, class activities, student-teacher and student-student interactions that influence an individual's motivation in learning (Brophy, 1998; Hanrahan, 1998; Pintrich & Schunk 1996).

It appears that besides the advantages it offers, there are also some problems of distance education. Moore (1993) defines transactional distance in distance education as the psychological and communication gaps that exist between learners and instructors besides physical distance. Recently, the Community of Inquiry model (CoI) has become popular to remove this gap for distance education and provide a sense for students to feel themselves in the real classroom.

THEORETICAL BACKGROUND

A community is defined as "a general sense of connection, belonging and comfort that develop over time among members of a group who share purpose and commitment to a common goal" (Conrad, 2005, p. 1). In a well-developed learning community, students learn from their interactions with others, with objects of the effort, and from their own participation during the process (Riel & Polin, 2004).

Community of Inquiry framework was developed by Garrison, Anderson, and Archer (2000). In the CoI framework, which places emphasis on critical thinking and collaboration, learning is based on educational experience in online and blended learning environments. Community of Inquiry provides a well-structured model and a set of guidelines for the purpose of constructing meaningful and worthwhile knowledge (Akyol, 2009). Garrison et al. presented the CoI model to help identify and show the relationships between required elements for learners to have successful learning experiences (Garrison, Anderson, & Archer, 2001). In this view, learners collaboratively communicate during their educational experience to construct knowledge (Colt, 2008). "The Community of Inquiry model was specifically designed to guide the use of computer conferencing to support critical thinking in higher education" (Rourke, Garrison, Anderson, & Archer, 2001, p. 2). The fundamental assumption of the CoI model is social interaction among students and teachers provides deep and meaningful learning environments in higher education, which can be either online or face-to-face (Shin, 2008).

The CoI model assumes that deep and meaningful learning, particularly in online environments, takes place within the community through the interaction of three core elements (Tolu, 2010). As shown in Figure 1, these elements comprise social presence (participants seem like actual people), teaching presence (the design and development of learning experiences), and cognitive presence (the ability of learners to use online communication to construct meaning).

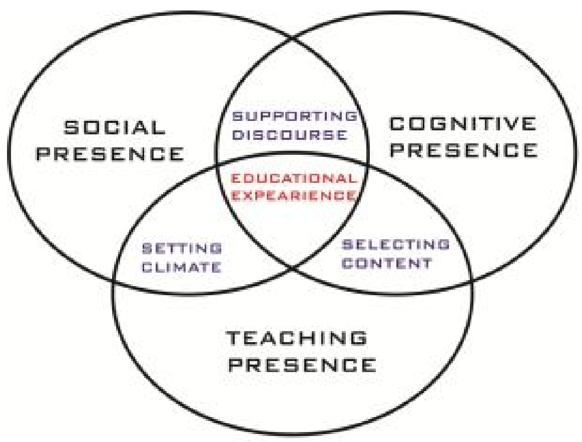

Figure 1. Community of Inquiry Model

Social Presence

Social presence is "the ability of learners to project themselves socially and emotionally in a community of inquiry" (Rourke et al., 2001, p. 3). It involves two important concepts—immediacy and intimacy. Immediacy is defined as the psychological proximity of the persons in communication. Intimacy is the perceived familiarity caused by social behaviors, such as body language, eye contact and smiling (Short, Williams, & Christie, 1976). In face-to-face learning, the persons in communication always convey and perceive positive, neutral, or negative levels of intimacy and immediacy through culturally-shared signs and codes, such as language choice, voice tone, body orientation, eye contact, and physical proximity (Tolu, 2010). Akyol (2009) states both intimacy and immediacy contribute to the development of social presence.

Social presence includes three essential categories—affective expression, open communication, and group cohesion. Affective expression is an initial stage of the course as a means of building trust and establishing oneself as a 'real person' (Bartruff, 2009). Affective expression refers to the emotional expressions within online environments, such as the use of emoticons, humor, and self-disclosure (Colt, 2008). Open communication develops awareness and acceptance of others' ideas with respect. Group cohesion starts to form through affective response and open communication (Akyol, 2009).

The main purpose of social presence is to improve cognitive presence and increase critical thinking through educational transactions and communications among peers enrolled in an online course (Lazarevic, 2011). Social presence is an important part of constructing cognitive presence because it is through interactions with other students and their ideas that new ideas can be formed (Harasim, Hiltz, Teles, & Turoff, 1996; Shin, 2008).

Cognitive Presence

Garrison (2007, p. 65) defined cognitive presence as "the exploration, construction, resolution and confirmation of understanding through collaboration and reflection in a community of inquiry." Garrison et al. (2001) operationalized cognitive presence through the Practical Inquiry model in terms of community of inquiry (Akyol, 2009).

The practical inquiry model was established to understand the development process of critical thinking to assess and investigate cognitive presence in an online learning environment (Maness-Gilliland, 2010). The practical inquiry model comprises four phases: 1) triggering event, 2) exploration, 3) integration, and 4) resolution (see Figure 2).

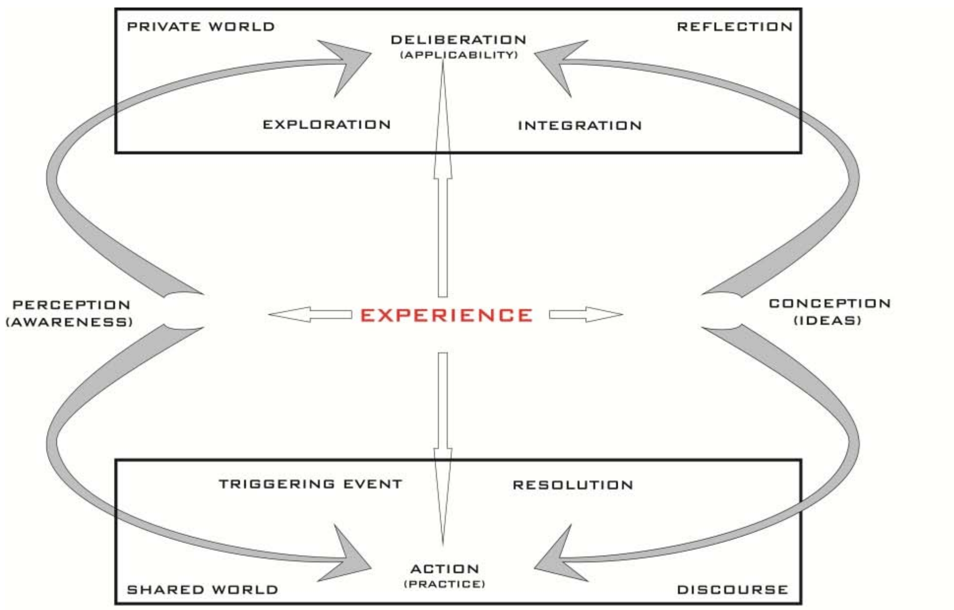

Figure 2. Practical Inquiry Model

- The first phase of the model is the triggering event, considered as the starting point of critical inquiry (Maness-Gilliland, 2010). In this phase, learners recognize a problem and develop a sense of puzzlement in the learning environment (Tolu, 2010).
- In the second phase, exploration, learners explore problems by asking each other brainstorming ideas, sharing experiences, and information, and adding to the knowledge established or expressed (Shin, 2008).
- In the third phase, integration, learners focus on making connections between ideas and developing possible solutions to construct meaning from the ideas developed in the exploration phase (Arbaugh, 2007).
- In the fourth phase, resolution, learners describe ways to test and apply knowledge created, and also apply the idea or knowledge to new situations (Tolu, 2010).

Teaching Presence

Teaching presence is defined as "the design, facilitation and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes" (Garrison & Anderson, 2003, p. 29). Anderson, Rourke, Garrison, and Archer (2001) prefer the term "teaching presence" rather than "teacher presence" in their research because teachers often collaborate to achieve this role. Students may provide such a role (Jinks, 2009). Teaching presence is "essential in balancing cognitive and social issues consistent with intended educational outcomes" (Garrison et al., 2000, p. 24). Teaching presence has three components: 1) instructional design and organization, 2) facilitating discourse, and 3) direct instruction.

Instructional design and organization includes setting the curriculum, defining goals and objectives, selecting suitable technology, designing methods for teaching and learning, setting time parameters, determining assessment procedures, defining lecture resources, and designing individual and collaborative activities (Garrison & Anderson, 2003).

Anderson et al. (2001) consider facilitating discourse as a critical component for maintaining student interest, engagement, and motivation during the course activities. Therefore, the instructor helps students identify areas of agreement and disagreement; seeks to reach an understanding; encourages, acknowledges, and reinforces student contributions; sets the climate for learning; draws in participants, prompting discussion; and assesses the efficacy of the process (Jinks, 2009).

The final component of teaching presence, direct instruction, looks to the instructor as a subject matter expert, providing intellectual and scholarly leadership through in-depth learning (Anderson et al., 2001). In direct instruction, the teacher presents the content and questions; focuses the discussion on specific issues; summarizes the discussions; confirms understanding; diagnoses misconceptions; injects knowledge from diverse sources; and responds to technical concerns (Anderson et al., 2001).

Purpose of the Study

The main purpose of this study was to examine the development of students' academic success, motivation, satisfaction, social presence, cognitive presence, and teaching presence in a face-to-face and a blended learning environment assisted by Facebook use.

For this purpose, the following research questions were examined by comparing the face-to-face course and the blended course in terms of posttest scores:

1) Is there a significant difference between the two groups in terms of academic success?
2) Is there a significant difference between the two groups in terms of motivation towards the course?
3) Is there a significant difference between the two groups in terms of social, cognitive and teaching presence?
4) Is there a significant difference between the two groups in terms of satisfaction in the education process?

In addition, the question, 'How do social, teaching, and cognitive presences develop on Facebook discussions in a blended course?' was answered through content analysis.

METHODOLOGY

Mixed methods research was conducted to examine the academic success, satisfaction, motivation, social presence, cognitive presence, and teaching presence of pre-service teachers in blended and face-to-face learning environments. In this section of the paper, research design, participants, research instruments, and experimental research procedures of the study are explained.

Research Design

Mixed methods research was used to provide depth and breadth to the study. An experimental pretest and posttest design with a control group was employed for this study. Furthermore, a content analysis of the discussions on Facebook was completed to calculate the frequencies and percentages for each category within teaching, social, and cognitive presences.

Participants

Participants were 109 students of the Computer and Instructional Technology Education Program in the Faculty of Education. Experimental and control groups were formed randomly. The achievement and motivation pretest, validity and reliability were confirmed, was applied to the students. There was no significant difference between control and experimental groups in terms of academic success and motivation. Thus, there were almost two equal study groups: 1) an experimental group comprised of 55 students and 2) a control group comprised of 54 students.

Research Instruments

In this study, the tools used to gather data included an achievement test, a motivation survey, a satisfaction survey, and a community of inquiry survey. Besides, students' discussions on Facebook were examined through content analysis.

Achievement test: The achievement test included 25 multiple choice test items developed by the researcher (Küçük, 2012). In the study, the analyses of the item discrimination index and the item difficulty index were conducted using ITEMAN software. According to the results of the analyses, five questions were eliminated from the test. A KR-20 reliability coefficient of .80 was obtained.

Motivation survey: Students' motivations towards the course were examined by using the Motivated Strategies for Learning Questionnaire (MSLQ). The questionnaire was developed by Pintrich, Smith, Garcia, and McKeachie (1991) and adapted into Turkish by Büyüköztürk, Akgün, Özkahveci, and Demirel (2004). The scale consisted of 31 items in the motivation subscale and 50 items in the learning strategies subscale. These subscales can be used singly or together, depending on the researcher's purpose (Büyüköztürk et al., 2004). Thus, the motivation subscale was used to determine the students' motivations towards the course. A single factor of the scale explained 56% of the total variance.

Community of Inquiry Survey: Students' social presence, teaching presence, and cognitive presence were examined by using the Community of Inquiry survey. This survey was developed by Arbaugh et al. (2008) and adapted into Turkish by the researcher (Küçük, 2012). The survey included a total of 34 items for teaching presence (13 items), social presence (9 items), and cognitive presence (12 items). The items were measured on a 5-point Likert-type scale, ranging from 1=Strongly Disagree to 5=Strongly Agree. Cronbach's alpha was 0.93 for teaching presence, 0.83 for social presence, and 0.92 for cognitive presence.

Satisfaction Survey: Students' satisfaction in the education process was examined by using Student Evaluations of Educational Quality (SEEQ) survey. This survey was developed by Marsh (1982, 1987) and adapted into Turkish by Özgüngör (2010). The scale consisted of 34 items and nine subscales. A single factor of the scale explained 80.42% of the total variance. Cronbach's alpha varied between .77 and .95 for the survey categories.

The development of students' social, cognitive, and teaching presences was examined on Facebook discussions through content analysis in the blended learning environment. The qualitative analysis was applied on three groups comprising of 13 students, who attended every assignment and provided deep discussions. To analyze the qualitative data, the coding schemes determined by Shea et al. (2010) were used.

Experimental Research Procedure

The study was conducted in blended and face-to-face learning environments with ICT students (Figure 3-4). Before the instruction, the researcher created a closed Facebook group, which gave the right of access only to the members of the experimental group. Group activities, sharing of lesson materials, and group discussions were conducted synchronously and asynchronously with this Facebook group throughout the course. Teaching strategies, methods, assessment techniques, and learning activities employed throughout the course were developed in accordance with the CoI framework. Thus, the course was designed to improve students' critical thinking, reflection, collaboration, and higher order thinking skills. In the blended learning environment, students studied in both the classroom environment and online through Facebook.

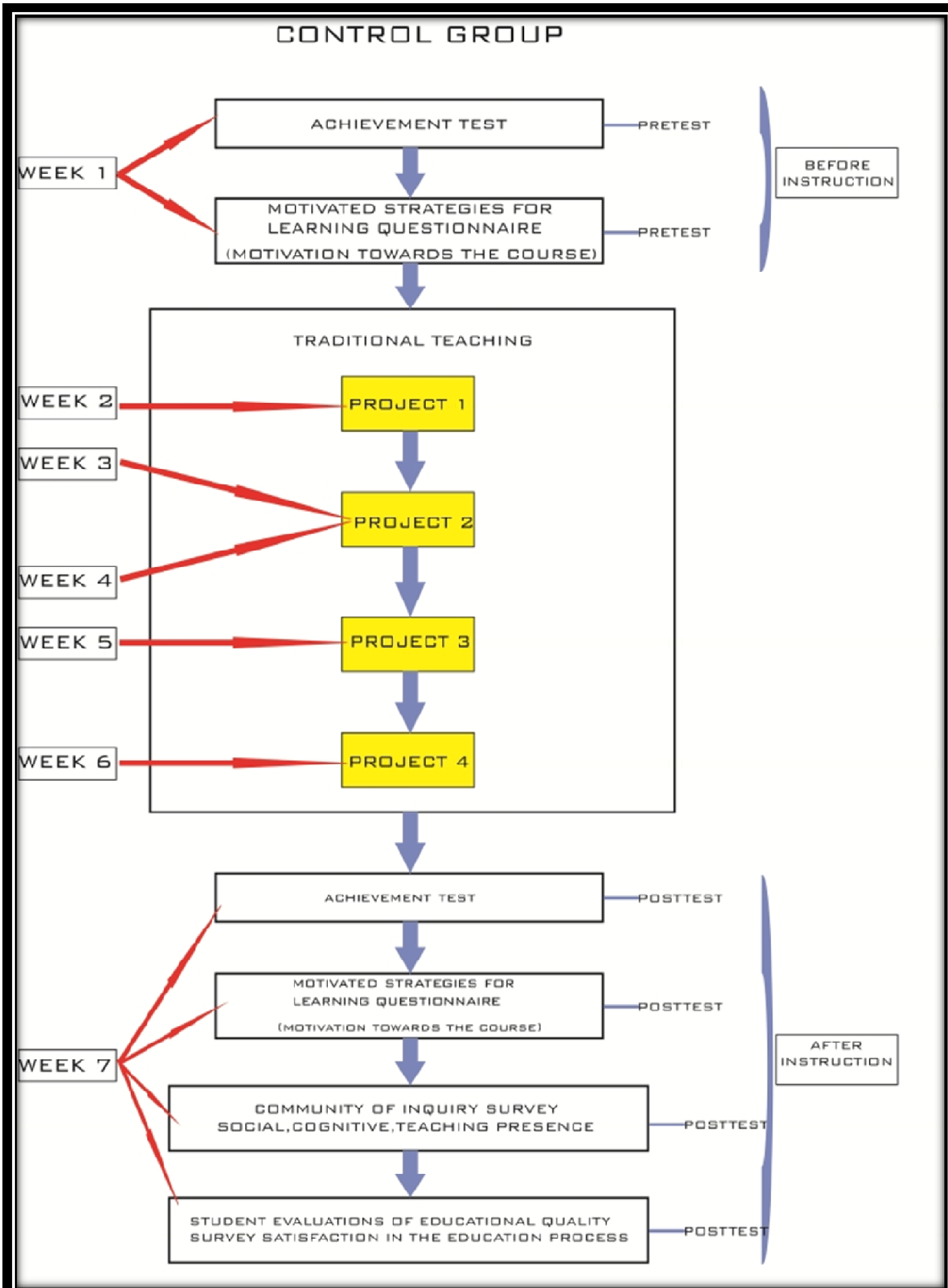

Figure 3. Experimental Process of Control Group

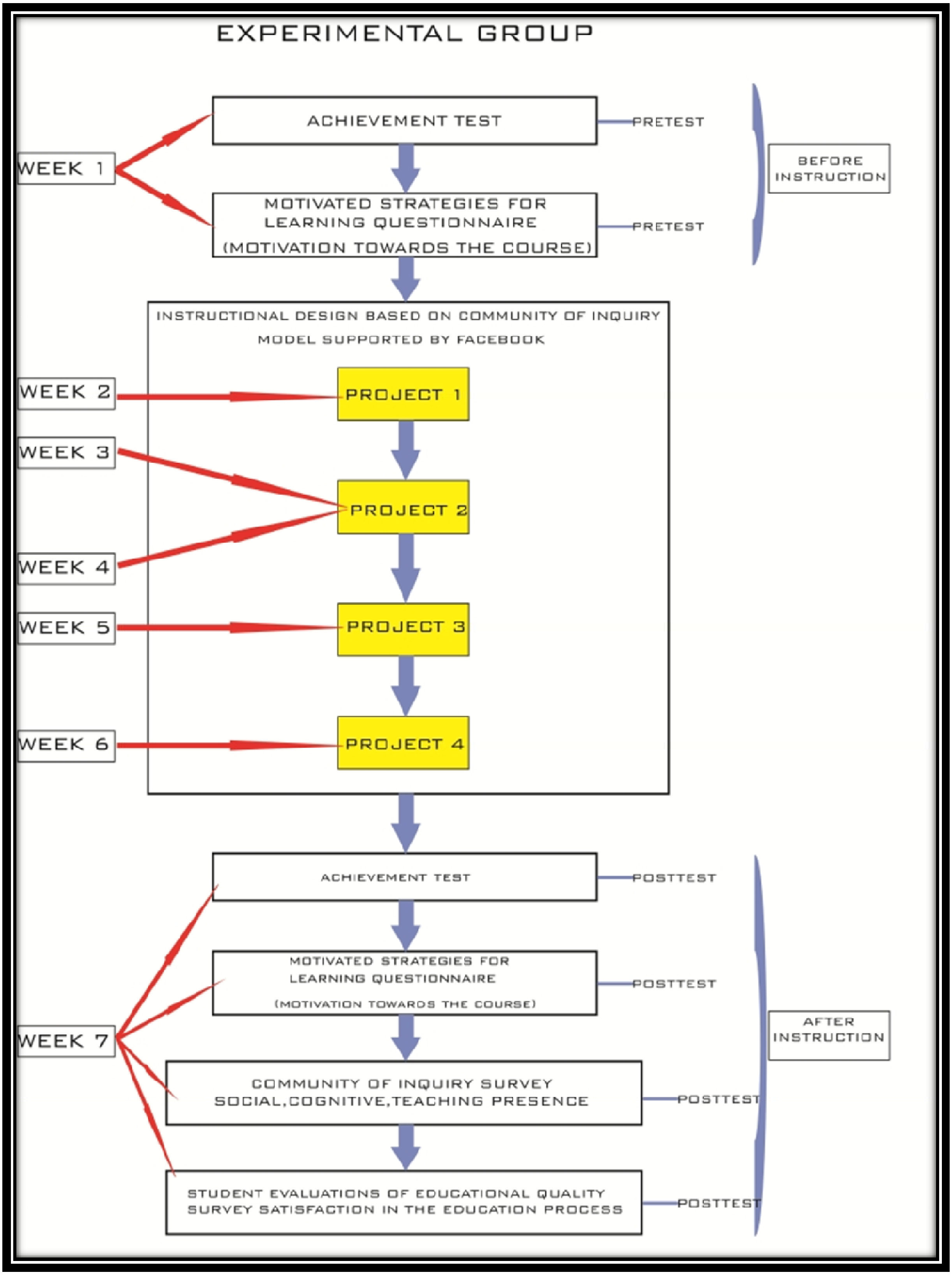

Figure 4. Experimental Process of Experimental Group

FINDINGS

Academic Success

In this study, an independent sample t-test was conducted to explore whether any statistically significant differences existed between the blended course (experimental group) and the face-to-face course (control group) in terms of academic success. Posttest results for academic success showed no significant difference between face-to-face and blended courses ($t=.700$, $p>0.05$).

Motivation Towards the Course

An independent t-test was applied to explore whether statistically significant differences existed between the blended course and the face-to-face course in terms of students' motivations towards the course. The analysis did not indicate any significant differences for *intrinsic goal orientation*, *control of learning beliefs*, *extrinsic goal orientation*, *task value*, and *test anxiety* categories for students' motivation between blended and face-to-face courses. However, the t-test yielded a significant difference for *self-efficacy for learning and performance* category of students' motivation between face-to-face and blended courses ($t=2.356$, $p<0.05$). Students in the control group ($\overline{X}=42.45$) had higher levels of the self-efficacy for learning and performance than the ones in the experimental group ($\overline{X}=39.06$).

Community of Inquiry Framework

In the study, independent t-tests were conducted to explore whether statistically significant differences existed between blended and face-to-face courses in terms of each element of community inquiry framework (social presence, cognitive presence, and teaching presence).

The independent t-tests applied to the categories of social presence (affective expression, open communication, and group cohesion) did not yield any statistically significant differences for *affective expression* and *open communication* between face-to-face and blended courses. However, the test results showed a significant difference between face-to-face and blended courses in terms of *group cohesion* ($t=2.064$, $p<0.05$). As the mean values for this category indicate, group cohesion was more frequent in the blended course ($\overline{X}=11.57$) compared to the face-to-face course ($\overline{X}=10.74$).

The independent t-tests applied to the categories of cognitive presence (triggering event, exploration, integration, resolution) did not yield any statistically significant differences between face-to-face and blended courses in terms of *triggering event, integration,* and *resolution*. However, the test results revealed a significant difference between face-to-face and blended courses in terms of *exploration* ($t=2.030$, $p<0.05$). As the mean values for this category indicate, the level of exploration was higher in the blended course ($\overline{X}=12.29$) compared to the face-to-face course ($\overline{X}=11.43$).

The independent t-tests applied to the categories of teaching presence (instructional design, facilitating discourse, and direct instruction) did not yield any statistically significant differences between face-to-face and blended courses in terms of the categories.

Satisfaction in the Education Process

The independent t-test was applied to explore whether the differences in students' satisfaction in the education process between the blended course and the face-to-face course were statistically significant.

The test results indicated no significant differences in terms of *learning/academic value, group interaction, individual rapport, breath of coverage, assignments,* and *overall* categories of students' satisfaction between face-to-face and blended courses. However, the t-test yielded significant differences for *enthusiasm* ($t=3.075$, $p<0.05$), *organization/clarity* ($t=2.475$, $p<0.05$) and *examinations* ($t=2.162$, $p<0.05$) categories of students' satisfaction between face-to-face and blended courses. As the mean values for these categories indicate, enthusiasm was higher in the face-to-face course ($\overline{X}=16.09$) compared to the blended course ($\overline{X}=14.59$). Besides, organization/clarity was higher in the face-to-face course ($\overline{X}=15.36$) compared to the blended course ($\overline{X}=14.13$). At the same time, examination was higher in the face-to-face course ($\overline{X}=12.16$), compared to the blended course ($\overline{X}=11.35$).

Content Analysis Results for Community of Inquiry Model

Students, who took the blended course, participated in weekly 'to do projects' discussions on Facebook. Transcripts were generated from these discussions. These transcripts were subjected to content analysis to examine the development of students' social, cognitive, and teaching presences considering the projects. The analysis involved the coding of 580 student postings for social, cognitive, and teaching presences (see Figure 5).

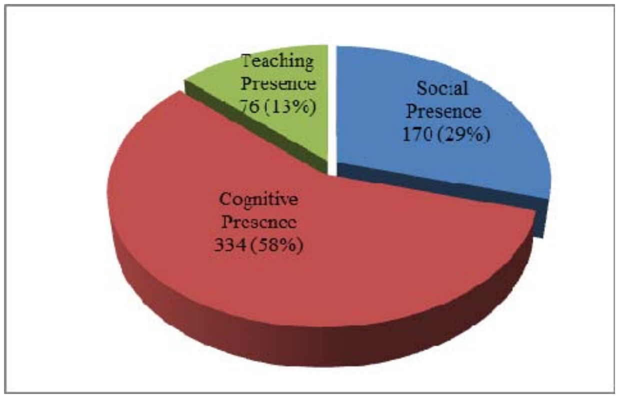

Figure 5. Number of Messages for Each Presence on Facebook

As seen in Figure 5, the highest number of postings was for cognitive presence. Teaching presence had the lowest percentage of postings (13%) among all postings throughout the course.

Content Analysis for Social Presence

Social presence was analyzed in the transcripts by coding for affective expression, open communication, and group cohesion categories. Table 1 illustrates the comparison of the coding results for the categories of social presence, according to the projects the students completed on Facebook.

Table 1. Comparison of Coding Results for Social Presence According to Projects

SOCIAL PRESENCE		Project 1	Project 2	Project 3	Project 4	TOTAL
Affective Expression	**Number of Codes**	17	17	11	16	61
	Percent of Codes	30.3%	42.5%	36.6%	36.3%	35.8%
Open Communication	**Number of Codes**	31	17	13	25	86
	Percent of Codes	55.3%	42.5%	43.3%	56.8%	50.5%
Group Cohesion	**Number of Codes**	8	6	6	3	23
	Percent of Codes	14.2%	15%	20%	6.8%	13.5%
TOTAL	**Number of Codes**	56	40	30	44	170
	Percent of Codes	32.9%	23.5%	17.6%	25.8%	100%

For all projects, the majority of the messages were coded as open communication (50.5%) (Table 1). The category of affective expression was coded as stable for all four projects. Although open communication decreased after Project 1, it increased in Project 4. Group cohesion considerably decreased after Project 3.

Content Analysis for Cognitive Presence

Cognitive presence was analyzed in the transcripts by coding for triggering event, exploration, integration, and resolution categories. Table 2 illustrates the comparison of the coding results for the categories of cognitive presence, according to the projects the students completed on Facebook.

Table 2. Comparison of Coding Results for Cognitive Presence According to Projects

COGNITIVE PRESENCE		Project 1	Project 2	Project 3	Project 4	TOTAL
Triggering Event	**Number of Codes**	31	11	9	7	58
	Percent of Codes	41.8%	10.6%	10.3%	10%	17.3%
Exploration	**Number of Codes**	33	47	55	62	197
	Percent of Codes	44.5%	45.6%	63.2%	88.5%	58.9%
Integration	**Number of Codes**	10	29	21	1	61
	Percent of Codes	13.5%	28.1%	24.1%	1.4%	18.2%

Resolution	**Number of Codes**	0	16	2	0	18
	Percent of Codes	0%	15.5%	2.2%	0%	5.3%
TOTAL	**Number of Codes**	74	103	87	70	334
	Percent of Codes	22.1%	30.8%	26%	20.9%	100%

The majority of the messages posted throughout the projects were coded as the exploration phase (58.9%) (Table 2). The triggering event considerably decreased after Project 1. Exploration increased steadily throughout the projects. The third phase of cognitive presence and integration increased in Projects 2 and 3, but it showed a sharp decrease in project 4. None of the messages were coded as resolution in projects 1 and 4. Besides, the rate of codes for resolution was low in projects 2 and 3.

Content Analysis for Teaching Presence

Teaching presence was analyzed in the transcripts by coding for design and organization, facilitating discourse, and direct instruction categories. Table 3 illustrates the comparison of the coding results for these categories of teaching presence, according to the projects the students completed on Facebook.

Table 3. Comparison of Coding Results for Teaching Presence According to Projects

TEACHING PRESENCE		**Project 1**	**Project 2**	**Project 3**	**Project 4**	**TOTAL**
Design and Organization	**Number of Codes**	7	2	3	3	15
	Percent of Codes	29.1%	10.5%	20%	16.6%	19.7%
Facilitating Discourse	**Number of Codes**	7	5	8	8	28
	Percent of Codes	29.1%	26.3%	53.3%	44.4%	36.8%
Direct Instruction	**Number of Codes**	10	12	4	7	33
	Percent of Codes	41.6%	63.1%	26.6%	38.8%	43.4%
TOTAL	**Number of Codes**	24	19	15	18	76
	Percent of Codes	31.5%	25%	19.7%	23.6%	100%

In all projects, the majority of the messages were coded as direct instruction (43.4%) (Table 3). Design and organization showed a decrease after Project 1. Facilitating discourse was coded almost at the same rate in Projects 1 and 2, but increased after Project 2. Direct instruction considerably decreased in Projects 3 and 4 compared to Projects 1 and 2.

DISCUSSION

The findings obtained from the academic success scale showed no significant difference between the academic success levels of the students in experimental and control groups. This occurred because the course in which the application was implemented mainly consisted of theoretical information. In a similar experimental study, Demirer (2009) stated no significant difference occurred between the academic success posttest scores of the students in experimental and control groups, but there was a significant difference in favor of the experimental group with respect to the training materials the students developed. In their study on blended learning environments, Garrison and Kanuka (2004) put forth that blended learning leads to an increase in student success and creates permanent learning experiences through providing rich learning environments. Horzum and Balta (2008) state in their study of students in blended and face-to-face learning environments in terms of several variables, blended environments provide more and permanent learning compared to other environments.

The results of these tests showed a significant difference for *self-efficacy for learning and performance* in favor of the control group. The high self-efficacy perceptions of the students in the control group can be explained because the students in the experimental group were anxious about the educational use of Facebook and blended learning at the beginning of the application. Kurbanoğlu and Takunyacı (2012) stated students, who had a low level of anxiety towards the subject, would have higher self-efficacy levels. Students' lack of experience with distance education prior to the application caused them to have problems in adapting to the process. The students showed they had a certain level of anxiety at the beginning of the application by uttering statements like "*Instructor, what did you mean by ….., what do we have to do?*" and "*How should we do Project 1?*" during the discussions they completed over Facebook. In the present study, although the clear and definite explanations from the teacher regarding the application decreased over time, to a certain extent, this anxiety could not be completely eliminated. For this reason, it can be said the students' anxieties in the experimental group towards the process affected the results.

A significant difference was observed between the experimental and control groups in terms of *group cohesion*, one of the three categories of social presence. Group cohesion scores for the experimental group were determined higher compared to those for the control group. In online and blended learning environments, the sense of belonging to a group, low in the beginning, becomes stronger among the individuals over time (Akyol, 2009). The online discussions the members of the experimental group held over Facebook highly improved the students' interaction and communication skills, and the group members felt they were part of whole group. Student-student interaction, which maintains social presence as also stated by Moore (1989), showed a considerable increase owing to Facebook use. The students had the opportunity to communicate with their group members and discuss the course by means of Facebook. According to the results obtained through the analysis of the qualitative data, it was seen that students exhibited patterns of social presence in every project conducted in the blended learning environment. The students used a total of 170 codes concerning social presence during the online discussions over Facebook in four projects; that is, a student made an average of 12 statements. This case can be regarded as a predictor of social sharing and presence.

The data obtained from the community of inquiry scale did not reveal any significant differences between the students in face-to-face and blended learning environments in terms of the *triggering event*, *integration* and *resolution* phases of cognitive presence. Previous studies showed the level of cognitive presence rarely moves beyond the exploration phase (to integration-resolution) (Garrison et al., 2001; Fahy, Crawford, & Ally, 2001; Kanuka & Anderson, 1998; Meyer, 2004; Murphy, 2004; Vaughan & Garrison, 2005).

However, a significant difference was observed between the experimental and the control groups in terms of the *exploration* category of cognitive presence. *Exploration* phase scores for the experimental group were determined higher compared to those for the control group. The students in the experimental group completed their projects via Facebook caused a reasonable improvement in their exploration skills compared to the control group. The students individually and collaboratively searched for relevant material and ideas (Swan et al., 2008). The students achieved new information by sharing their ideas and experiences about this knowledge and resources. The results from the analysis of the qualitative data showed the students used a total of 336 codes concerning cognitive presence during the online discussions over Facebook in four projects; that is, a student made an average of 24 statements. Mazman (2009) noted one of the aspects that constitute the educational use of Facebook was "sharing resources and materials." The reasonably high rate of the exploration phase of cognitive presence observed in the results of the content analysis indicates the students shared information and materials as part of their educational use of Facebook and benefited from their content shared by the others.

The data obtained from the community of inquiry scale did not reveal any significant differences between the students in face-to-face and blended learning environments in terms of the *design and organization*, *facilitating discourse* and *direct instruction* categories of teaching presence. Teaching presence continues before teaching formally starts and during the educational process (Lazarevic, 2011). Teaching presence is closely related to instructional design. Instructional design plays a highly important role in the success of the distance education process and the realization of teaching presence (Winfield, Mealy, & Scheibel, 1998). The content of the course was taught to both learning groups, using the same teaching techniques by the instructor in a classroom environment. This shows the teaching strategies, methods, and learning activities determined in accordance with the community of inquiry model and applied in face-to-face and blended learning environments were effective and successful. It is seen that an online learning environment created through a successful instructional design was as effective as a face-to-face learning environment (So & Brush, 2008). The results of the analysis of the qualitative data demonstrated the students showed patterns of a teaching presence in every project conducted in the blended learning environment. The students used a total of 76 codes concerning teaching presence during the online discussions held over Facebook in four projects; that is, a student made an average of five statements. It was noted in various studies the reason for a teaching presence being coded less compared to other types of presences was students viewed a teaching presence as the responsibility and duty of the teacher only (Akyol, 2009; Rourke & Anderson, 2002; Shea et al., 2006).

The results of the tests showed a significant difference for *enthusiasm*, *organization/clarity* and *examinations* categories in favor of the control group. The constructivist approach was adopted for the course, designed in accordance with the community of inquiry model, which is also based on constructivism. Under the constructive learning model, interactive communications and media presentation provided with technology can help learners develop high-level thinking skills and deep learning (Leidner & Jarvenpaa, 1995). According to constructivist approach, students are placed at the center, and knowledge is made meaningful as the result of their own activities and their interactions with the environment. For this reason, the teacher helps students construct knowledge through his role as a guide and mentor. İşman (2011) stated students take the role of instructor, one of the roles of the student in distance education, to help and support each other's learning through interacting with each other during the teaching process. In the present study, the analysis of the qualitative data shows students considered a teaching presence as the responsibility and duty of the teacher only. For this reason, it can be said the students had an expectation for the teachers to play an active role in the discussions during the experimental application. This can be regarded as the reason the experimental group students' viewed the teacher as less enthusiastic, who only guided and adopted a student-centered approach during the discussions they completed via Facebook.

Hara & Kling (2001) stated that students experienced several types of distress in distance education: anxiety, frustration and confusion. The high anxiety levels of the students in the control group at the beginning of the experimental application process and their lack of experience with distance education led them to become biased towards the instruction provided over Facebook. Bolliger & Halupa (2012) reported that the students who had less anxiety were more satisfied than the ones who had higher anxiety. Course quality is an important factor that influences learning outcomes and satisfaction in distance education (Piccoli, Ahmad, & Ives, 2001). Online interactive discussions, brainstorming, multimedia presentation, timely feedback, management of learning process were helpful for students in establishing learning models effectively and motivating continuous distance education (Piccoli et al., 2001). In the study, although all those details for the course were broadly outlined and everything proceeded according to course plan, the students' anxiety levels could not be completely eliminated since they worried about grades. This might have negatively affected the experimental group students' satisfaction with organization/clarity, which measures the clarity of the course content, materials, and organization.

Using different assessment methods in distance education courses causes students to think that a connection is provided between them and the instructor and their learning efforts are properly assessed (Sun, Tsai, Finger, Chen, & Yeh, 2008). In the present study, the students discussed the assigned projects in detail within their groups over Facebook, and finally sent the outcomes as a report to the instructor by e-mail. Also, the instructor gave feedback to the students whenever it is needed. Students' activities and processes might be corrected or developed through feedbacks for successful performance (Thurmond, Wambach, & Connors, 2002). As stated earlier, anxiety with technology can have a negative effect on student performance and satisfaction (Sun et al., 2008). The question "but everyone can see what I write here, so how will you distinguish those who know from others who do not?," which was one of the sources of students' anxiety and asked to the teacher over Facebook, clearly exhibits the anxieties of students regarding examinations. Despite all the explanations the instructor provided for course evaluation at the beginning of the term, it was not possible to eliminate these concerns completely. This might negatively affected the students' satisfaction with examinations.

CONCLUSIONS

The study has taken a step to understand importance of the community of inquiry development in learning environments. The issue of community of inquiry development of students in blended and face-to-face learning environments in general is not well documented. Thus, the study was performed to attempt to provide a bridge the information gap in the literature regarding community of inquiry development in these learning environments. The study was aimed to examine the development of students' academic success, motivation, satisfaction, social presence, cognitive presence and teaching presence in face-to-face and blended learning environments. The development of each presence in community of inquiry showed different progress in terms of projects in blended learning context. In this way, instructional design based on CoI framework played an important role in deep and meaningful learning. In future research, students' anxiety levels about online learning and students' attitudes towards educational use of Facebook can be examined. Also, the online learning environment can be compared to both face-to-face and blended learning environments.

NOTES

This paper has been generated from the thesis study of the first author.

REFERENCES

Akyol, Z. (2009). *Examining Teaching Presence, Social Presence, Cognitive Presence, Satisfaction And Learning In Online And Blended Course Contexts*. (Ph.D Thesis, Middle East Technical University).

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing Teaching Presence in Computer Conferencing Context. *Journal of Asynchronous Learning Networks*, 5(2), 1-17.

Arbaugh, J. B. (2007). An empirical verification of the community of inquiry framework. *Journal of Asynchronous Learning Network, 11*(1), 73-85.

Arbaugh, J.B., Cleveland-Innes, M., Diaz, S.R., Garrison, D.R., Ice, P., Richardson, J., & Swan, K. (2008). Developing a community of inquiry instrument: Testing a measure of the Community of Inquiry framework using a multi-institutional sample. *The Internet and Higher Education*, 11(3-4), 133-136.

Bartruff, E. A. (2009). *Community Of Inquiry: A Useful Model For Examining Educational Interactions In Online Graduate Education Courses at Christian Colleges*. (University of George Fox). *ProQuest Dissertations and Theses*, http://search.proquest.com/docview/305153170?accountid=13654

Bolliger, D. U. & Halupa, C. (2012). Student perceptions of satisfaction and anxiety in an online doctoral program. *Distance Education*, 33:1, 81-98

Brophy, J. (1998). *Motivating students to learn*. Madison, WI: McGraw Hill.

Büyüköztürk, Ş., Akgün, Ö. E., Özkahveci, Ö., & Demirel, F. (2004). The validity and reliability study of the Turkish version of the Motivated Strategies for Learning Questionnaire. *Educational Sciences: Theory & Practice*, 4(2), 207-239.

Colt, D. L. (2008). *Cognitive Presence Among Mathematics Teachers: An Analysis Of Tasks And Discussions In An Asynchronous Online Graduate Course.* (Ph.D Thesis, Montana State University). *ProQuest Dissertations and Theses*, http://search.proquest.com/docview/304535210/137302FE93639B6CD9/1?accountid=13654

Conrad, D. (2005). Building and maintaining community in cohort-based online learning. *Journal of Distance Education, 20* (1), 1-21.

Demirer, V. (2009). *Effect of blended learning approach on academic success, knowledge transfer, attitude, and self-efficacy perception in educational material development.* (Unpublished master's thesis). University of Selcuk, Konya.

Fahy, P. J., Crawford, G., & Ally, M. (2001). Patterns of interaction in a computer conference transcript. *International Review of Research in Open and Distance Learning*, *2*(1).

Garrison, D. R. (2007). Online community of inquiry review: Social, cognitive, and teaching presence issues. *Journal of Asynchronous Learning Networks*, 11(1), 61-72.

Garrison, D. R. & Anderson, T. (2003). *E-Learning in the 21st century: A framework for research and practice.* London: Routledge/Falmer.

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, *2*, 87-105.

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal of Distance Education*, 15(1), 7-23.

Garrison, D. R. & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *Internet and Higher Education*, *7*(2), 95−105.

Hanrahan, M. (1998). The effect of learning environment factors on students' motivation and learning. *International Journal of Science Education*, 20(6), 737–757.

Hara, N. & Kling, R. (2001). Student distress in Web-based distance education. *EDUCAUSE Quarterly*, 24(3), 68–69.

Harasim, L., Hiltz, S.R., Teles, L., & Turoff, M. (1996). *Learning networks*. Cambridge, MA: MIT Press.

Horzum, M. B. & Balta, Ö. (2008). Students' Achievement, Motivation And Computer Anxiety Level in Different Web Based Learning Environments. *Hacettepe University Journal of Education*, 34, 140-154.

İşman, A. (2011). *Distance Education* (4th Press). Pegem Publication, Ankara, Turkey.

Jinks, S. E. (2009). *An examination of teaching presence and the sense of community on perceived student learning.* (University of Florida). *ProQuest Dissertations and Theses,* http://search.proquest.com/docview/304880530?accountid=13654

Kanuka, H. & Anderson, T. (1998). On-line social interchange, discord, and knowledge construction. *Journal of Distance Education, 13(1),* 57-74.

Kurbanoğlu, N. İ. & Takunyacı, M. (2012). An investigation of the attitudes, anxieties and self-efficacy beliefs towards mathematics lessons high school students' in terms of gender, types of school, and students' grades. *International Journal of Human Science,* 9 (1).

Küçük, Ş. (2012). *Examining pre-service teachers' facebook use as a learning environment with community of ınquiry model.* (Unpublished master's thesis). University of Necmettin Erbakan, Konya.

Lazarevic, B. K. (2011). *Examining the role of the introductory video in the development of teaching presence in online instruction.* (Ph.D Thesis, The University of Nebraska-Lincoln). *ProQuest Dissertations and Theses*, http://search.proquest.com/docview/863490403?accountid=13654

Leidner, D. L. & Jarvenpaa, S. L. (1995). The use of information technology to enhance management school education: a theoretical view. *MIS Quarterly*, 19, 265–291.

Lopez-Perez, M. V., Perez-Lopez, M. C., & Rodriguez-Ariza, L. (2011). Bended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & Education*, 56(3), 818-826. http://dx.doi.org/10.1016/j.compedu.2010.10.023

Maness-Gilliland, A. (2010). *Influence of learning styles on cognitive presence in an online learning environment.* (Ph.D Thesis, Capella University). *ProQuest Dissertations and Theses,* http://search.proquest.com/docview/839826033?accountid=13654

Martin, A. J. & Tracey, D. (2002). Motivating students to learn. *Learning-Links – Publication of Association for Children with Learning Disabilities,* 3, 1-5.

Marsh, H. W. (1982). Validity of students' evaluations of college teaching: A multitrait-multimethod analysis. *Journal of Educational Psychology*, 74, 264-279.

Marsh, H. W. (1987). Students' evaluation of university teaching: Research findings, methodological issues, and directions for future research. *International Journal of Educational Research,* 11, 253-388.

Mazman, S. G. (2009). *Adoption process of social network and their usage in educational context.* (Unpublished master's thesis). University of Hacettepe, Ankara.

Meyer, K. A. (2004). Evaluating online discussions: Four different frames of analysis. *Journal of Asynchronous Learning Networks, 8*(2), 101−114.

Moore, M. G. (1989). Editorial: Three types of interaction. *American Journal of Distance Education*, *3*(2), 1-6.

Moore, M. (1993). Theory of transactional distance. In D. Keegan (Ed.), Theoretical principles of distance education (p. 22-38). London: Routledge.

Murphy, E. (2004). Recognizing and promoting collaboration in an online asynchronous discussion. *British Journal of Educational Technology*, 35(4), 421 -431.

Özgüngör, S. (2010). Teaching Dimensions Predicting the Instructors Defined as the Best and Worst According to Students' Characteristics. *Ege Journal of Education*, 11(2): 45–72

Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based virtual learning environments: a research framework and a preliminary assessment of effectiveness in basic IT skill training. *MIS Quarterly*, 25(4), 401–426.

Pintrich, P. R. & Schunk, D. H. (1996). *Motivation in education: Theory, research and applications.* (2nd ed.). Englewood Cliffs, NJ: Merrill Company.

Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A Manual for the use of the motivated strategies for learning*. Michigan: School of Education Building, The University of Michigan. (ERIC Document Reproduction Service No. ED338122).

Riel, M. & Polin, L. (2004). Learning Communities: Common Ground and Critical Differences in Designing Technical Support. In S. A. Barab, R. Kling ve J. H. Gray (Eds.), *Designing for Virtual Communities in the Service of Learning* (pp. 16-50). New York: Cambridge University Press.

Rourke, L. & Anderson, T. (2002). Exploring Social communication in Computer Conferencing. *Journal of Interactive Learning Research*, 13(3), 259–275.

Rourke, L., Anderson, T., Garrison, D. R., & Archer, W. (2001). Assessing social presence in asynchronous, text-based computer conferencing. *Journal of Distance Education*, 14(2), 51-70.

Rovai, A. P. (2002). Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. *The Internet and Higher Education*, 5(4), 319-332.

Shea, P. (2006). A Study of Students' Sense of Learning Community in Online Environments. *Journal of Asynchronous Learning Networks*, 10(1), 35-44.

Shea, P., Li, C. S., & Pickett, A. (2006). A study of teaching presence and student sense of learning community in fully online and web-enhanced college courses. *The Internet and Higher Education*, 9(3), 175–190.

Shin, J. K. (2008). *Building an effective international community of inquiry for EFL professionals in an asynchronous online discussion board.* (Ph.D Thesis, University of Maryland, Baltimore County). *ProQuest Dissertations and Theses,* http://search.proquest.com/docview/194075880?accountid=13654

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications.* Toronto: John Wiley & Sons.

So, H. J. & Brush, T. A. (2008). Student Perceptions of Collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors. *Computers & Education,* 51(1), 318-336.

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful elearning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, 50(4), 1183-1202.

Swan, K., Shea, P., Richardson, J., Ice, P., Garrison, D.R., & Cleveland-Innes, M. (2008). Validating a measurement tool of presence in online communities of inquiry. *E-Mentor,* 2 (24), 1-12.

Thurmond, V. A., Wambach, K., & Connors, H. R. (2002). Evaluation of student satisfaction: determining the impact of a web-based environment by controlling for student characteristics. *The American Journal of Distance Education,* 16(3), 169–189.

Tolu, T. A. (2010). *An exploration of synchronous communication in an online preservice ESOL course: Community of inquiry perspective.* (Ph.D Thesis, University of South Florida). *ProQuest Dissertations and Theses,* http://search.proquest.com/docview/822619990?accountid=13654

Tuan, H. L., Chin, C. C., & Shieh, S. H. (2005). The development of a questionnaire to measure students' motivation towards science learning. *International Journal of Science Education*, 27:6, 639-654

Vaughan, N. & Garrison, D. R. (2005). Creating cognitive presence in a blended faculty development community. *Internet and Higher Education*, 8, 1-12.

Winfield, W., Mealy, M., & Scheibel, P. (1998). *Design Considerations for Enhancing Confidence and Participation in Web Based Courses*. Paper presented at the Annual Conference on Distance Teaching and Learning. Madison, WI.

INTEGRATING POPULAR WEB APPLICATIONS IN CLASSROOM LEARNING ENVIRONMENTS AND ITS EFFECTS ON TEACHING, STUDENT LEARNING MOTIVATION AND PERFORMANCE

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ABSTRACT
Advancements in information and communication technology (ICT) allowed several tools and systems to be proposed for improving classroom experiences to both instructors and students. However, most of these tools were brand-new and stand-alone programs that require users to invest additional time and effort to become familiar with their use. This requirement could adversely affect the users' motivation on using these particular programs. However, enhancing student learning motivation and participation is crucial for the teaching and learning of new knowledge or skills since motivation would affect how instructors and students interact with learning materials. In the era of Web 2.0, both instructors and students are heavily immersed in various web applications such as SkyDrive, Evernote, DropBox, and Google Apps on a daily basis. These web applications were also well-received by both instructors and students in their daily lives. Therefore, the use of well-known web applications could be a potentially novel method to engage instructors and students in meaningful teaching and learning activities. Bearing this in mind, this study proposed a learning environment supported by well-known web applications to supplement classroom teaching and learning activities, assist instructors in facilitating student learning and participation, and help improve student learning motivation and performance. Experimental results revealed that students had higher learning motivation and participation when using the proposed web application supported learning environment during and after class as it gave them access to adequate learning support. The proposed approach also gave effective assistance to instructors and students in administering and conducting learning activities during and after class.

BACKGROUND AND OBJECTIVES
Education has undergone significant changes with the advance of information and communication technology (ICT) in the last decade. Teachers could now use ICT to administer various educational activities that engage students in meaningful learning contexts. Additionally, learning motivation of students could be stimulated by integrating ICT into learning processes (Law, Lee, & Yu, 2010). Consequently, the ultimate goal of using ICT would be to enhance teaching and learning performances of teachers and students.

Several tools or systems had been proposed to support various classroom activities (Jou, Chuang, & Wu, 2010; Lee, Lu, Yang, & Hou, 2010; Lin, Tan, Kinshuk, & Huang, 2010). Nevertheless, most of these systems and tools were brand-new and stand-alone programs. This means that users (instructors and students) had to spend additional time and effort to familiarize themselves with the use of these tools or systems. Moreover, users may need to install additional programs on their own devices or apply for new user accounts. These requirements could adversely affect user motivation on using these particular programs that was supposed to support specific educational contexts (Lin, Lin, & Huang, 2011).

Enhancing student learning motivation is important for the teaching and learning of new knowledge or skills because motivation would affect how instructors and students interact with learning materials (Hung, Chao, Lee, & Chen, 2012). From the instructors' perspective, student learning motivation would often influence their teaching efforts and how they plan teaching strategies for new classes in order to enhance student learning performance (Keller, 1983). From the students' perspectives, poor learning motivations would mean higher risks that new knowledge would be built upon faulty foundations (Murphy & Alexander, 2000). Strong learning motivation could also encourage students to continue their learning after a learning session (Maehr, 1976).

The era of Web 2.0 introduced several web applications that have been developed for free and open use. Examples include SkyDrive, Evernote, DropBox, and Google Apps. These web applications provided friendly user interfaces and powerful functions, and were well-received by both instructors and students in their daily lives. Several literatures that reviewed these features indicated that well-known web applications could be potentially utilized in novel methods in engaging users in meaningful teaching and learning activities (Alexander, 2006; Hughes, 2009; Schneckenberg, Ehlers, & Adelsberger, 2011; Thompson, 2007; Wang, Woo, Quek, Yang, Liu, 2012). Furthermore, instructors and students would already have the necessary technical skills required to use these applications, and would therefore be more motivated to use them in educational contexts

(Dohn, 2009). They would only need to consider the means of applying these applications to help them administer educational activities in class (Pretlow & Jayroe, 2010). Additionally, previous studies also found that participants who took part in a web-enhanced class outperformed those in a traditional lecture class (Crook & Harrison, 2008; Hamann & Wilson, 2002). Effective use of web applications could also soften the boundaries between formal and informal learning (Bennett, Bishop, Dalgarno, Waycott, & Kennedy, 2012).

Therefore, in order to assist instructors in facilitating student learning participation, improve student learning motivation and performance, and support learning and teaching activities in class, a web application supported learning environment that integrated Google web applications was proposed in this study. An experiment was also conducted on an industrial course in a Taiwanese university to investigate the effectiveness of the proposed approach.

Web application supported learning environment

In this study, a web application supported learning environment was proposed to enhance classroom teaching and learning experiences. Figure 1 shows the framework of the proposed environment, which consists of three major components – web application, teacher side, and student side.

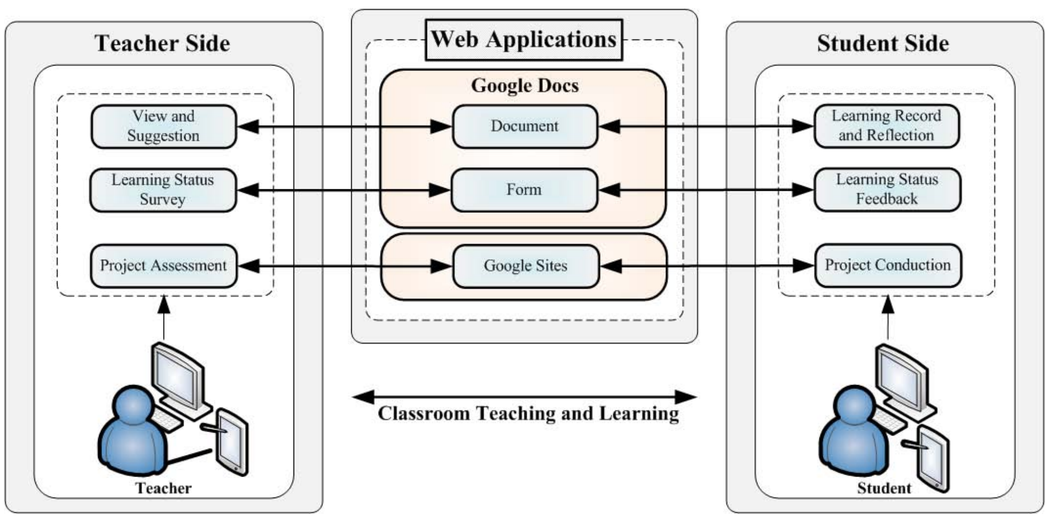

Figure 1. The framework of the web application supported learning environment

- *Web application side*. Two Google web applications, Google Docs and Sites, were adopted to develop the proposed learning environment. Two types of Google Docs, document and form, were used to facilitate participant interaction. Google document provided a web-based document service that enabled users to create and edit online documents through a web browser. Users could also easily share their own documents with others. Furthermore, Google form provided an online questionnaire service, allowing users to create and conduct online questionnaires and surveys efficiently and effectively. Google Sites provided an easy way for users to create dynamic web pages for team projects with the ease of writing a document. This meant that users without any web programming skill could also create web pages without hindrance.
- *Teacher side*. Instructors could ask students to use Google document to provide their feedback on a certain learning activity. Students would be able to improve the comprehension of their own thinking processes through giving feedbacks and reviews (Jou & Shiau, 2012). Moreover, instructors could also use Google document to view each student submission and share comments and suggestions immediately with the students. Furthermore, Google form allowed the instructors to immediately administer online questionnaires and assess student learning statuses and performances during the teaching process, as shown in Figure 2. The information obtained could provide a useful basis for the instructors to understand how students felt about the teaching and adjust teaching paces if required (Hwang & Chang, 2011). In addition, Google Sites allowed instructors to lead students collaboratively in team projects.

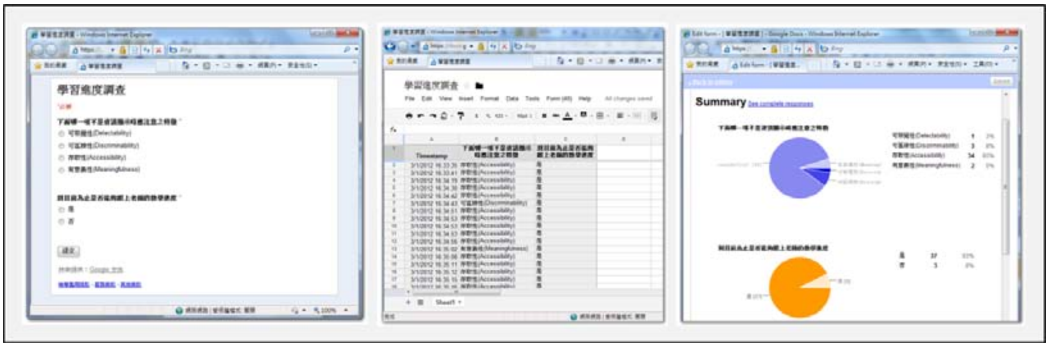

Figure 2. Screenshots of online questionnaire created using Google form

- *Student side*. Students could create a Google document to record their learning status and notes as though they were using Microsoft Office Word. They could also express their opinions and thoughts by responding to Google forms written by the instructors. Additionally, students could present their learning results to their peers via Google sites, as shown in Figure 3.

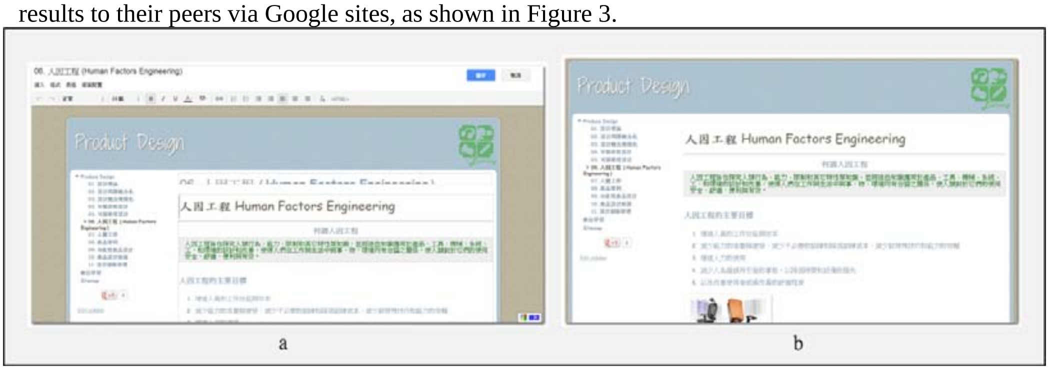

Figure 3. Screenshots of a developing project created using Google sites

Experiment
To investigate the influence of web application supported learning environment in classroom teaching and learning, an experiment was 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, questionnaires and interviews, were utilized. The questionnaires were designed to gauge student learning motivation and attitude, while interviews were used to investigate participant perception towards the entire teaching and learning process.
As mentioned above, in order to assess student learning motivation, a questionnaire with intrinsic value scales for learning motivation (MSLQ, Motivated Strategies for Learning Questionnaire) was adopted. The intrinsic value scale was recommended by researchers for assessing student goals and beliefs about the importance and interest of class work. The questionnaire we used included nine items based on a seven-point Likert scale (Pintrich & De Groot, 1990).
Student learning attitude was surveyed using a learning attitude questionnaire that consisted of six questionnaire items based on a five-point Likert scale. This questionnaire had been used previously to measure student 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 on the subject of product design at a university in Taiwan. A course instructor and 40 university students participated in the experiment. The average age of the students was 20. To instruct the subject, a website was developed to consolidate all relevant learning content as shown in Figure 4. The subject was taught in the sixth week of the course syllabus and was divided into six units as described in Table 1. The subject had a total of 500 min of learning activities that included instruction, discussion, reflection, and practice sessions. Time allotment for each learning activity was planned by the course instructor.

Figure 4. Screenshot 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

Figure 5 shows the experimental process. All students were asked to fill out the learning motivation questionnaires before and after participating in the learning activities. A separate learning attitude questionnaire was distributed to each student after the learning activities as well. Two interviews were carried out after the questionnaires to document participant perception towards the entire teaching and learning process.

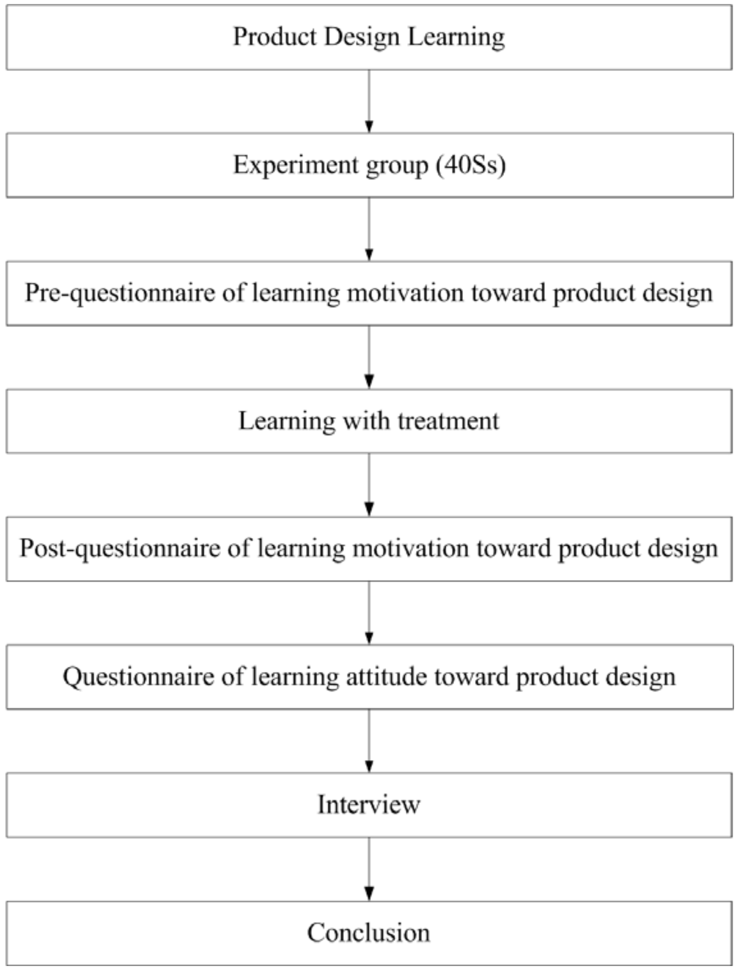

Figure 5. The experimental process

Experimental Evaluation

Learning motivation survey

In this study, a web application supported learning environment was utilized in a university-level industrial course. All students were asked to fill out MSLQ questionnaires before and after participating in the learning activities. Cronbach's alpha values of the questionnaire items were .776 and .828, respectively. It was found that students were significantly motivated after learning with the proposed approach. From the statistical results of the MSLQ questionnaire survey, it was found that more than 87.5% of the students had increased learning motivation after going through the proposed learning environment. However, learning motivation of the remaining students (12.5%) had decreased. Additionally, a paired *t*-test was used to examine differences in learning motivation of each student before and after the learning activities. The results, as shown in Table 2, revealed that students were motivated after participating in the learning activities. However, the study was limited as the effect of the proposed approach could not be clearly identified using the paired-samples *t-test* on student learning motivation in the experimental group. To eliminate this limitation, two interviews were carried out to survey participant perceptions, with special focus on learning motivation when using the proposed approach.

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	

$^{*}p < .05$.

Learning attitude survey

In this experiment, students were asked to fill out a learning attitude questionnaire after participating in the learning activities to provide a feedback on the instruction of product design. The Cronbach's alpha value of the questionnaire items was .786. The statistical results are shown in Table 3.

Result analyses revealed that 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 this kind of learning ('D & SD' column). Moreover, most students indicated that the learning activities assigned by the instructor were helpful. A majority of the students stated that they liked to use the web applications in learning (item 1). Nearly four-fifths of the students felt that the use of the web applications was very easy (item 4), and almost none felt otherwise. 80.0% of the students agreed that they had good interactions with their peers and the course instructor (items 5 and 6).

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 web applications in learning	87.5	5.0	7.5	4.35
4	The web applications are very easy to use	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 students were interviewed to investigate how they felt about teaching and learning with the web application supported lessons. Since the instructor had taught the same course and implemented similar learning activities without the proposed approach in other semesters, this study specifically asked him to analyze differences of student learning motivation and performance between the traditional and proposed learning environments. Students were also asked to assess their own learning outcomes as they had never experienced the proposed learning approach before. Instructor and student responses were recorded and then transcribed for each and every interview. To clearly present the interview results, the transcripts were processed into the three main categories of instruction, interaction, and technology aspects, as described in Table 4.

Table 4. Sample comments for the three categories

Inductive Categories	Sample Comments
Instruction Perspective	*The instructor believed that the proposed approach could assist him in administering the class.*
	The instructor observed that the students had higher learning motivation in activities that integrated web applications than those in activities without the web applications he taught before.
	Most students specifically emphasized that engaging in the learning environment motivated them to record what they had learned and enabled them to make a deep impression on their learning.
Interaction Perspective	*The instructor observed that students often gave feedback and asked questions on product design concepts in the learning environment.*
	The instructor felt that students had better discussions and reflections in each learning activity during and after the course.
	Most students emphasized that the proposed approach could effectively facilitate interactions and collaborations with each participant, especially after class.
Technology Perspective	*The instructor felt that most participants could accept the use of web applications in this class.*
	The instructor indicated that the web applications were convenient. They allowed him to easily check the student documents and projects anytime and anywhere.
	Most students indicated that the use of the web applications was easy for them.

Instruction perspective

When comparing with the industrial course without the proposed approach that the instructor had taught in other semesters, the instructor believed that the proposed approach assisted him in administering the class especially when reviewing student feedback and learning statuses. Moreover, he stated that the students were interested in using web applications during the learning process since they never used web applications to support learning before. He also observed that students in activities that integrated web applications had better learning motivations compared to students he taught before that underwent activities without the web applications. With regard to student learning performance, the instructor indicated that students using the proposed learning environment were more engaged in the learning events and activities during and after class as they could easily and conveniently administer, share, and consolidate individual thoughts and knowledge. Furthermore, he was impressed that students were able to demonstrate excellent performance in every discussion and reflection activity. In addition, the instructor said that Google Sites was an appropriate and useful tool for students to present individual or team projects.

During student interviews, most of them believed that they had better learning performances and motivation when using the proposed approach in class. They specifically emphasized that using the learning environment motivated them to record what they had learned and enabled them to make a deep impression for their learning. Moreover, students with no prior programming skills found a sense of achievement in using Google Sites to develop an independent website for the team projects. Nevertheless, a small number of students felt that Google Sites hindered their projects as they were unfamiliar with its use.

Interaction perspective

For interaction, the instructor observed that students who used the proposed learning environment gave additional feedback and asked more questions on product design concepts compared to those that did not. Students using the learning environment also had better discussions and reflections in each learning activity during and after class, and the instructor felt that the use of Google document could enhance student interactions during each activity. Moreover, the instructor indicated that the use of Google Docs allowed him to gauge student learning statuses and their perceptions efficiently and effectively, especially for the more introverted students. Furthermore, the instructor stated that the sharing of student notes through Google document allowed him to easily provide learning suggestions and comments to the students.

From the perspective of the students, most thought that they could express personal opinions better when the instructor applied Google form to survey their learning statuses. Moreover, several students said that Google Docs was a useful tool for conducting group-work with their peers since it supports simultaneous reviews and corrections by several reviewers. Additionally, over half of the students indicated that the use of Google Sites could strengthen peer-interaction and further enhance project productivity. When compared with other industrial courses the students had participated before, they emphasized that the proposed approach could efficiently facilitate participant interaction and collaboration, especially after class, since the proposed approach included useful sharing and collaborative functions that allowed them to stay connected on a daily basis.

Technology perspective

The technology context surveyed the experience of participating students and course instructor when utilizing the web application supported learning environment. The instructor felt that most students could accept the use of web applications in class since these applications were already widely used by the students on a daily basis. Another critical benefit of these web applications was that they were mutually supportive. Therefore, users could easily apply the same web applications to support different activities. Furthermore, the instructor indicated that since web applications were supported in various devices such as PC, tablet, and smart phone, he could conveniently administer his class anytime and anywhere via the Internet. He also observed that several students used Google document to edit their feedback notes after-school. This implied the convenience and usefulness of the web applications which allowed most students to use them actively, motivating them to review their lecture notes after the lesson.

Most students indicated that Google document was easy for them to use as the user interface of Google document was similar to that of Microsoft Office Word. They also felt that Google document was convenient for reviewing learning activities since they need not worry about losing documents given that they were available anytime and anywhere. Due to these advantages, students stated that they were willing to apply Google document as a learning tool for taking lecture notes for other courses. Furthermore, several students thought that Google Sites was a useful tool for administering large-scale activities or study groups in addition to carrying out team projects.

STUDY LIMITATIONS

The proposed approach in this study was conducted in a computer-aided classroom. One of the limitations was that the approach was not yet possible in traditional classrooms as tablet PCs and smartphones were not available for every student. However, this issue will be resolved in the future as portable devices become more popular. Another limitation was that many participants had poor understanding of how web applications could support their learning despite being familiar with their use (Ng, 2012). Therefore, course instructors must provide adequate information and instructions for the use of web applications as an educational tool to the students.

CONCLUSIONS AND DISCUSSIONS

This study proposed a web application supported learning environment for classroom teaching and learning activities that could be seamlessly used by instructors and students with Web 2.0 tools they use daily. To evaluate the performance of the proposed approach, an experiment was conducted in an industrial course at a university in Taiwan.

The following paragraphs are detailed descriptions on how this research contributed to classroom teaching and learning, giving novel ideas and expanding upon existing literature. Future use of web application supported learning environment, research limitations, and proposals for further research on the development of web application supported learning environments were provided as well.

Contribution of the web application supported learning environment to teaching and learning

Enhancing learning motivation and participation for individual students during and after class is critical in improving classroom teaching and learning. Poor learning motivation would often confound an instructor's best efforts to teach effectively. Nevertheless, most learning tools and systems were often unattractive to instructors and as they were incompatible with other tools that were used daily. The major contribution of this study was the proposed learning environment supported by well-known web applications. The proposed learning environment provided appropriate learning tools to facilitate student learning motivation and participation. In other words, the objective of this research was to promote student learning motivation and participation during and after class by enhancing the learning environment via the use of familiar web applications. Teaching became more successful as a result of improved motivation and participation.

A web application supported learning environment was implemented in an experiment on a product design course at a Taiwanese university. A series of evaluation processes that included questionnaires and interviews were used. We verified that both instructor and students obtained effective support from the proposed learning environment. Experimental results revealed that students had higher learning motivation and participation as they had access to adequate learning support from the proposed web application supported learning environment during and after class. Although learning motivation and participation are important for students and instructors, they could be difficult for instructors to induce. Instructors often fail to interact with students effectively due to limits on class duration. Therefore, we concluded that the web application supported learning environment was able to effectively assist instructors and students in administering and conducting learning activities during and after class.

Further applications of web application supported learning environment for educators

This study applied the proposed web application supported learning environment to a product design course. The proposed approach could be used by educators in different educational contexts to achieve various pedagogical objectives. Before teaching a specific subject, educators could use the learning environment to interact with students and survey their opinions to improve both teaching and learning experiences. The environment could also be used during instruction to conduct a formative assessment on student learning statuses and identify learning issues. Finally, educators could use the environment to conduct performance assessments after instruction to find out how well the students had acquired relevant knowledge taught during the learning process.

Future work

The well-known web applications applied in this study could be integrated with other learning tools or systems like the learning management system (LMS). Therefore, the future research directions would be to integrate appropriate web applications into the LMS to strengthen the proposed learning environment for other subjects, disciplines, and educational pedagogies. The integration of web applications and LMS would allow instructors and students to obtain comprehensive educational services and use familiar web applications to support their teaching and learning. Therefore, further investigations should analyze student learning effects and develop suitable solutions to support the proposed approach using application program interfaces (API).

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REFERENCES

Alexander, B. (2006). Web 2.0: a new wave of innovation for teaching and learning? *Educause Review*, 41(2), 32–44.

Bennett, S., Bishop, A., Dalgarno, B., Waycott, J., & Kennedy, G. (2012). Implementing Web 2.0 technologies in higher education: A collective case study. *Computers & Education*, 59 (2), 524-534.

Crook, C., & Harrison, C. (2008). *Web 2.0 technologies for learning at key stages 3 and 4: Summary report*. Retrieved May 15, 2012, from http://dera.ioe.ac.uk/1480/1/becta_2008_web2_summary.pdf.

Dohn, N. (2009). Web 2.0: inherent tensions and evident challenges for education. *Computer Supported Collaborative Learning*, 4, 343–363.

Hamann, K., & Wilson, B. M. (2003). Beyond search engines: Enhancing active learning using the internet. Politics & Policy, 31, 533-553.

Hung, I. C., Chao, K. J., Lee, L., & Chen, N. S. (2012). Designing a robot teaching assistant for enhancing and sustaining learning motivation. *Interactive Learning Environments*, in press, DOI: http://dx.doi.org/10.1080/10494820.2012.705855.

Hughes, A. (2009). *Higher education in a Web 2.0 world*. JISC Report. Retrieved May 22, 2012 from. http://www.jisc.ac.uk/media/documents/publications/heweb20rptv1.pdf.

Hwang, G. J, & Chang, H. F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education*, 56(4), 1023-1031.

Jou, M., Chuang, C. P., & Wu, Y. S. (2010). Creating interactive web-based environments to scaffold creative reasoning and meaningful learning: from physics to products. *The Turkish Online Journal of Educational Technology*, 9(4). 49-58.

Jou, M., & Shiau, J. K. (2012). The development of a web-based self-reflective learning system for technological education. *The Turkish Online Journal of Educational Technology*, 11(1), 165-171.

Keller, J.M. (1983). Motivational design of instruction. In C.M. Regality (Ed.), *Instructional design theories and models: An overview of their current status* (pp. 386–434). Hillsdale, NJ: Lawrence Erlbaum.

Lai, C. Y., & Wu, C. C. (2006). Using handhelds in a jigsaw cooperative learning environment. *Journal of Computer Assisted Learning*, 22(4), 284–297.

Law, M. Y., Lee, C. S., & Yu, Y. T. (2010). Learning motivation in e-learning facilitated computer programming courses. *Computers & Education*, 55(1), 218-228.

Lee, C. L., Lu, H. P., Yang, C., & Hou, H. T. (2010). A process-based knowledge management system for schools: a case study in Taiwan. *The Turkish Online Journal of Educational Technology*, 9(4), 10-21.

Lin, Y. C., Lin, Y. T., & Huang, Y. M. (2011). Development of a diagnostic system using a testing-based approach for strengthening student prior knowledge. *Computers & Education*, 57(2), 1557-1570.

Lin, Y. T., Tan, Q., Kinshuk, & Huang, Y. M. (2010). Location-based and knowledge-oriented microblogging for mobile learning – framework, architecture, and system. In *Proceedings of the sixth IEEE International Conference on Wireless, Mobile and Ubiquitous Technologies in Education (WMUTE 2010)*, Kaohsiung, Taiwan.

Maehr, M.L. (1976). Continuing motivation: An analysis of a seldom considered educational outcome. *Review of Educational Research*, 46, 443–462.

Munoz, C. L., & Towner, T. L. (2009). Opening Facebook: how to use facebook in the college classroom. In *Proceedings of Society for Information Technology and Teacher Education Conference*, Charleston, South Carolina.

Murphy, P.K., & Alexander, P.A. (2000). A motivated exploration of motivation terminology. *Contemporary Educational Psychology*, 25(1), 3–53.

Ng, W. (2012). Can we teach digital natives digital literacy?, in press, DOI: 10.1016/j.compedu.2012.04.016.

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82(1), 33–40.

Pretlow, C., & Jayroe, T. (2010). Training in the clouds. *Computers in Libraries*, 30(4), 18-23.

Schneckenberg, D., Ehlers, U., & Adelsberger, H. (2011). Web 2.0 and competence-oriented design of learning—Potentials and implications for higher education. *British Journal of Educational Technology*, 42(5), 747-762.

Thompson, J. (2007). Is education 1.0 ready for web 2.0 students? *Innovate*, 3(4).

Wang, Q., Woo, H. L., Quek, C. L., Yang, Y., & Liu, M. (2012). Using the Facebook group as a learning management system: An exploratory study. *British Journal of Educational Technology*, 43(3), 428-438.

INTEGRATING WORKED EXAMPLES INTO PROBLEM POSING IN A WEB-BASED LEARNING ENVIRONMENT

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ABSTRACT
Most students always lack of experience and perceive difficult regarding problem posing. The study hypothesized that worked examples may have benefits for supporting students' problem posing activities. A quasi-experiment was conducted in the context of a business mathematics course for examining the effects of integrating worked examples into problem posing activities. A total of 107 undergraduate students at a technology university were invited to join this experiment for six weeks. The problem posing activities were carried out in a web-based learning system. The experimental condition receiving worked examples was compared with a control condition regarding the number, orientation and complexity for indicating problem posing performance. To evaluate students' problems as objectively as possible, a Problem-Level-Taxonomy was developed in this study. By the independent sample t-test analysis, the results showed that integrating worked examples into problem posing has a significant skills development effect on posing more orientated and complex problems, particularly for analytical problems referring to a learning concept or a formula. Besides, novice students with none experience in problem posing may benefit from the support of worked examples to improve their problem posing skills. The implications and limitations of this study were also discussed.

INTRODUCTION

Good science education demands asking right questions and getting right answers, among that asking good questions is the important beginning (Orr, 1999; Woodward, 1992). However, the questions usually generate by the teacher and rarely by the students (Dillon, 1988). Dillon (1990) suggested that questions should come from both teachers and students. Recently, researchers emphasized the task of generating questions falls onto the shoulders of students (Chang, Wu, Weng, & Sung, 2012; Hofstien, Navon, Kipnis, & Mamlok-Naaman, 2005; Kaberman & Dori, 2009; Lan & Lin, 2011; Marbach-Ad & Sokolove, 2000; Vreman-de Olde & de Jong, 2004; Yu, 2009; Yu, Liu, & Chan, 2005), in which students shift from a passive role as information receiver to an active role, assuming the role of teachers as questioners to generate problems and also answer the problems. That is, students engage in self-questioning and self-answering activities during the problem posing process (King & Rosenshine, 1993). Mathematics education, without exception, has widely engaged in problem posing (Barlow & Gates, 2006; Crespo, 2003; Lavy & Shriki, 2010; Silver, 1994; Toluk-Ucar, 2009). While the positive influence of problem posing on content knowledge, comprehension, analytical skills, problem solving skills, and beliefs about subject matter has been evidenced (Barlow & Cates, 2006; Chang et al., 2012; Dori & Herscovitz, 1999; Kaberman & Dori, 2009; Lavy & Shriki, 2010; Toluk-Ucar, 2009), successful problem posing may be difficult for students. Particularly, students are accustomed to answering questions but still complete novices at problem posing (Dillon, 1990). The main challenge is a lack of experience (Vreman-de Olde & de Jong, 2004; Yu & Liu, 2009) and perceived difficulty regarding problem posing (Yu et al., 2005).

Under the premise that students should be provided real-time support with unrestricted time and space, a web-based learning environment used as a platform for problem posing would appear to be promising. Several web-based learning systems, such as QSIA (Rafaeli, Barak, Dan-Gur, & Toch, 2004), QPPA (Yu et al., 2005), PeerWise (Denny, Hamer, Luxton-Reilly, & Purchase, 2008), Concerto II (Hazeyama & Hirai, 2009), and QPIS (Lan & Lin, 2011) were therefore developed for supporting problem posing. Within these systems, having access to model problems was perceived as the most important support during problem posing (Yu, 2009). However, the model problems were generated by peer students, in which case the demonstrated problem states and solution procedures may contain errors (Braaksma, Rijlaarsdam, & Van den Bergh, 2002; Schunk & Hanson, 1985). In contrast, expert model problems, such as worked examples, that are presented in a didactical way are considered as an effective instructional strategy to demonstrate how to perform a task (Atkinson, Derry, Renkl, & Wortham, 2000; Braaksma et al., 2002; Sweller, Van Merriënboer, & Paas, 1998). Assisted by worked examples, that is, examples generated by teacher/expert generally provides complete problem states and correct didactical problem solving procedures (Atkinson et al., 2000; Crippen & Earl, 2007; Renkl, 2002; van Gog & Rummel, 2010; Ward & Sweller, 1990), it is hoped that students may view and imitate the worked examples and further reformulate or elaborate upon them in better conducting the problem posing task.

Nevertheless, the issue of considering the provision of expert model problems to support problem posing for students has attracted relatively little attention and is worth examining. A novel way of integrating worked examples into problem posing in a web-based learning environment was proposed in this study. The effects were investigated in the context of a business mathematics course focused on undergraduate students. The problem posing was conducted across three homework exercises in which students were required to generate at least one applied problem (i.e., like a real-life problem) respectively. The main assumption underlying this study was that studying worked examples could stimulate students' problem posing activities and develop problem posing skills. It was grounded in the literature documenting observational learning occurs when students are provided with model problems in problem posing activity (Yu, 2009) and studying worked examples is regarded as a kind of observational learning (Bandura, 1986; Sweller & Sweller, 2006; Sweller, 2004; van Gog & Rummel, 2010).

THEORETICAL BACKGROUND

Problem Posing

Problem posing refers to generating an original new problem or reformulating an existing problem (Silver, 1994). Marbach-Ad and Sokolove (2000) claimed that problem posing involves more than generating a problem, and also presenting a solution to the problem. From a cognitive perspective, Yu et al. (2005) referred to problem posing as an information-processing process that requires students to become actively immersed in the material, point out the important learning concepts, reason which parts are worth testing, clarify the relationships among the concepts and formulate or elaborate a problem. Through posing problems students expose their thoughts and reflect their level of understanding, skills and beliefs (Dori & Herscovitz, 1999; Toluk-Ucar, 2009). The posed problems provide opportunities for teachers to gain insights into the students' cognitive understanding (Woodward, 1992), and therefore, some studies used problem posing exercises as an assessment tool (Dori & Herscovitz, 1999; Hofstien et al., 2005; Kaberman & Dori, 2009). Moreover, Kaberman and Dori (2009) indicated that problem posing is a metacognitive function because students are trained to be self-questioners, enabling students to monitor their comprehension or identify the limits of their knowledge and better self-regulate their progress (King & Rosenshine, 1993; Palinscar & Brown, 1984; Wong, 1985).

Considering that problem posing is an important strategy for cognitive comprehension and metacognitive regulation (Aldridge, 1989; Dori & Herscovitz, 1999; Hartman, 1994; Heady, 1993; Kaberman & Dori, 2009; Paris & Myers, 1981; Yu et al., 2005), several researchers have focused on teaching/learning environmental designs such as cooperative learning, or inquiry-based learning, in which students were provided with opportunities to formulate more and higher level problems (Hofstien et al., 2005; Lan & Lin, 2011; Marbach-Ad & Sokolove, 2000). Although Kaberman and Dori (2009) presented evidence that question classification taxonomy served as scaffolding that effectively stimulated students to generate questions, the question of ways to guide or instruct students in posing better problems, particularly in upgrading the cognitive level of problems, remains unanswered and there is a need to be investigated. Yu et al., (2005, 2009) also indicated that the question of how to improve students' problem posing ability and performance is emerging as an important issue. Therefore, this study aimed to fill this gap in the literature.

Worked Examples

Worked examples usually provide students with example problems and worked-out solution steps for final answers (Renkel, Stark, Gruber, & Mandl, 1998; Sweller et al., 1998). Research has shown that studying worked examples in contrast to conventional problem solving is an effective way to enhance understanding why solution steps are effective, how the operators should be applied and the rationale underlying solution procedures (Sweller, 1988, 2004; Sweller & Cooper, 1985), which allows students to build cognitive schemas (van Gog & Rummel, 2010). The effectiveness of learning from worked examples for novice students in well-structured domains such as physics, programming and mathematics (Kalyuga, 2007; Kalyuga, Chandler, Tuovinen, & Sweller, 2001; Sweller et al., 1998; van Gog & Rummel, 2010; VanLehn, 1996) is promising, but validation of the strategy in the problem posing activity is needed and noticeably missing from the literature.

Integrating Worked Examples into Problem Posing

Most students always lack the experience of problem posing (Vreman-de Olde & de Jong, 2004; Yu & Liu, 2009). Even though students were drawn into problem posing activities, a significant percentage of students felt that problem posing was a difficult task (Yu et al., 2005). These problems demonstrate the necessity of searching for further support in the effort to promote problem posing activity. Yu (2009) researched students' perceived usefulness of each scaffolding techniques, among which model problems generated by peers was viewed as the top most support for problem posing. The researchers employed the exemplary problems generated by students as models for being viewed and observed by other students. In this case, observing model problems were considered as observational learning (Yu, 2009). Furthermore, researchers claimed that the words or images included in worked examples are symbolic models that can be observable for the students (Bandura, 1986; Sweller & Sweller, 2006; Sweller, 2004). Therefore, studying worked examples is also regarded as a kind of observational learning (van Gog & Rummel, 2010) in which students may observe symbolic models in words or images with written accounts of what the problems state and how the solution steps evolve. The present study hypothesized that observational learning may occur when integrating worked examples into a problem posing activity.

Summarizing the above, the study presumed that worked examples may contribute to problem posing activities. Worked examples, expert model problems, could be viewed as an analogy (Reed, Willis, & Guarino, 1994) for generating new problems and solving such problems during problem posing. Studies showed that the availability of models for reference is one of the factors that influence student performance in problem posing activities (Yu et al., 2005). The main research question in the study was: Can providing worked examples stimulate more problem posing activities and develop better problem posing skills?

METHODOLOGY

Participants

A total of 107 undergraduate students taking business mathematics course, with an average age of 21 from department of business administration at a technology university in Taiwan, were invited to join the experiment. The participants of this study were taught by the same teacher. A quasi-experiment was conducted in two classes. Each class was randomly assigned to one of two conditions, worked examples condition (n=54) and control condition (n=53). Students' consent was obtained. The two conditions differed in whether worked examples provided along with each problem posing homework. The control condition only received the notification of homework without any worked examples, whereas in the worked examples condition, two worked examples were additionally provided. A control condition was included in this study, thus, the effects of integrating worked examples into problem posing could be observed in the absence of confounding factors. Before the experiment, none of the participants was ever equipped with problem posing skills and experience in such activities.

Learning Materials and Objectives

Business mathematics, a 2-credit, two-semester required class, was specifically selected for leaning materials in this study because the course is a well-structured domain and emphasizes introductory mathematics skills that are prior knowledge for required courses such as consumer finance and investments. The learning objective was to enable students to become acquainted with five units: "Simple Interest", "Compounded Interest", "Future Value of Annuities", "Bonds and Sinking Funds", and "Present Value of Annuities". The experimental materials addressed latter three learning units and the "Simple Interest" and "Compounded Interest" learning materials were instructed before the experiment.

The Learning Environment

A web-based learning management system, a commercially system called iLMS, developed by FormosaSoft Corp. in Taiwan, was used in this study for managing students' assignments and sharing information. The reasons of using the learning system were as follows. First, the problem posing homework could be assigned in an assignment function and the requirements of the homework could be specified herein, especially including the delivering of the worked examples for worked examples condition. Furthermore, the notification of homework information could be sent by the system. Second, the period of submitting homework could be set to ascertain that the students submit their problem posing homework to the system during the valid period. The function of submitting-assignment would be disabled automatically once the period is expired.

During the valid period, students could modify the problems they posed at any time. Finally, the system could be act as a platform for demonstrating the problems that the students posed; that is all problems were shown in the system until after the valid period of submitting homework. In the light of Brandura's (1986) social modeling, previous researchers suggested that engaging in the process of observing their peers' problems may be conducive to their knowledge levels and modeling may be occurred (Yu et al., 2005; 2009). The effects of the peer model problems were not relevant in this study though.

A Problem-Level-Taxonomy for categorizing students' problems

Bloom taxonomy (Bloom, 1984) is the most common hierarchy for evaluating questions based on the cognitive level required to answer it. The hierarchy consists of six levels: knowledge, comprehension, application, analysis, synthesis and evaluation from lower to higher levels respectively. However, Bloom taxonomy is not fully appropriate for this study due to the following reasons. One is that the classification is mainly used to categorize teachers' questions rather than students' questions posed in problems posing activity (Marbach-Ad & Sokolove, 2000). A second is that problem posing can be regarded as a component of high level thinking skills (Barak & Rafaeli, 2004) rather than low level skills such as information recalling or knowledge understanding, and the problems posed in this study were all applied problems. A third is that problems should be evaluated based on the required learning concepts concerned with the objectives of the lesson for completing the task (Barden, 1995; Shepardson, 1993). Bloom's taxonomy and other methods that have been used to classify students' problems (Barak & Rafaeli, 2004; Dori & Herscovitz, 1999; Marbach-Ad & Sokolove, 2000) were completely inadequate for this study.

Table 1: Rubric for Problem-Level-Taxonomy

Level	Description	Score
Digression	Problems that do not make sense regarding the learning unit or digressed from the subject.	0
Application	Problems to which the answer is figured out by matching the elements of problems with the formula elements referring to a learning concept or a formula.	1
Analysis	Problems to which the answer is an analytical or comparative evaluation for reaching a particular goal referring to a learning concept or a formula.	2
Synthesis	Problems resulting from a synthesis of prior knowledge and the newly acquired learning concepts.	3

Consequently, in order to match with the objectives of the lesson, a Problem-Level-Taxonomy was developed in this study for ranking students' problems as objectively as possible, as specified in Table 1. The problem was categorized as one of four levels: digression, application, analysis, and synthesis under the number of above-mentioned learning concepts required to answer the problem for demonstrating students' mastery.

A digression-level problem referred to a problem that did not contain a certain formula or orientated toward a certain learning unit. An application-level problem caused students to vary the knowns or givens, reversing knowns and unknowns from an original problems. The answers were figured out by matching the elements of problems with the formula elements referring to a formula. An analysis-level problem required students to generate a new problem including several similar cases with different conditions. The answers were obtained by utilizing a certain formula to analyze or evaluate these cases for reaching an optimal goal. Lastly, a synthesis-level problem engaged students in drawing relationships among prior knowledge and the newly acquired learning concepts. More than one learning concept or formula was synthesized for solving this kind of problems. Both the analysis- and synthesis-level problems were viewed as complex problems resulting from analyzing different cases or from synthesizing different learning concepts (Marbach-Ad & Sokolove, 2000). An example of "Future Value of Annuity" was given, for each level each example problem posed by students was illustrated and the comments for each one were also exemplified respectively in Table 2.

Table 2: Examples for each level regarding "Future Value of Annuity"

Level	Examples	Comments
Digression	For an 8.5% simple interest 4-year $20,000 loan, what is the total interest?	The problem is a digressive problem, since it is not orientated towards the concept of "Future Value of Annuity".
Application	You deposit $100 per month into an account that earns 1.2% interest per year compounded monthly. After 10 years, how much should the account be?	The answer to the problem can be solved with a concept of "Future Value of Annuity" only.
Analysis	You deposit $100 per month into an account that earns 1.2% interest per year compounded monthly. And, Mary deposit $350 per quarter into an account that earns 1.5% interest per year compounded quarterly. After 10 years, how much should the difference between your and Mary's account be?	For answer the difference between the two accounts, the concept of "Future Value of Annuity" is utilized for both accounts and the difference can be calculated accordingly.
Synthesis	You deposit $100 per month into an account that now contains $10,000 and earns 1.2% interest per year compounded monthly. After 10 years, how much should the account be?	The problem contains two learning concepts, "Compounded Interest" and "Future Value of Annuity".

Procedures

Before the experiment, to assure equivalent student achievement across conditions, a prior knowledge test on "Simple Interest" and "Compounded Interest" was administered in a traditional paper and pencil form. The test consisted of five applied problems with a total possible score of 100. No significant differences in prior knowledge scores existed between the two conditions. Besides, all participants were provided with a Problem-Level-Taxonomy that instructed what the evaluation criteria were, what complex problems were, and what the instructor expected for problems posing to self-evaluate the problems they posed. Related research showed that students instructed in problem classification taxonomy significantly improved their problem posing skill and advanced on the complexities of the problems they posed (Kaberman & Dori, 2009).

The total duration of the experiment was six weeks. For matching with three experimental units, that is, "Future Value of Annuities", "Bonds and Sinking Funds", "Present Value of Annuities", the experiment procedures were conducted in three rounds of learning activities. Each round lasted two weeks and concentrated on one of the three units. Students were instructed in traditional classes for 2 hours each week. In the first week of each round, the foundational concepts related to the corresponding unit were instructed. After class, the students were assigned a problem posing homework of a week. The homework required students to generate at least one applied problem and the subject of the problems should be matched with the learning unit. Two worked examples corresponding to the learning unit were additionally provided only for worked examples condition. These two worked examples were application-level problems with the same underlying concepts but changed known or unknown features. The impetus for students was that all posed problems were graded and counted towards one fifth of the overall semester grade. The following week of each round, in order to maximize students' mastery of the learning units, the teacher illustrated some problems posed by the students in the class and took them as exercises by discussing any existed misunderstanding, aiming to remedy students' comprehension. The problems illustrated in both conditions were exactly the same.

Summing up, the following steps provide an overview of the process for problem posing activities: (1) to inform students the grading of posed problems counted towards semester grade, (2) to provide the Problem-Level-Taxonomy for students, (3) to delivery 2-hour lecture in class, (4) to assign a problem posing homework in iLMS and provide two worked examples only for worked examples condition, (5) to require students complete problem posing in iLMS within a week, and (6) to discuss posed problems for 2 hours in next class. Each round of learning activities repeated from step (3) to (6).

DATA ANALYSIS

Over the experiment period, students were assigned three problem posing homework exercises. The results over three homework exercises were aggregated for analyzing in terms of the number, orientation and complexity for indicating problem posing performance (Dori & Herscovitz, 1999).

Firstly, with regard to the number, for each student the quantity of posed problems across three homework exercises was counted in Total Problems (future called TP). Next, with regard to the orientation, the content of each problem was analyzed for determining whether the problem digressed, i.e., judging whether the problem that did not orientated towards the learning unit. Digressive Problems (DP) was used to indicate the number of non-orientated problems that fell into the digression level. Conversely, a non-digression problem was implemented only if the problem oriented towards the learning unit, that is, the answer to it contained the learning concepts for solving it.

Thirdly, with regard to the complexity, the content of each non-digression problem was further analyzed for determining what level into which the problem fell in the Problem-Level-Taxonomy. Complex Problems (CP) was used for representing the quantity of complex problems including analysis- and synthesis-level problems. Besides the quantity, it is also valuable to understand the obtained scores associated with the quantity of complex problems. Therefore, for scoring students' problems, one, two, three points were given respectively for application-, analysis- and synthesis-level problems. No credit was given for digression-level problems. The Average Complexity (AC) was defined as the ratio of the obtained points to the quantity of complex problems.

After the experiment two experts were invited to grade the problems over three homework exercises according to the Problem-Level-Taxonomy, i.e., to categorize problems as digression-, application-, analysis- or synthesis-level problems. The two independent raters fully agreed on the problems categorized as digression level. The inter-rater reliability between the two raters on was 0.938 (Spearman's Rho). The problems on which disagreement occurred were re-categorized and an agreement was reached. This indicated that the two experts graded very consistently. This also implied that the Problem-Level-Taxonomy was appropriate for problem posing evaluation matching with the objectives of the lesson.

RESULTS

The number of problem posed by students for worked examples condition (below called WE) and control condition was 405, and 370 respectively. Figure 1 presented the percent distribution with respect to problem levels in two conditions, sorting by cognitive level. The distribution of the percentage of digression-, application-, analysis-, and synthesis-level problems in WE was 4, 78, 15, and 3 compared with 14, 76, 7, and 3 in the control condition, respectively. With the exception of digression-level problems, the percentage points for the WE were almost above the control condition. Both conditions posed mainly application-level problems. Even though both condition performed equal percentage of synthesis-level problems, the WE outperformed the control condition for posing over two times of analysis-level problems, suggesting worked examples effects for WE.

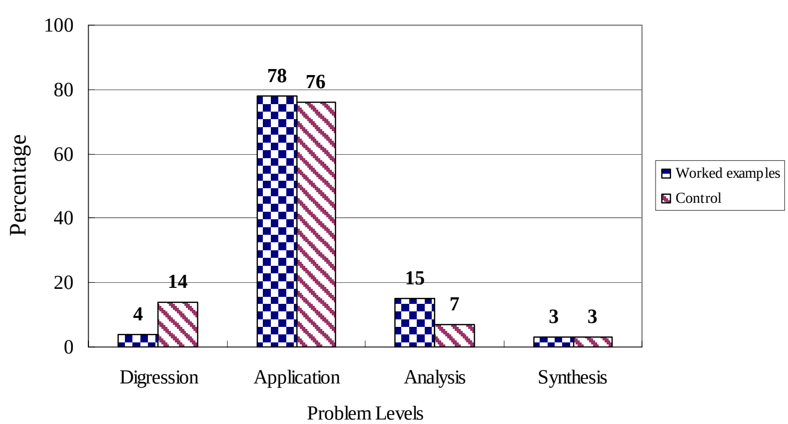

Figure 1: Distribution of problem levels in two conditions.

Table 3 presented a comparison of problem posing performance in terms of the number, orientation and complexity of problems between two conditions. The mean scores for the WE were higher than that for the control condition regarding to TP, CP, and AC. However, DP was a negative item that is reversely related to problem posing skills, the mean score for the WE was below that for the control. The greater DP one received the more digressive problems one posed, and the poorer problem posing skills one had.

Table 3: A comparison of each measure by two conditions

			WE (n=54)		Control (n=53)		t-value	p-value
Aspect	Measure		M	SD	M	SD		
Stimulation	Quantity	TP	7.50	3.61	6.98	4.12	0.69	.25
Skills Development	Orientation	DP	0.26	0.52	0.98	1.10	-4.35	.00**
	Complexity	CP	1.37	1.32	0.72	0.99	2.90	.00**
		AC	1.24	0.27	1.19	0.34	0.83	.41

Notes: WE = worked example condition, Control = control condition.
** $p < 0.01$, one-tailed testing.

The study aimed at examining the effects of worked examples on problem posing activity stimulation and problem posing skills development. The results of data analysis focused on two aspects: activity stimulation and skills development. As to activity stimulation, the two conditions were compared with regard to the quantity of problems. On the other hand, the quantity of digressive problems and the complexity of problems were considered for skills development.

Problem posing activity stimulation
For examining the worked examples effect on problem posing activity stimulation, the difference in the quantity of problems, TP, posed by the two conditions was tested. The independent sample t-test showed that the WE condition did not significantly outperform the control condition in TP, as shown in Table 3. The worked examples effect on problem posing activity stimulation was not confirmed, yet the direction of the results was as expected.

Problem posing skills development
Regarding worked examples effect on problem posing skills development, the differences in sub-skills (orientation and complexity) for the two conditions were examined respectively.

Problem orientation
With regard to problem orientation, the quantity of problems classified as digression level, DP, was examined. The independent sample t-test revealed that there was a significant difference between the WE condition and the control condition. However, the result also showed a significant trend in the contrary direction, as mentioned before, DP is a negative item. As expected, the mean of DP for the WE condition ($M = 0.26$) was significantly below the control condition ($M = 0.98$; $p = 0.00$). In other words, the students in the WE condition supported by worked examples posed more orientated problems compared to those in the control condition, suggesting that worked examples had a positive effect on problem orientation.

Problem complexity
The complexity of the problems was examined by utilizing AC and CP respectively. The independent sample t-test showed that the WE condition did not produce significantly more AC ($M = 1.24$) than the control condition ($M = 1.19$, $p = 0.41$). However, more CP ($M = 1.37$) were posed by the WE condition compared to the control condition ($M = 0.72$, $p = 0.00$), suggesting that the WE condition supported by worked examples exhibited a positive effect on posing more complex problems but not on average complexity of problems.

DISCUSSION
The results indicated that worked examples had an inconclusive effect, particularly in 'stimulation' case in which the hypothesis of stimulating more problem posing activities was not confirmed. The results suggested that worked examples did not elicit more problem posing activities. Additionally, with respect to the problem posing skills development, the following discussion focused on the effects of worked examples on (1) orientated problems posing, and (2) complex problems posing.

Effects of worked examples on orientated problems posing
The worked examples effect was detected on orientated problem posing. The control condition produced significantly more digressive problems than the worked examples condition. This can be attributed to the fact that worked examples provided students with the problem states and worked-out solution steps (Atkinson et al.,

2000; Crippen & Earl, 2007; Renkl, 2002; van Gog & Rummel, 2010; Ward & sweller, 1990). The problems states clearly describing the tasks in particular situations for reaching particular goals orientating towards the particular learning unit can be viewed as models for worked examples condition to observe and imitate. Therefore, observation learning could take place in the worked examples condition, leading to producing fewer digressive problems.

Effects of worked examples on complex problems posing

The effects of worked examples on complex problems posing were discussed regarding the quantity of complex problems and average complexity respectively. Worked examples effects were partially detected on complex problem posing. The quantity of complex problems posed by the worked examples condition was almost twice the quantity posed by their counter peers. However, there was not a differentiating effect on the average complexity between two conditions.

A possible explanation for the lack of a significant difference in the average complexity might be that students posed mainly application-level problems that were not categorized as complex problems whatever condition they were in. The average complexity was a measure of an average score relative to the quantity of orientated problems. Even though the worked examples condition produced significantly more complex problems compared with their counter peers, they still posed relatively more application-level problems. Therefore, the points given for complex problems did not significantly contribute to the average complexity, resulting that the average complexity of problems for the worked examples condition were not noticeably higher than that for the control condition.

Although worked examples produced a significant positive effect on the quantity of complex problems, the percentage of synthesis-level problems across conditions were identical. In other words, the result showed that the significant effect on the quantity of complex problems was resulting from the quantity of analysis-level problems. The effect found in this study suggested that worked examples may promote complex problem posing for only specific type problems and not for others. Previous research indicated that the effectiveness of problem posing depends on the amount and type of training and practice that students received (Dori & Herscovitz, 1999; 2005). We believed that the superior outcomes of the quantity of analysis-level problems were most likely due to the worked examples that students received mainly referring to a learning concept. Furthermore, the finding was similar to those of Butler and Winne (1995) who claimed that students with more explicit teacher modeling of cognitive and metacognitive skills were more likely to develop cognitive and metacognitive skills.

CONCLUSION

Problem posing is an active learning strategy in which students generate problems and present the answers to those problems. Research has shown that students have difficulties with problem posing due to a lack of experience or support. For guiding the students into problem posing activities, the Problem-Level-Taxonomy developed in the study was exposed to them before the experiment for demonstrating what the instructor expected. Moreover, for fostering students with mastery of related learning concepts, the notion of developing Problem-Level-Taxonomy was based on the number of learning concepts required to answer the problem. Regarding the issue of how to instruct problem posing, worked examples were used as expert model problems for supporting problem posing in this study to stimulate problem posing activities and develop problem posing skills. A quasi experiment was conducted to examine the effects of worked examples provided in an experimental condition compared to a control condition in terms of problem posing activity stimulation and skills development.

Based on the inconclusive results, several important findings were obtained. First, worked examples did not have a significant impact on stimulating students' motivation for posing more problems. Secondly, integrating worked examples into problem posing partially exerts a significant effect on skills development. Considering the results of orientation problems posing, students in the worked examples condition may produce fewer digressive problems. Thirdly, considering the results of complex problems posing, students in the worked examples condition may work best only for analysis-level problems. Combining with the results of orientation problem posing, this study manifested that studying worked examples improves problem posing skills development regarding posing orientated and analytical problems to which the answer is an analytical or comparative evaluation by referring to a learning concept or a formula for reaching a particular goal.

Although the web-based learning management system, iLMS, used in this study is a general system for learning management rather than a customized system for problem posing, it appeared to be an alternative suggestion for supporting innovative instructional activity, especially when the specialized systems were inadequate. For example, for integrating worked examples into problem posing in the context of mathematics, the developed systems specialized for problem posing were deficient for integrating worked examples into them and were deficient for editing graphical representation and devising mathematical equations or symbols. For addressing usability issues, the integration of instructional design with human-computer interface, particularly in creating multimedia learning environment, is an important consideration to promote learning interest and willingness of the students for success of web-based instruction (Dalacosta, Kamariotaki-Paparrigopoulou, Palyvos, & Spyrellis, 2009; Kuzu, Akbulut, & Şahin, 2007; Lan, Hung, & Hsu, 2011; Özdilek & Özkan, 2009).

IMPLICATIONS FOR PEDAGOGIES AND FUTURE RESEARCH

The results from this study might imply several pedagogies for problem posing activities. The study suggested that teachers try as much as possible to encourage students to conduct problem posing, such as relating the problem posing performance to the final semester grade. For novice students with none experience in problem posing, the support of worked examples may benefit students in posing orientated and complex problems. In addition to worked examples, providing students with an adequate problem classification taxonomy matching the objective of a lesson is also needed.

Although the findings are encouraging and useful, there are some questions that remain in this study. First, this study focused mainly on examining problem posing performance. It is not clear whether the problem posing performance also directly fosters positive learning achievements. Moreover, prior-knowledge (Yeh, Chen, Hung, & Hwang, 2010) or leaning styles (Özgen & Bindak, 2012) are important learner characteristic that should be considered when choosing the most appropriate instructional formats for students. Third, only providing worked examples did not contribute to posing synthesis-level problems that synthesize prior knowledge and the newly acquired learning concepts. The meaningful relationship of learning concepts may be beneficial for students in synthesizing the relationships of learning concepts. A concept map expressing the hierarchal structure to knowledge (Gaines & Shaw, 1995; Gordon, 2000) may be promising. These issues should be addressed in future studies. Finally, Moreno (2006) indicated that students are often under the illusion of understanding when studying worked examples. Bearing in mind that problem posing is recognized as both a cognitive and a metacognitive function, it is therefore may be considered as an important strategy in the comprehension of worked examples. Thus, further research should also address whether problem posing enhances learning performance when studying worked examples. The topic regarding whether problem posing and worked examples are mutually beneficial deserves to be studied.

REFERENCES

Aldridge, M. (1989). Student questioning: A case for freshmen academic empowerment. *Research and Teaching in Developmental Education,* 5(2), 17–24.

Atkinson, R. K., Derry, S. J., Renkl, A., & Wortham, D. (2000). Learning from examples: Instructional principles from the worked examples research. *Review of Educational Research*, 70, 181–214.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs: Prentice Hall.

Barak, M., & Rafaeli, S. (2004). On-line question-posing and peer-assessment as means for web-based knowledge sharing in learning. *International Journal of Human-Computer Studies, 61*, 84–103.

Barden, M. B. (1995). Effective questioning and the ever-elusive higher-order questions. *The American Biology Teacher, 57*, 423–426.

Barlow, A. T., & Cates, J. M. (2006). The impact of problem posing on elementary teachers' beliefs about mathematics and mathematics teaching. *School Science and Mathematics, 106*(2), 64–73.

Bloom, B.S. (Ed.) (1984). Taxonomy of educational objectives: Handbook 1: Cognitive domain. New York: Longman Inc.

Braaksma, M. A. H., Rijlaarsdam, G., & Van den Bergh, H. (2002). Observational learning and the effects of model-observer similarity. *Journal of Education & Psychology*, 94, 405–415.

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*, 245–282.

Chang, K. E., Wu, L. J., Weng, S. E., & Sung, Y. T. (2012). Embedding game-based problem-solving phase into problem-posing system for mathematics learning. *Computers & Education, 58* (2), 775–786.

Crespo, S. (2003). Learning to pose mathematical problems: Exploring changes in pre-service teachers' practices. *Educational Studies in Mathematics, 52*(3), 243–270.

Crippen, K. J., & Earl, B. L. (2007). The impact of web-based worked examples and self-explanation on performance, problem solving, and self-efficacy. *Computers & Education, 49,* 809–821.

Dalacosta, K., Kamariotaki-Paparrigopoulou, M., Palyvos, J. A., & Spyrellis, N. (2009). Multimedia application with animated cartoons for teaching science in elementary education. *Computers & Education, 52*, 741–748.
Denny, P., Hamer, J., Luxton-Reilly, A. & Purchase, H. (2008). PeerWise: Students sharing their multiple choice questions. *Proceedings of the Fourth International Workshop on Computing Education Research (ICER 2008)*, Sydney, Australia, 51–58.
Dillon, J.T. (1988). The remedial status of student questioning. *Journal of Curriculum Studies*, 20, 197–210.
Dillon, J.T. (1990). The practice of questioning. Routledge, London.
Dori, Y. J., & Herscovitz, O. (1999). Question posing capability as an alternative evaluation method: Analysis of an environment case study. *Journal of Research in Science Teaching, 36*, 411–430.
Dori, Y. J., & Herscovitz, O. (2005). Case-based long-term professional development of science teachers. *International Journal of Science Education*, *27*(12), 1413–1446.
Flavell, J. H. (1976). *Metacognitive aspects of problem solving*. In L. B. Resnick (Ed.), The nature of intelligence (pp. 231–235). Hillsdale, NJ: Erlbaum.
Gaines, B. R., & Shaw M. L. G. (1995). Concept maps as hypermedia components. *International Journal of Human–Computer Studies, 43*(3), 323–361
Gordon, J. L. (2000). Creating knowledge maps by exploiting dependent relationships. *Knowledge Based System*, *13*, 71–79.
Hartman, H. J. (1994). From reciprocal teaching to reciprocal education. *Journal of Developmental Education, 18*(1), 2–8.
Hazeyama, A. & Hirai, Y. (2009). Concerto II: A collaborative learning support system based on question posing. In Hijon Neira, R. (Ed), *Advanced learning*. InTechOpen. http://www.intechopen.com/source/pdfs/8590/InTech-Concerto_ii_a_collaborative_learning_support_system_based_on_question_posing.pdf
Heady, J. E. (1993). Teaching embryology without lectures and without traditional laboratories-An adventure in innovation. *Journal of College Science Teaching, 23*(2), 87–91.
Hofstein, A., Navon, O., Kipnis, M., & Mamlok-Naaman, R. (2005). Developing students' ability to ask more and better questions resulting from inquiry-type chemistry laboratories. *Journal of Research in Science Teaching, 42*(7), 791–806.
Kaberman, Z. & Dori, Y. J. (2009). Metacognition in chemical education: Question posing in the case-based computerized learning environment. *Instruction Science, 37*, 403–436.
Kalyuga, S. (2007). Expertise reversal effect and its implications for learner-tailored instruction. *Educational Psychology Review*, *19*, 509–539.
Kalyuga, S., Chandler, P., Tuovinen, J., & Sweller, J. (2001). When problem solving is superior to studying worked examples. *Journal of Education & Psychology, 93,* 579–588.
King, A., & Rosenshine, B. (1993). Effects of guided cooperative questioning on children’s knowledge construction. *Journal of Experimental Education*, *6*(12), 127–148.
Kuzu, A., Akbulut, Y., & Şahin, M. C. (2007). Application of multimedia design principles to visuals used in course-books: An evaluation tool. *The Turkish Online Journal of Educational Technology–TOJET, 6*(2), 8–14
Lan, Y. F., & Lin, P. C. (2011). Evaluation and improvement of student's question-posing ability in a web-based learning environment. *Australasian Journal of Educational Technology*, *27*(4), 581–599.
Lan, Y. F., Hung, C. L., & HSU, H. J. (2011). Effects of guided writing strategies on students’ writing attitudes based on media richness theory. *The Turkish Online Journal of Educational Technology–TOJET, 10*(4), 148–164.
Lavy, I., & Shriki, A. (2010). Engaging in problem posing activities in a dynamic geometry setting and the development of prospective teachers’ mathematical knowledge. *The Journal of Mathematical knowledge*, *29*, 11–24.
Marbach-Ad, G., & Sokolove, P. G. (2000). Can undergraduate biology students learn to ask higher level questions? *Journal of Research in Science Teaching, 37*(8), 854–870.
Moreno, R. (2006). When worked examples don’t work: Is cognitive load theory at an impasse? *Learning and Instruction, 16*, 170–188.
Orr, H.A. (1999). An evolutionary dead end? *Scie*nce, 285, 343–344.
Özdilek, Z., & Özkan, M. (2009). The effect of applying elements of instructional design on teaching material for the subject of classification of matter. *The Turkish Online Journal of Educational Technology–TOJET, 8*(1), 84–96.
Özgen, K., & Bindak, R. (2012). Examining students opinions on computer use based on the learning styles in mathematics education. *The Turkish Online Journal of Educational Technology–TOJET, 11* (1). 79–93.

Palinscar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 2*, 117–175.
Paris, S. G., & Myers, M. (1981). Comprehension monitoring, memory and study strategies of good and poor readers. *Journal of Reading Behavior*, 13(1), 5–22.
Rafaeli, S., Barak, M., Dan-Gur, Y., & Toch, E. (2004). QSIA – a web-based environment for learning, assessing and knowledge sharing in communities. *Computers & Education*, *43*(3), 273–289.
Reed, S. K., Willis, D., & Guarino, J. (1994). Selecting examples for solving word problems. *Journal of Education & Psychology*, *86*, 380–388
Renkl (2002). Worked-out examples: instructional explanations support learning by self-explanations. *Learning and Instruction, 12*, 529–556.
Renkl, A., Stark, R., Gruber, H., & Mandl, H. (1998). Learning from worked-out examples: The effects of example variability and elicited self explanations. *Contemporary Educational Psychology, 23*, 90–108.
Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Education & Psychology, 77*, 313–322.
Shepardson, D.P. (1993). Publisher-based science activities of the 1980's and thinking skills. *School Science and Mathematics, 93*, 264–268.
Silver, E. A. (1994). On mathematical problem posing. *For the Learning of Mathematics, 14(1)*, 19–28.
Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*, 257–285.
Sweller, J. (2004). Instructional design consequences of an analogy between evolution by natural selection and human cognitive architecture. *Instructional Science, 32*, 9–31.
Sweller, J., & Cooper, G. A. (1985). The use of worked examples as a substitute for problem solving in learning algebra. *Cognition and Instruction, 2*, 59–89.
Sweller, J., & Sweller, S. (2006). Natural information processing systems. *Evolutionary Psychology*, 4, 434–458.
Sweller, J., Van Merriënboer, J. J. G., & Paas, F. (1998). Cognitive architecture and instructional design. *Educational Psychology Review, 10*, 251–295.
Toluk-Ucar, Z. (2009). Developing pre-service teachers understanding of fractions through problem posing. *Teaching and Teacher Education, 25*, 166–175.
van Gog, T., & Rummel, N. (2010). Example-based learning: Integrating cognitive and social-cognitive research perspectives. *Educational Psychology Review, 22*, 55–174.
VanLehn, K. (1996). Cognitive skill acquisition. *Annual Review of Psychology, 47*, 513–539.
Vreman-de Olde, C., & de Jong, T. (2004). Student-generated assignments about electrical circuits in a computer simulation. *International Journal of Science Education*, 26(7), 859–873.
Ward, M., & Sweller, J. (1990). Structuring effective worked examples. *Cognition and Instruction*, 7(1), 1–39.
Wong, B. Y. L. (1985). Self-questioning instructional research: A review. *Review of Educational Research, 55*, 227–268.
Woodward, C. (1992). Raising and answering questions in primary science: Some considerations. *Evaluation and Research in Education*, *6*, 145–153.
Yeh, Y. F., Chen, M. C., Hung, P. H., & Hwang, G. J. (2010). Optimal self-explanation prompt design in dynamic multi-representational learning environments. *Computers & Education, 54*(4), 1089–1100.
Yu, F. Y. (2009). Scaffolding student-generated questions: Design and development of a customizable online learning system. *Computers in Human Behavior, 25*, 1129–1138.
Yu, F. Y., & Liu, Y. H. (2009). Creating a psychologically safe online space for a student-generated questions learning activity via different identity revelation modes. British Journal of Educational Technology, 40(6), 1109-1123.
Yu, F. Y., Liu, Y. H., & Chan, T. W. (2005). A web-based learning system for question-posing and peer assessment. *Innovations in Education and Teaching International*, *42*(4), 337–348.

IPAD INFUSE CREATIVITY IN SOLID GEOMETRY TEACHING

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ABSTRACT
We unveiled our plans to revolutionize the students' spatial conception development through the challenge and support of a cooperative learning of practice, the development of the profession as a whole and through sharing innovation and expertise. This encompasses cognitive consultancy, curriculum integration, solutions architecture, management of cooperative learning, embedding the solution and delivering through efficient technology involvement. This unique difference means we can advise on the implementation of those technologies within a live environment. In Taiwan, we are experimenting with a high level of technology integration to suit the student's learning requirements in the solid geometry curriculum. Married to this idea is the use of the iPad. The implementation of a new teaching model using the iPad has been very successful. The devices have been well received by students and by teachers and are increasingly well-used in the solid geometry curriculum as their attributes and limitations are learned. Both pedagogical changes and new ways of learning engender by access to information and learning tools, progress in the implementation of the scheme has been outstanding. By having teachers become more aware of their students' cognitive skills, attitudes, and misconceptions, teaching practices and student achievement can be enhanced.

INTRODUCTION
Solid geometry is an important part of the mathematics curriculum, and being the foundation for study in such fields as graphics, geology, science, engineering, architecture, computer and astronomy (Banchoff, 1990; Senechal, 1990). However, students are not demonstrating strong conceptual knowledge in reasoning about geometric ideas (Carroll, 1998). Carroll (1998) found that students are capable of developing continued growth and power of reasoning. The visualization of geometry improves students' perception of spatial relationships. Unfortunately, many students develop misconceptions, and others fail to derive from geometric figures. Learners who have engaged with geometry are likely to have an example space based on their previous encounters with geometry (Mason, 2003).

In applying the view of Piaget (1959) to how students learn within a dynamic geometry software environment, the students would construct their mathematical knowledge through interaction with the software, building their ideas through interaction and reflection on the results of their actions, a process facilitated by the feedback provided by the computer. This places implications on the learning environment itself. The layout of most school computer rooms positions the PC around the perimeter of the room or in blocks facing each other. It is not unusual for students learning in such a space to be completely silent. The teacher is paramount in creating an atmosphere that allows the students to interact in an environment that promoted collaborative inquiry about concepts using appropriate tools.

Recently, we have relied upon the mobile learning as a way to infuse the technology of the computer and software to the learning objectives found in the various content areas of our curriculum. Staying up to date on new technology, teacher can incorporate geometry software on class to present students the geometry graphics dynamically. When students are poorly prepared in critical order thinking skills and independent inquiry skills, the development can be supported by effective use of mobile technologies. A considerable body of literature confirms there has been a significant and very positive impact on learning which be reflected in the achievement and attainment (Hwang, Chu, Lin, & Tsai, 2011; Hwang, Wu, & Ke, 2011). Like the iPod and iPhone, the iPad is a platform intended to support online content including books, magazines, games, music, and video, plus Web access. Because of the bigger display, it is potentially a better platform for mobile learning than the iPhone or the iPod Touch. With the iPad, teachers can offer a flexible, complete, and cost efficient alternative to the traditional classrooms. Great iPad when teachers need to quickly explain something that requires a sketch or drawing and it's easy to share to cloud storage.

The iPad and the Cabri3D software can combine to provide an advantageous alternative to traditional solid geometry teaching. Certainly merging into an iPad environment from a traditional classroom can be challenging. We should explore the instructional implications of a move towards this new option at the Taiwan high school. Besides, we will address a gap in the literature by examining the impact on learning and teaching in an innovative school that already has a strong commitment to ICT. In particular, it will focus on changes in teaching and learning styles, impact on standards and on student's attitudes to learning with the iPad. Melhuish and Falloon (2010) lead us to a consideration of how mobile technologies are redefining what constitutes a learning space, one that is no longer fixed in time but based on connecting people with each other and information through virtual collaborative spaces and communities.

We proposed a new teaching model, is based on the theories of Van Hiele and Vygotsky. Theoretical foundations such as constructivism, social interaction and discussions, the use of smartboard, iPads, Cabri3D, cooperative learning groups, and higher order thinking are just a few of the theories that support our teaching philosophy and this research. For all the sophistication of our technology, our view of learning is still talking about courses and investigate students' learning of solid geometry in a phase-based instructional environment using iPad based on the van Hiele theory. This study was undertaken to investigate the following research questions,

1. Is the new teaching model useful in promoting students' thinking processes on geometry tasks?
2. Can the levels be characterized operationally by student behavior?
3. Can an interview procedure be developed to reveal different levels of reasoning on specific geometry tasks?

We use technology to move from an event-based learning model that we know to be ineffective, to a more distributed and contextualized environment that spans the continuum from formal learning to performance support.

THEORETICAL BACKGROUND

van Hiele theory

The van Hiele theory of geometric thinking comprises three main components; levels of geometric thinking, characteristics of the levels and phases of learning (Crowley, 1987). The van Hiele defined five phases of reasoning in geometry and the role of instruction in raising levels of thinking. The student passes before jumping to the next level (van Hiele-Geldof, 1957). They believed the developmental model of thought processes were discrete through which student progress as they learn geometry.

1. Level 1 (Visualization). The student reasons about geometric figures, such as simple shapes, by identifying, naming and comparing them according to their appearance. Perception is visual only and primarily by means of visual considerations of the concept as a whole without explicit regard to the properties of its components.
2. Level 2 (Analysis). The student reasons about geometric concepts empirically, such as folding, measuring, analyzing figures in terms of their components and relationships among components. Necessary properties and their attributes are used to describe and established figures.
3. Level 3 (Abstraction). The student logically orders previously discovered properties of concepts, form abstract definitions. By giving informal arguments the student operates with these concepts both within a figure and between related figures.
4. Level 4 (Deduction). The student can manipulate the relationships within the context of a mathematical system rather than a collection of shapes. Reasoning at this level includes complete with undefined terms, axioms, an underlying logical system, definitions, and theorems.
5. Level 5 (Rigor). The student can analyze and compare systems based on different axioms. The student can study various geometries in the highly abstract and does not necessarily involve pictorial models. At this level the axioms themselves become the object of intense rigorous scrutiny.

The van Hiele levels have generally been accepted by some researchers as a reasonable explanation as to how students learn geometry (Wilson, 1990; Flores, 1993; Battista, 1994; Perdikaris, 1996; Sharp & Hoiberg, 2001). In addition to furnishing insights into the thinking that is specific to each level of geometric thought, the van Hiele identified some generalities that characterize the model. These properties are particularly significant for educators because they provide guidance for making instructional decisions.

1. Sequential. As with most developmental theories, a person must proceed through the levels in order. To function successfully at a particular level, a student requires adequate and effective learning strategies in order to learn how to think and reason at higher levels (Crowley, 1987; Clements & Battista, 1993).
2. Advancement. Progress from level to level depends more on the influence of a teaching-learning program than on age. No method of instruction allows a student to skip a level; some methods enhance progress, whereas others retard or even prevent movement between levels (Crowley, 1987; Corley, 1990).
3. Intrinsic and extrinsic. The inherent geometric concepts that implicitly understand at one level become explicitly understood at the next level (Corley, 1990).
4. Linguistics. Each level has its own language, set of symbols and network of relations (Crowley, 1987; Clements & Battista, 1993).
5. Mismatch. If the student is at one level and instruction is at a higher level, the desired instruction and progress may not occur. The teacher, instructional materials, content, vocabulary is at a higher level than the learner, the student will not be able to understand the thought processes being used (Crowley, 1987).

Despite its importance, students still performed poorly on the compulsory solid geometry questions in Mathematics. To help students progress from one level to the next, the van Hiele propose five sequential phases of learning: inquiry, directed orientation, explication, free orientation, and integration (van Hiele-Geldof, 1984).

1. Information. The teacher and students engage in conversation and activity about the objects of study for this level. Questions are raised, and observations and evaluations are made how level-specific vocabulary is interpreted. And gives them some awareness of why they are studying the topic, so as to set the stage for further study.
2. Directed orientation. The students explore the topic of study by doing short tasks designed that the teacher carefully sequenced. These activities should gradually elicit the students the structures characteristic of this level. These steps help students acquaint themselves with the objects from which geometric ideas are abstracted.
3. Explication. Students learn to express and exchange their emerging views about the structures that have been observed during class discussions. The teacher leads students' discussion of the objects of study in their own words, so that students become explicitly aware of the objects of study. Then, the teacher introduces what figures and properties emerged in the activities above vocabulary.
4. Free orientation. The student encounters more complex tasks - tasks with many steps, tasks that can be completed in different ways. The teacher encourages students to solve and elaborate on these problems and their solution strategies.
5. Integration. The students review and summarize what they have learned about the objects of study with the goal of creating an overview of the topic. The teacher guides students through this process using standard vocabulary, but does not present any new ideas. At the end of the fifth phase, the students have attained a new level of thinking about the topic of study.

Sabean and Bavaria (2005) examined the research, which suggested that instruction must be balanced between the practice of skills and methods previously learned and new concept discovery. This discovery of new concepts, they suggest, facilitates a deeper understanding of mathematical connections. Researchers have explored the impact of technology on geometry that reported by GeoCAL (Chang, Sung & Lin, 2007) , DALEST developing an Active Learning Environment for Stereometry (Clements, Battista, Sarama & Swaminathon, 1997) , Dynamic Geometry Systems (DGS) and the Geometric Supposers (Schwartz & Yerushalmy, 1992). Some scholars analyze characteristics and properties of geometric shapes and develop mathematical arguments about geometric relationships based on the ideas of NCTM (National Council of Teachers of Mathematics) (Christou, Jones, Pitta-Pantazi, Pittalis, Mousoulides, Matos, Sendova, Zachariades & Boytchev, 2007).

Vygotsky theory

Vygotsky (1978) took up the idea of the Zone of Proximal Development (ZPD) as the difference between the level of difficulty of a subject that the student can understand with the help of a teacher or a fellow student. The concept of ZPD emerged as an argument against the use of standardized tests to gauge the human intelligence within our society or culture. The learner proceeds to the next developmental level of participation in activities slightly beyond their competence.

Vygotsky's theory of individual intellectual development emphasizes the importance of individual cognitive gains occur first through interaction with the social environment and then is internalized in the individual (Vygotsky, 1978; Rogoff, 1990). It is contrasted to Piaget's supposed tendency to view learning as a primary private affair. Based on Vygotsky's work, the learning communities can support learning through assisted performance, managed discourse, and reciprocal teaching.

Rather than the push to memorize facts, cognitive psychology advanced beyond behaviorism by positing that students actually could try to find facts and how to distinguish solid from the environment. Practical experiences involve problem solving situations that cognition has gone beyond knowledge to recognize not only operate "in the wild", but use information in the environment as part of the thinking process (Hutchins, 1996). Some students this age still confuse solid shape.

By assessing prior knowledge, the teacher is in accordance with both the constructivist view of teaching and learning mathematics will be able to see where the students are cognitively and push to have them work in their zone of proximal development through scaffolding (Vygotsky, 1978; Vygotsky, 1986). Teachers create an attractive scenario and assign students homework to on a daily basis. There is all manner of grunt work that students need to do in terms of time spend interacting with others. They can't really get rid of much of that grunt work, but it can streamline it. Playful activities in which students can physically practice directional instructions help them develop a kinesthetic understanding of solids. That offers a value to the students whenever they achieve new levels. Once these processes are internalized, they become part of the student's independent developmental achievement (Vygotsky, 1978).

METHODOLOGY

Computer Software

Current some math software is designed for plane geometry use and is poorly suited to solid geometry. The Cabri3D has become the dominant tool for giving students a tangible, visual way to explore and understand core concepts of geometry (See Fig 1). The Cabri3D's friendly user interface allows teachers and students to get quickly up to speed so teacher can spend time on teaching mathematics, not software. The teacher can easily generate dynamic instructional materials with accurately measured figures by exporting Cabri3D files to word and PowerPoint programs, and the internet. Teachers can provide engaging learning experiences and explore variables, relationships, and the mathematics of change with their students.

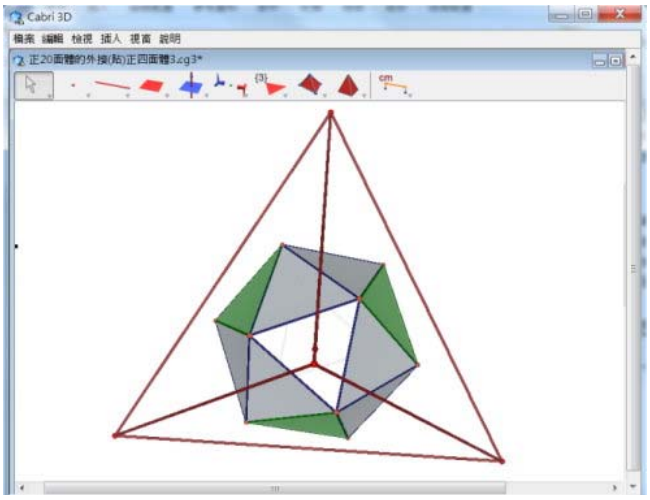

Fig 1 Cabri3D working environment

Cabri3D, with its dynamic manipulation environments, has three important attributes. First, students can directly manipulate mathematical objects represented on the screen. Second, mathematical objects stay coherent at all times as they are dragged. Third, students feel that they are involved with the objects they are manipulating, that is, they are immersed in the environment.

For students, it is designed to help explore and understand concepts in mathematics. Students can develop their algebraic equation solving skills through playing Cabri3D and print out (See Fig 2). As shapes and positions change, all mathematical relationships are preserved, allowing teacher and students to examine an entire set of similar cases in a matter of seconds.

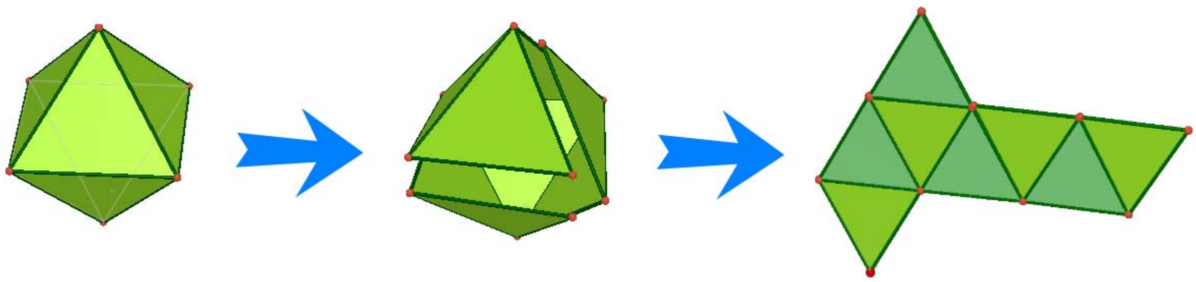

Fig 2 spread out the solid

Teaching Strategy

Our research plan is based on the theories of Van Hiele and Vygotsky. Theoretical foundations such as constructivism, social interaction and discussions, the use of smartboard, iPads, Cabri3D, cooperative learning groups, and higher order thinking are just a few of the theories that support our teaching philosophy and this research.

We proposed a SIC (smartboard, iPad, Cabri3D) teaching model which is a blend of classroom materials, self-paced e-learning and assessments. A broader extension of this model is to do more than facilitate performance, by actually promoting learning as well. As shown in Fig 3, considerable initial and ongoing training and professional development has been provided. The iPad can support classroom instruction and performance support. It can display HD video. It has a video out via the dock connector, so a teacher can display keynote presentations from the iPad alone. E-learning on iPad consolidates the delivery of these materials into a single tablet platform and leverages the best the iPad has to offer: ease of distribution, powerful e-reader functionality, rich multi-media and unparalleled navigability.

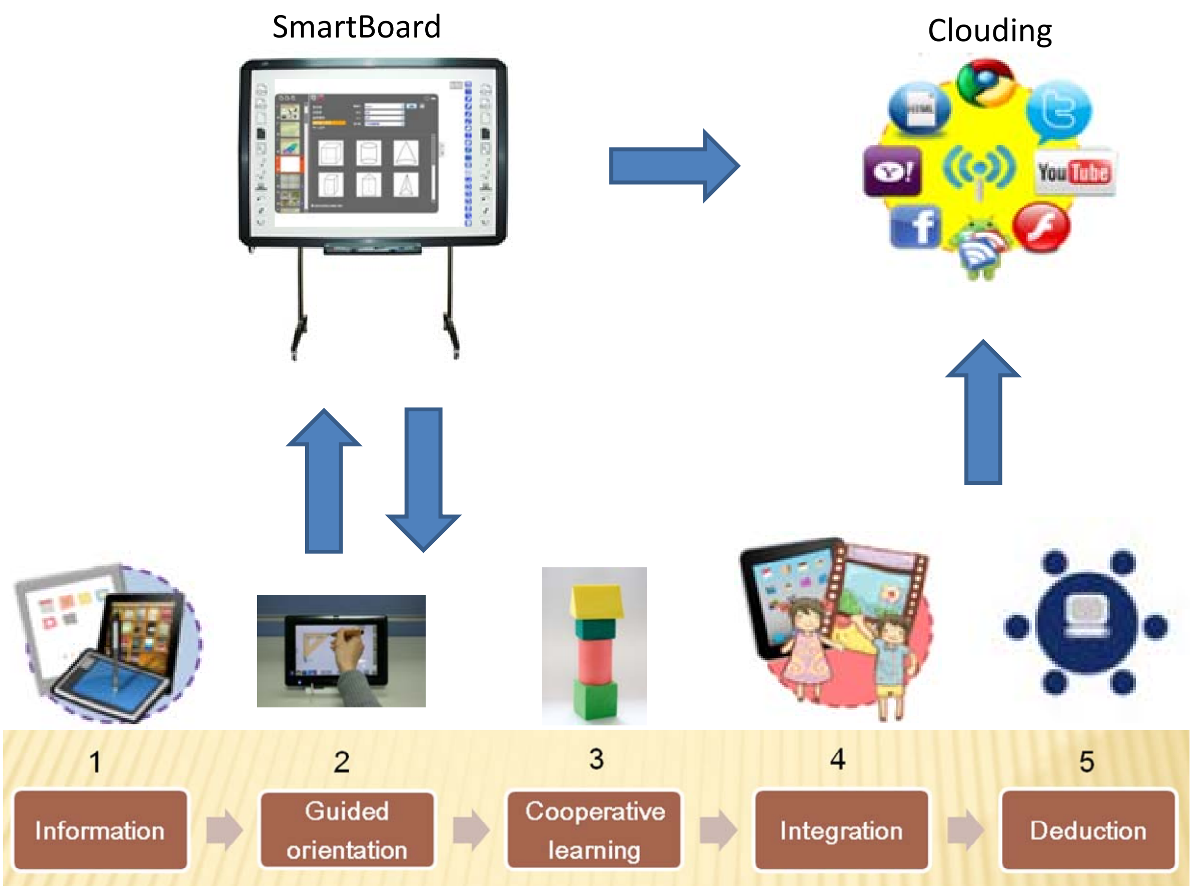

Fig 3 SIC teaching model

The teaching procedure includes five steps as follows.

1. Information

This activity explored and manipulate shapes help students develop a sense of spatial relationships. The use of the smartboard in combination with an iPad in the teacher's hand provides a mobile platform from which classroom activities can be initiated. Ask students to classify and search for examples of different shapes in their environment, and allow students to participate from their own seats in a variety of interactive activities. The iPad lets students organize their concept better as well as create their own solid categorization from the classroom as well as internet reference sources. The tasks included drawing shapes, identifying and defining shapes, sorting shapes, determining a mystery shape, establishing properties of parallelograms, and comparing shapes explicitly by means of properties of their components. Descriptions of types of shapes by explicit use of their properties, rather than by type names, even if known. Finally, teacher help students write the names of the objects on the sheet entitled short. Thus, this activity lets students have the ability to sort shapes according to a variety of mathematically precise attributes and to complete definitions of types of shapes. Once students have finished, attach the categorization of the corresponding list of objects, upload the diagram to website for sharing (See Fig 4).

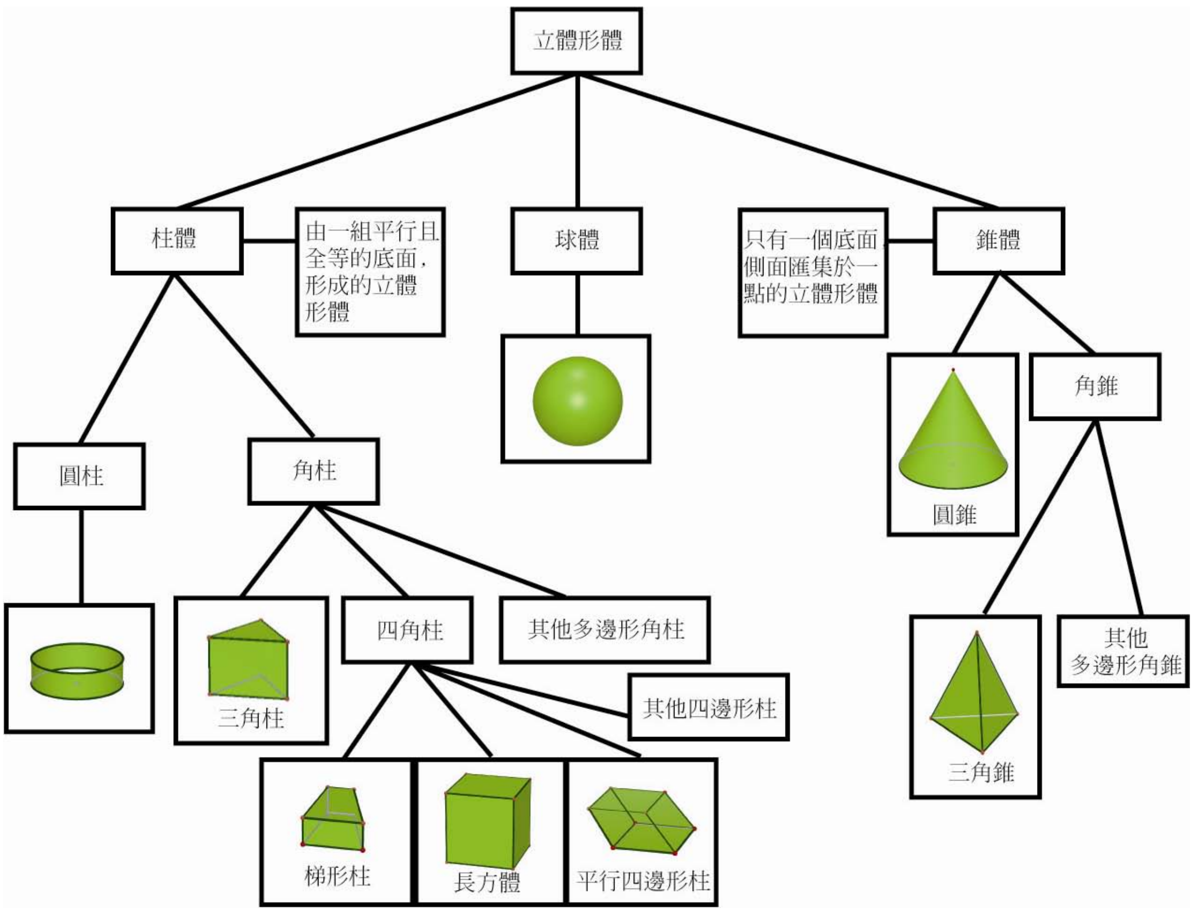

Fig 4 solid geometry classification

2. Guided orientation

This activity encourages students' incorporation of conventional terminology by consistently and accurately referring to objects by their mathematical names, for example, cube, cylinder, or rectangular prism. Begin by showing students Cabri3D with smartboard, iPad and projector. The teacher provides students conceptual material and examples beforehand, reactivate relevant knowledge to meet their unique learning needs. Students develop spatial visualization and reasoning abilities as they predict and then encourage students to be precise in their iPad movements. Ask students to explain their thinking and ask students if they can think of situations in which the size of the forward step would make a difference. As students become better at navigating, increase the amount of solids, e.g., spheroid, cone, pyramid. Give students an opportunity to check their estimates by measuring each of the objects. Challenge student to measure volume as many different shapes as they can using exacting formulas. The students' behavior on the tasks was consistent with the ability to modify definitions and immediately accept and use definitions of new concepts. They explore various ways of getting a volume by marking lengths, comparing lengths, and help students develop ideas of distance, direction, and relative position in space. In this activity, students identify and describe different lengths within the iPad and on a figure, and follow directions to measure volume (See Fig 5).

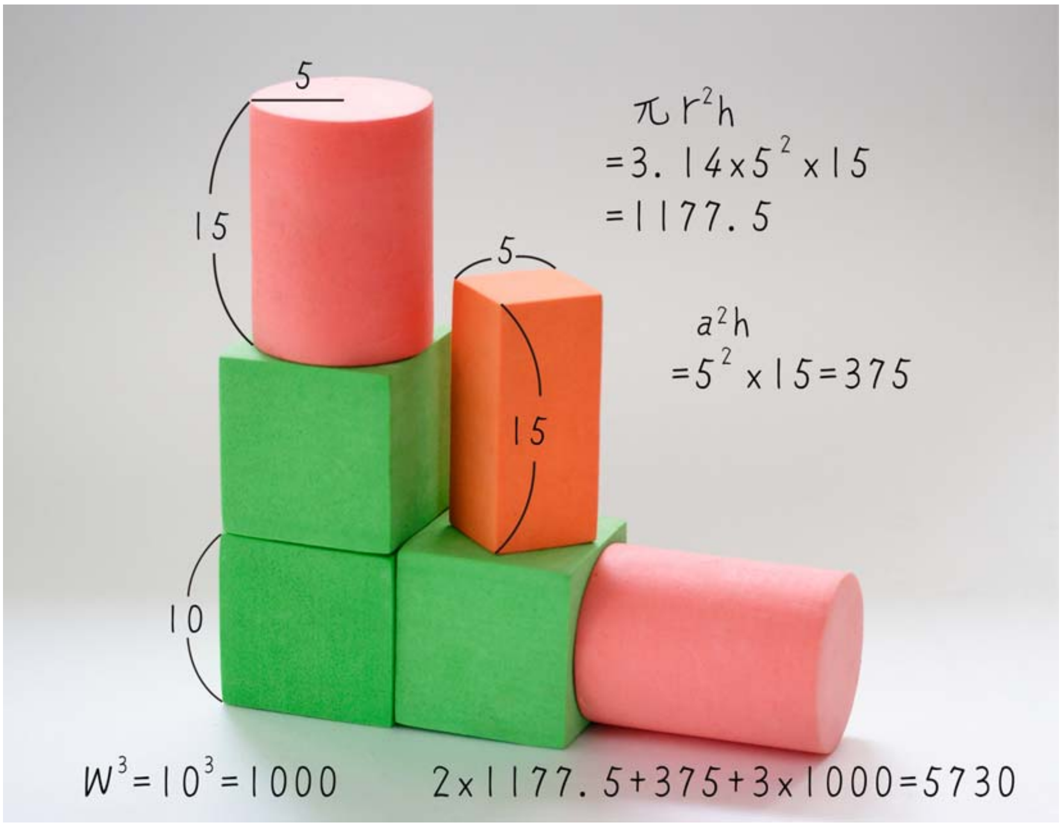

Fig 5 student use iPad and share others the computing

3. Cooperative learning

The teacher offers a range of exercises to ensure students comprehend the content and self-progressing that uses social techniques to encourage achievement. A set of solids was spread out on the table and being put together that are alike in a different way. Encourage students to look for familiar shapes in the geometric quilt designs. Invite them to pick out their favorite design and say why they like it. The students were asked how the figures differed and how many different solids he or she could draw. The learning space is no longer fixed but based on connecting student with each other and information through collaborative spaces and communities. This task investigated the properties that students varied to make different solids and explore the effects of transformations in different geometric solids. They explore different new shapes that can be made by combining solids and explore what happens when shapes are cut or divided into smaller shapes. Students use spatial reasoning as they indicated they had enough clues to decide the shape, they were asked how they knew with certainty and whether another clue would change their minds. This cooperative learning was continued as long as the student could come up with new sorting properties. Then they were asked to give an example of each term with which they were familiar (See Fig 6).

Fig 6 students design a shape of compound solids

4. Integration

This activity elicited formal inference and addressed the role of necessary versus sufficient conditions to determine a shape. The students were asked to draw a shape that was different from the other group's design, and so forth as long as the question proved fruitful. Have students described their pictures in terms of the shapes they have created. On the identifying and defining activity, the students included many additional shapes. Some students identified the shapes completely correctly and defined them by properties of their components, perhaps including some redundancies. Encourage students to explore what happens when they divide other shapes such as a spheroid, cone, or pyramid to make new shapes. Students can collaborative create new understandings that may only be personally new, or indeed may be new contributions to shared understandings. The number of knowledge nodes is absolutely immense and do have social aspects that encourage discussing and learning with classmates. Students are focused on delivering a solid geometry experience while teaching concepts and information along the way. The iPad presents content created with Cabri3D in accordance with personal preference by the students (See Fig 7).

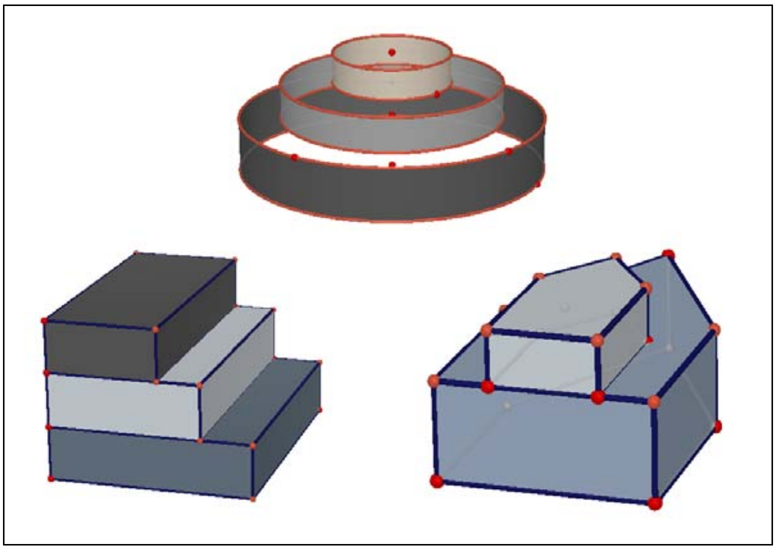

Fig 7 co-creation with Cabri3D

5. Deduction

Encourage students to communicate mathematically by talking about the shapes they see or have constructed in their geometric designs. They identify and describe geometric shapes in the designs and analyze how shapes are transformed to create the overall pattern (See Fig 8). Since custom polyhedron is rarely designed for public use, the others have to say how much the volume is. When they have finished, have them challenge someone else to measure volume. Students could also have the device capture performance, and share it with classmates for feedback. They point to additional information about their creation online, such as idea, character, and process. Finally, the teacher rewards students for reaching specific goals and targets.

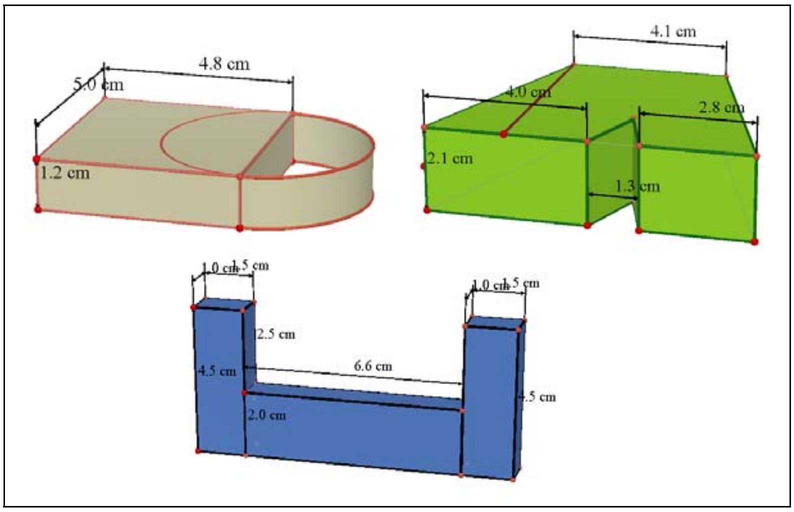

Fig 8 solids designed for competition

Sample

The samples were all second grade students enrolled at a Taipei high school. Treatment group has 158 students which have gathered from 4 classes. All students sit in their cozy locations in front of an iPad. The control group has 158 students which have gathered from 4 classes where tech is classroom based. Students in the control group used their student textbooks for instructional purposes, and used corresponding worksheets for practice.

According to math level, every class was divided into three parts by 27% and 73%. The top 27% of the class is high grade level. The bottom 27 % of the class is low grade level. And the rest of the class is middle grade level. As shown in Figure 1, in the treatment group, the high grade number of students is 44, the middle grade number of students is 70, and the low grade number of students is 44. In the control group, the high grade number of students is 44, the middle grade number of students is 70, and the low grade number of students is 44.

Table 1 Number of sample data

	Treatment group				Control group			
Class	1	2	3	4	5	6	7	8
High	11	11	11	11	11	11	11	11
Middle	18	17	18	17	17	18	17	18
Low	11	11	11	11	11	11	11	11

The students were assigned for the duration of the geometry unit, which lasted for three weeks instructional days.

Evaluation

Over three weeks, we ran an experiment asking students to explore by way of cooperating learning gradually with their iPads that they use in a solid geometry-related context. Clearly the students know what the device is capable of and are keen to exploit that functionality.

When the experiment is over, we had a final examination to measure the geometric abilities of students as a function of van Hiele level. One month later, we had a posttest to investigate the effects of instruction on a student's predominant van Hiele level. Both the two examinations include five parts, each part has four questions, i.e., ‘relations between lines’ (See Fig 9), ‘relations between line and plane’ (See Fig 10), ‘relations between planes’ (See Fig 11), ‘theorem of three perpendiculars’ (See Fig 12), ‘combined concept’ (See Fig 13).

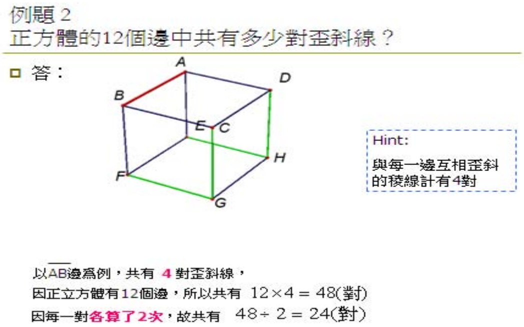

Fig 9 relations between lines

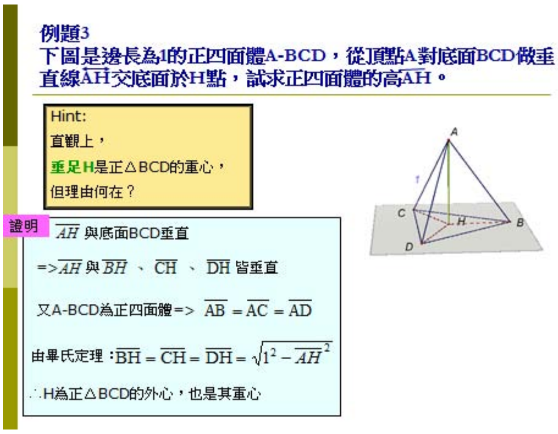

Fig 10 relations between line and plane

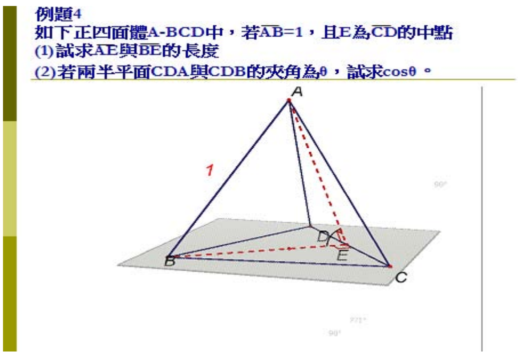

Fig 11 relations between planes

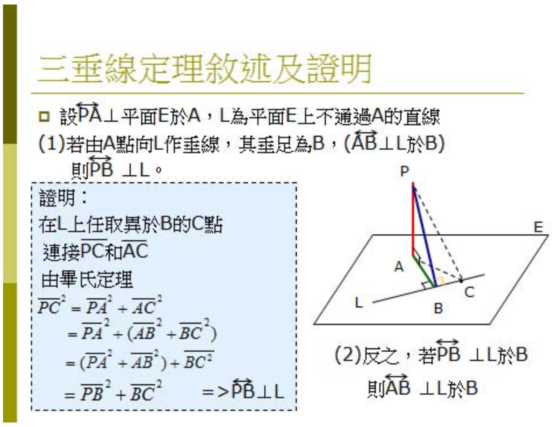

Fig 12 theorem of three perpendiculars

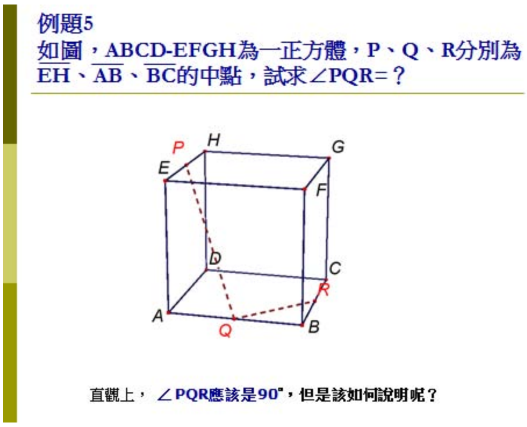

Fig 13 combined concept

Statistics
This study is interested in the effect of teaching and level of achievement. Group descriptive statistics, such as mean and standard deviation, were calculated to classify and summarize data. For the comparisons between different teaching and practice activities, Two-way ANOVA with α = 0.01 were conducted.

Two-way ANOVA with unequal number of observations per cell was performed to analyze the data on measurement of Teaching and Level, of each parameter of different group of subjects. The Teaching factor depends on the teaching model use iPad or not. The Level factor includes high grade level, middle grade level, and low grade level. This study does not concern the effect of different grade levels. We prefer to know the interference degree cause by Level. All tests were two-tailed and $p < 0.01$ was considered statistically significant. However, the data was not equal across groups. When the sample sizes within the levels of our independent variables are not equal, we have to handle our ANOVA differently than in the typical two-way case. In our study, three (high, middle, low) grade level students participated in the iPad environment. As such, we should take action to compensate for the unequal sample sizes in order to retain the validity of our analysis.

According to Myers (1979), when the group sizes are sharply unequal (largest/smallest > 2) and a statistical test shows that the population variances are unequal. The ratio of treatment group sizes to control group size in this study was 70/44 = 1.59 (less than 2). This indicated that the F statistic was robust.

The success of the structured interview, using a specific script as a basis, enabled the teachers to compare many students' responses to the same tasks. Tasks that involved a variety of environments in which the concepts were embodied (drawing, identifying from pictures, sorting, and solving abstract problems) revealed modes of reasoning about specific concepts that the teachers could identify with confidence.

DATA COLLECTION AND ANALYSIS

1. On the high grade level the treatment group had a mean of 18.3 out of 44 items, with a standard deviation of 1.07. The control group had a mean of 18 with a standard deviation of 1.26. On the middle grade level the treatment group had a mean of 15 out of 70 items, with a standard deviation of 1.37. The control group had a mean of 13.4 with a standard deviation of 2.02. On the low grade level the treatment group had a mean of 9.6 out of 44 items, with a standard deviation of 6.9. The control group had a mean of 18 with a standard deviation of 2.53.

An unweighted mean is calculated by taking the average of the individual group means. Thus, we can derive our unweighted means by summing the means of each level of our independent variables and dividing by the total number of levels. The harmonic mean of n is derived 50.21 ($n11 = 44$, $n12 = 70$, $n13 = 44$, $n21 = 44$, $n22 = 70$, $n23 = 44$).

As shown in table 2, with $\alpha = 0.01$ (99% confidence), the ANOVA results indicated a significant main effect for the Teaching factor, $F(1, 310) = 46.09$ ($p < 0.01$), a significant main effect for the Level factor, $F(2, 310) = 649.22$ ($p < 0.01$), as well as the interaction between them, $F(2, 310) = 9.43$ ($p < 0.01$). F values for all three level groups were found to be highly significant ($p < 0.01$).

Table 2 Results of ANOVA for the Teaching and Level data

Variance resource	SS	df	MS	F	Significance
A (Teaching)	177.10	1	177.10	46.09*	$p = 0.0000$
B (Level)	4988.76	2	2494.38	649.22*	$p = 0.0000$
A×B(Interaction effect)	72.48	2	36.24	9.43*	$p = 0.0032$
w.cell(error)	1191.05	310	3.84		

Another way to say this is that we don't want the Teaching variable contaminated by the variance it shares with Level: we want to know what the effect of Teaching is holding a Level constant. As shown in table 3, the Teaching effect in middle grade level and in low grade level was found to be statistically significant ($p < 0.01$). But the Teaching effect in high grade level was not significant ($p > 0.05$).

Table 3 Level group-wise analysis of ANOVA

Variance resource	SS	df	MS	F	Significance
A (Teaching)					
in B1 (high grade level)	1.38	1	1.38	0.36	$p = 0.5214$
in B2 (middle grade level)	89.60	1	89.60	23.32*	$p = 0.0072$
in B3 (low grade level)	158.23	1	158.23	41.18*	$p = 0.0006$
w.cell(error)	1191.05	310	3.84		

2. A 2x2 (final-posttest by control-treatment) mixed model ANOVA with $\alpha = 0.01$ was conducted to examine reservation from final to posttest. The posttest is held one month later since final test. The results of the ANOVA indicated a significant main effect for the within factor, $F = 4.8132$, $p = 0.0032$ (<0.01).

3. We wonder if changing a teaching formula, process or material might deliver a better learning effect depend on five teaching units. Use one-way ANOVA to determine if there's a statistically significant difference between two alternatives.

As shown in table 4, both the *p*-value of unit 1: relation between lines and the *p*-value of unit 2: relation between line and plane are greater than the significance level (0.01), so we cannot reject the null hypothesis that the means are equivalent. Each *p*-value of the rest three units are less than the significance level (0.01), so we can reject the null hypothesis and safely assume that SIC teaching model affects learning effect.

Table 4 Results of ANOVA for five teaching units

Unit	F	*p*
1. relations between lines	0.1044	0.7543
2. relations between line and plane	1.7238	0.2416
3. relations between planes	11.0224	0.0024**
4. theorem of three perpendiculars	8.6046	0.0043**
5. combined concept	9.0027	0.0039**

4. The accumulated data of the questionnaire.

Table 5 Summary of questionnaire from 316 students

Question	Strongly disagree	Disagree	No comment	Agree	Strongly agree
Q1. The curriculum matched the life.	0%	6%	15%	35%	44%
Q2. Teaching can promote my learning emotion.	4%	14%	19%	32%	31%
Q3. The teacher can present the course content clearly.	0%	12%	22%	33%	33%
Q4. The teacher can use each equipment properly.	0%	2%	4%	51%	43%
Q5. Cabri3D helps and reinforce my learning.	4%	8%	12%	30%	46%
Q6. iPad helps and reinforce my learning.	0%	10%	12%	26%	52%
Q7. I am making better progress with the iPad than I did without it.	0%	0%	2%	17%	81%
Q8.My achievement has improved since the iPad was introduced.	0%	8%	6%	31%	55%

5. The comments that were listed most often, and include some feedback from teachers regarding their observed students in class.

A1. iPad has the flexibility to meet teaching needs regardless of subject matter, technological expertise, grade level, or curriculum.

A2. iPad provides a faster, more dynamic and engaging way to demonstrate mathematical concepts than drawing on the board.

A3.Concepts that students frequently find difficult become very clear when they see visual representations on the screen and interact with them using iPads. Students using iPads in the classroom felt better prepared with their homework and that the Cabri3D assisted them with their geometry taking skills.

A4. There is no camera, so the virtual classroom is likely to be an audio-only experience. Because the iPad does incorporate a microphone and speakers, learners should be able to conference via Skype or Google Voice.

A5. The large capacitive screen of the iPads allows more than one person to view and interact with the device without passing it around. Concepts that students frequently find difficult become very clear when they see visual representations on the screen and interact with them using iPad.

A6. It is clearly surprising that some students show such an improvement in their ability to recognize representations of theorems in more complex diagrams, when they could not recognize the same representations in simpler diagrams.

A7. In that way of teamwork and competition, students drive activity and advancement in ways that generate rewards and motivation.

A8.Using smartboard as well as iPads in share activities as well as group work, students will be more likely to develop a critical opinion.

DISCUSSION

1. Apart from this drawback, Cabri3D along with iPad, seem to be a great tool to use in the classroom. Use in ‘relation between planes’, ‘theorem of three perpendiculars’, ‘combined concept’ identified significant learning gains compared to ‘relation between lines’, ‘relation between line and plane’. However, there does appear to be a relationship between level of use and the ability of math. Overwhelmingly students, 78% (Q6), believe that the applications and freedom provided by the iPad and the Cabri 3D combination is a much better solution for their learning needs. Use of the iPads facilitated and encouraged group collaboration that it had a positive impact on achievement. The use of the iPads is becoming firmly embedded. A significant number of students, 98% (Q7), used the iPad in the majority of their lessons.

2. With applications available today, students have the capabilities to connect to the smartboard from their own iPad in order to share and present their own work. Thus geometry resources, science videos, online maps, can be referred to instantly and used to extend learning in ways simply not possible otherwise. The use of mind mapping is particularly important since it supports the development of higher level thinking skills and better analysis of information and connectivity of ideas and events. A lesson observation where the technique was used to reinforce understanding demonstrated that given a choice most students chose to use iPad rather than pencil and paper, the facility for rapid edits and the ability to readily share their mind map as important. A significant majority of students (86%, Q8) felt they worked better with an iPad rather than pen and paper, found Cabri3D beneficial to learning and wanted to make greater use of the devices. The technique was used to reinforce understanding demonstrated that given a solid geometric concept most students chose to use figure representation rather than algebra equation, the facility for rapid edits and the ability to readily share their mind map as important. For high grade level students, since there was not a significant difference between the experiment group and the control group students on measures of performance when experiencing the different instructional environment, does it follow that students should always coexist in SIC classes with their iPad peers? This research has demonstrated that a computer-based, dynamic instructional environment can provide for successful outcomes in students' solid geometry learning. It remains to be shown that similar instructional environments can afford students the opportunity to construct other areas of mathematics.

3. During the course of the study, several features of the levels emerged that we were not aware of initially. As van Hiele has suggested, neither person could understand the other's reasoning, resulting in frustration and discouragement. Therefore, it is very significant in the learning process to recognize and assess a student's intellectual capacity. First, the levels appear to be complex structures involving the development of both concepts and reasoning processes applicable to many task environments. Although the van Hiele have theorized that the levels are discrete structures, this study did not detect that feature. The occasional difficulties that teachers had in deciding between levels while making level assignments can be considered as evidence questioning the discrete nature of the van Hiele levels. Some students exhibited different preferred van Hiele levels of reasoning on different tasks. It is interesting to notice how these data agree with the constructivist learning theory (Hmelo-Silver, Duncan, & Chinn, 2007). Each student brings different experiences to the learning situation and hence may be more capable on different aspects of the same problem. As van Hiele has suggested, neither person could understand the other's reasoning, resulting in frustration and discouragement. Some even oscillated from one level to another on the same task under probing by the interviewer. Thus, the levels appear to be dynamic rather than static and of a more continuous nature than their discrete descriptions would lead one to believe. Students may move back and forth between levels quite a few times while they are in transition from one level to the next.

4. How these students might reason about shapes in a formal way was most unclear. Concept formation in geometry may well occur over long periods of time and require specific instruction. Most formal learning provides artificial contexts, but a closer approximation to the real world is through virtual worlds that add the immersion for students would experience in the real world. Memorization may be their only recourse. Students in the study who appeared to reason at the level of potential development used different problem-solving processes under teacher guidance or in collaboration with more capable peers. This phenomenon would also occur between a teacher and a student who are operating at different levels. It appears that tutoring is so effective because it maximizes the Zone of Proximal Development (Vygotsky, 1978). In the classroom, this concept is connected with another instructional design concept of scaffolding. The concept of scaffolding is a process, with each failures, a teacher provides with minimal feedback and then vary the response that will enable a student to build on prior knowledge. And once the stage of zone of proximal development has been reached, the specific guidance is gradually removed. This encourages the student to work and internalize new concepts. Students working in collaboration to design shapes may be seen as an elevation to higher ground what Vygotsky (1978) called "second-order symbolism, which involves the creation of written signs for the spoken symbols of words". The aids are in the form of verbal and nonverbal communication and model behavior. Finally, the notion of a

SIC teaching model that identifies deep concepts and structures of mathematics makes it possible to elevate student's learning of solid geometry to higher ground (Bruner, 1985), so that the new higher concepts in turn transform the meaning of the lower (Vygotsky, 1986). It is therefore paramount that activities are designed to allow such social interactions to take place.

5. The SIC teaching model could help students learn from these principles and put them into practice. This iPad presentation tool is easy to use, letting students annotate, animate, and narrate explanations and presentations. For iPad to learn and review their solid geometry-solving skills, it is addicting and a fun way to get students to learn. Think more deeply about a learning approaches that integrates the iPad into the instructional environment, teachers and students might discover many new ways in which the device can expand and enhance the learning environment. Ultimately, this type of Cabri3D software could increase competition among classmates and offer creative opportunities for the fertile minds of innovative students. This further supports the idea that attitude is a factor that is open to influence (Volman & van Eck, 2001). Think more deeply about a learning approaches that integrates the iPad into the instructional environment, teachers and students might discover many new ways in which the device can expand and enhance the learning environment.

CONCLUSIONS

1. The Cabri3D, in conjunction with the use of the iPad and smartboard, offers new possibilities for our teaching professionals.

These essential components of the phase-based instructional environment using iPad helped improve students' van Hiele levels of geometric thinking about solids. This suggests for this sample that with well-designed instructional activities, appropriate tools, and teacher guidance, students can learn important solid geometric concepts with increasing understanding. By directly manipulating the Cabri3D to generate many examples of solids, the students were able to recognize its shape and understand that solids by analyzing the measurement of its volumes. Through their dynamic manipulation and reflecting on those actions, students were able to understand properties of solids. Teachers need to use technology appropriately based on students' van Hiele levels to avoid mismatches between levels. It would be appropriate to investigate students' responses on tasks involving other geometry concepts, such as measurement, transformations, congruence, and similarity.

2. Knowledge alone cannot become developed, but it has to be a channel through which intellectual stimulation and development occurs.

This concept along with more modifications and changes has played a significant role in the way education has been imparted. Optimizing intellectual capacity that could surpass an instructor is what zone of proximal development aims for. The idea being that an association, if not an immediate then a gradual one has to be built between concepts, experiences and reactions. It is a more challenging task to find ways in which to determine what makes a representation fall within a student's direct match for their current level of ability, or just a bit beyond. If the challenge is too hard, then a student would become overwhelmed and stressed out by the task. If it was too easy, then this same student would be bored. Teachers need to know their students' levels of geometric thinking and the content areas they are teaching, and also have adequate resources to support their work so that they can serve in the various roles competently throughout all the five phases of learning.

3. Teachers have to identify a suite of social-learning skills and teaching styles to develop that is relevant to support the needs of specific classes and students.

The iPad enables a host of activities such as referencing, collaborating, and creating content. Our SIC teaching model includes not only providing the infrastructure, tools, and knowledge, but also developing learners as learners. The students developed their ability to perform, not just their knowledge. E-learning resources don't replace the classroom experience, but they do provide an extremely wide range of learning resources that teachers and students can take advantage to support classroom learning as well as to develop individual pathways based on actual student need. Teachers need to organize sequences of lessons comprising well designed instructional activities that move very deeply through the levels of geometric thinking and the five phases of learning, not only to enrich students' thinking at the current level but also to move them toward the next level in order to develop a deeper understanding of the concepts.

4. Encourage students to use iPad across the mathematics curriculum to cover the insufficient of thinking.

If students are not familiar with the iPad, they might want to look into life experience with peer. Characterize contexts both geographic and semantic, so that both the type of event students is engaged in as well as where they are and what would be useful to them here and now. The teacher should have the ability to truly create new learning experiences as well as tailor content to their classes, articulating them, assessing them, and developing them. Teacher in the future will be adapting the study's procedures to investigate other geometric concepts and linking individual learning goals, social learning power, distributed cognition, and spaced practice in a powerful, long-term learning opportunity. The capability for sharing this space with others becomes powerful for shared learning, with reciprocal performing and critiquing to co-develop ability.

REFERENCES

Banchoff, T. F. (1990). Dimension. In L. A. Steen (ed.). *On the shoulders of giants: New approaches to numeracy*. Washington, DC: National Academy Press, 11–59.

Battista, M. T. (1994). A Forum for Researchers. *Journal for Research in Mathematics Education*. 25(1), 86-99.

Bruner, J. S. (1985). Vygotsky: A historical and conceptual perspective. In J.V.Wertsch (Ed.), *Culture, communication and cognition: Vygotskian perspectives*. Cambridge: Cambridge University Press.

Carroll, W. (1998). Geometric knowledge of middle school students in a reform-based mathematics curriculum. *School Science and Mathematics*, 98(4), 188-197.

Chang, K. E., Sung, Y. T. & Lin, S. Y. (2007). Developing geometry thinking through multimedia learning activities. *Computers in Human Behavior*, 23, 2212-2229.

Christou, C., Jones, K., Pitta-Pantazi, D., Pittalis, M., Mousoulides, N., Matos, J. F., Sendova, E., Zachariades, T. & Boytchev, P. (2007). Developing student spatial ability with 3D software applications. Paper presented at *the 5th Congress of the European Society for Research in Mathematics Education* (CERME5), Larnaca, Cyprus, 22-26.

Clements, D. H. & Battista, M. T. (1993). Geometry and Spatial Reasoning. In Grouws, D.A.. *Handbook of Research on Mathematics Teaching and Learning*. 420-427.

Clements, D. H., Battista, M. T., Samara, J. & Swaminathan, S. (1997). Development of students' spatial thinking in a unit on geometric motions and area. *The Elementary School Journal*, 98(2). 171-186.

Corley, T. L. (1990). *Students' Levels of Thinking as Related to Achievement in Geometry*. Unpublished Doctoral dissertation, Arizona State University, Tempe.

Crowley, M. L. (1987). The Van Hiele Model of the Development of Geometric Thought. In M. M. Lindquist & A. P. Shulte(Eds.), *Learning and Teaching Gemretry*, K-12, 1-16.

Flores, A. (1993). Pythagoras Meets Van Hiele. *School Science and Mathematics*. 93(3), 152-157.

Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller, and Clark (2006). *Educational Psychologist*, 42(2), 99–107.

Hutchins, E. (1996). *Cognition in the Wild*. Boston: MIT Press.

Hwang, G. J., Chu, H. C., Lin, Y. S. & Tsai, C. C. (2011). A knowledge acquisition approach to developing Mindtools for organizing and sharing differentiating knowledge in a ubiquitous learning environment. *Computers & Education*, 57(1), 1368-1377.

Hwang, G. J., Wu, P. H. & Ke, H. R. (2011). An interactive concept map approach to supporting mobile learning activities for natural science courses. *Computers & Education*, 57(4), 2272-2280.

Hwang, G. J., Shi, Y. R. & Chu, H. C. (2011). A concept map approach to developing collaborative Mindtools for context-aware ubiquitous learning. *British Journal of Educational Technology*, 42(5), 778–789.

Mason, J. (2003). Structure of attention in the learning of mathematics, in J. Novotná (Ed.), *Proceedings, international symposium on elementary mathematics teaching* (pp. 9-16). Prague: Charles University.

Melhuish, K. & Falloon, G. (2010). Looking to the future: M-learning with the iPad. *Computers in New Zealand Schools: Learning, Leading, Technology*, 22(3).

Myers, J. (1979). *Fundamentals of experimental design*, 3rd ed., Boston: Allyn & Bacon.

Perdikaris, S.(1996). A System Framework for Fuzzy Sets in the van Hiele Level Theory of Geometric Reasoning. *International Journal of Mathematics Education in Science and Technology*.27(2), 273-278.

Piaget, J. (1959). *The language and thought of the child,* 3rd ed., Routledge and Kegan Paul, London

Rogoff, B. (1990). *Apprenticeship in Thinking: Cognitive Development in Social Context*. New York. 14-16.

Sabean, M. P. & Bavaria, R. (2005). *Sylvan Learning Center math research*. Sylvan Learning, Inc.

Schwartz, J. & Yerushalmy, M. (1992). *The Geometric SuperSupposer*. Pleasantville, NY: Sunburst Communications.

Senechal, M. (1990). Shape. In L. A. Steen (ed.). *On the shoulders of giants: New approaches to numeracy,* Washington, DC: National Academy Press, 139-181.

Sharp J. M. & Hoiberg K. B. (2001). And then There was Luke: the Geometric thinking of a young mathematician. *Teaching Children Mathematics*, 7(7), 432.

Van Hiele-Geldof, D. (1957). *De didaktiek van de meetkunde in de eerste klas van het V.H.M.O*. Unpublished doctoral dissertation, University of Utrecht.

Van Hiele. (1986). *Structure and insight: A theory of mathematics education*. Orlando, FL: Academic Press.

Van Hiele–Geldof, D. (1984). *The didactics of geometry in the lowest class of secondary school*. In D. Fuys , D Geddes & R. Tischler (Eds): english translation of selected writings of Dina van Heile-Geldof and Pierre M. van Heile, 1 – 214). Brooklyn, NY: Brooklyn College.

Volman, M. & van Eck, E. (2001). Gender equity and information technology in education: The second decade. *Review of educational research*, 71(4), 613-634.
Vygotsky, L. S. (1978). *Mind and society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
Vygotsky, L. S. (1986). *Thought and Language*. Cambridge, MA: Harvard University Press.
Wilson, M. (1990). Measuring a van Hiele Geometry Sequence:A Reanalysis. *Journal for Research in Mathematics Education*. 31(3), 230-237.

LITERATURE COMPUTER PROGRAM AMONG PRIMARY SCHOOL LEARNERS

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ABSTRACT
This study focuses on the use of computer in learning Malay literature. The objectives of the study were to identify and discuss the basic knowledge and views towards the Malay literature program by using the computer. The samples of the study consisted of 10 subjects who volunteered from Malay language class. They were nine-year-old male and female students. The study was carried out in one primary school in Malaysia. The subjects were given a task in the Malay language program, which consisted of various Malay literature genres, such as short story, poem, quatrain and drama. The study was carried out for one week and the subjects were interviewed and observed throughout. Their views were selected based on the purpose of the study. The results of the study revealed that the subjects were able to answer the questions from the given task. They managed to offer their views about the program and managed to learn new vocabulary. It is hoped that a future study will focus on other technology in learning Malay literature.

INTRODUCTION

Malay literature has been found as a difficult subject to learn at schools. School children and teenagers tend to disregard Malay literature as an important knowledge that resembles the roots of Malay people as well as culture. The Malay culture that has been preserved since long time ago was documented in the form of Malay literature genres, such as short stories, novels, poems, quatrains, dramas, etc. The Malaysian ministry of education has been disseminating literature genres in the form of books, and academicians published research articles in order to prove the importance and existence of each genre. There were steps taken to change the mindset of children and teenagers in appreciating the Malay literature; however, it seemed that the Malay literature subject delivered at schools was not effective since most of them would opt for other subjects as their favorites. The conventional way of teaching Malay literature was mundane and a lot of memorization took place in order to fulfill the needs of good grades. Apart from that, educators have tried various types of teaching techniques in order to attract students in learning. However, besides the conventional ways of teaching and negative perceptions from children and teenagers, there were still students who have positive feelings and belief towards Malay literature. Therefore, this study was hoped to help in introducing the Malay literature program with the help of the computer in order to increase the students' interest towards learning the Malay literature.

ENHANCEMENT THROUGH TECHNOLOGY LEARNING

Zamri Mahamod & Nur Aisyah Mohamad Noor (2011) postulate that Malay novels can also be delivered in the form of multimedia application. The objectives of the study were to discover the perception of teachers towards Malay literature through multimedia teaching. The study used the multimedia program for the novel 'Istana Menanti', which was used by student in Form One. Teaching Malay novels has been a tedious process since students did not find it interesting and moreover, the length of time to learn a novel usually takes a long time. This has led to a growth of feelings of boredom and consequently, the student will end up not understanding the text. Therefore, a multimedia program was set up, which consisted of strategies and learning theories, so that the learning environment would be effective and interactive. 60 Malay language teachers from four secondary schools participated in the study. The results from the questionnaires revealed that the multimedia application for the novel has helped teachers in the classroom. Teaching the novels using the tools of multimedia was flexible and effective (Heinich, Molenda, Russel & Smalindino, 2005). The results also revealed that teaching and learning through multimedia have increased the interest of students in learning Malay literature. Chan Mei Yuit & Yap Ngee Tai (2010) commented that learning via technology suits writing skill lessons in the classroom. Yet, Chan Mei Yuit & Yap Ngee Tai's (2010) study was not new; Zamri Mahamod & Nur Aisyah Mohamad Noor (2011) proved that literature can also be interesting with the help of technology. There were vast numbers of research on language learning using technology. Hence, the use of multimedia or technology in literature learning will be accepted since literature is a difficult subject to teach and learn. Chan Mei Yuit & Yap Ngee Tai (2010) stated that students need encouragement in order to participate through online writing. 1,400 students participated in the study where they were to write publicly in an online forum on issues in their everyday lives. The study revealed that the online writing has given them the motivation to share their experiences and at the same time, they would also read other students' writings in the target language. Studies related to the use of technology learning (Zamri Mahamod & Nur Aisyah Mohamad Noor, 2011; Chan Mei Yuit & Yap Ngee Tai, 2010; Heinich et al, 2005) as stated above have given a great impact toward this study where with the help of technology has showed positive feedback towards learning in the Malay literature or language classroom. Therefore, this study focuses on the use of technology in learning the Malay literature.

Educators have tried to develop various ways of teaching and learning materials in order to improve the new approaches in the classroom. The new approaches will help in the process of positive learning. English literature has also faced similar problems among learners; therefore, Rashidah Rahamat, Parilah M. Shah, Sharifahnor Puteh, Rosseni Din & Aidah Abdul Karim (2011) suggested the development of web-based learning for the subjects. The study identifies end-user involvement in web-based learning resources. The objectives of the study were to develop and evaluate the usability of web-based learning resources for English literature learning among secondary school students. This study has used the participatory design approach, which involved four teachers and three students, in order to evaluate the website interface. The results revealed that most website interface displays were important to the end users and these have helped the researcher to make improvements and changes towards the program in order to fit the needs of the users. Ashinida Aladdin, Afendi Hamat & Mohd Shabri Yusof (2004) stated that the teaching and learning of the Arabic language will also be effective with the help of the computer. The study involved 40 teachers teaching the Arabic language. The study showed that students at religious schools felt that the conventional way of teaching and learning was not interesting and therefore with the help of the computer (Brinkerhoff, 2006; Abdul Razak Habib & Jamaluddin Badusah, 1998), the students actively participated in the classroom. Hence, the use of computer has helped in learning (Zamri Mahamod & Mohamed Amin Embi, 2008; Nadzrah Abu Bakar, 2007; Rozinah Jamaludin, 2005) a foreign language. The studies above that involved in the use of the web-based literature learning (Rashidah Rahamat et al, 2011) and using the computer in the foreign language (Ashinida Aladdin et al, 2004) have shown that the use of the computer was able to enhance the learning process. Besides active participation from the students in using the computer, it was revealed that the technology has helped in the process of learning. Therefore, this study has considered both studies (Rashidah Rahamat et al, 2011 and Ashinida Aladdin et al, 2004) in terms of the technology learning which involved active participation from the students. Thus, this study focuses on the Malay literature by using technology learning.

Hassan Basri (2007) argues and states that it is impossible to learn most Malay literature genres in a short period of time. The time given for a student to study novels, short stories, poems, quatrains, dramas, etc. was limited and therefore, steps should be taken to overcome this matter. Lachs (2006:16) agrees with Hassan Basri (2007) and states that the workload for a student to carry in a day is more than enough and therefore, the burden should be lessened by giving students learning activities that involve enjoyment. Lachs (2006) adds that the activities involved in a lesson should be easily understood by students; hence, questions and confusion should not be engendered. Teachers and educators play an important role in dealing with the various types of activities that suit students. Moreover, with the existence of the technology in our everyday lives, the utilization of the technology would be viable for students. Normaliza Abd Rahim, Arbaie Sujud, Nik Rafidah Nik Affendi & Siti Nur Aliaa Roslan (2012) agree with Lachs (2006:5), where educators should be creative and innovative when it comes to teaching. Students would be motivated in the process of learning, particularly with difficult subjects. Normaliza Abd Rahim et al, (2012) had conducted a research on the use of media technology in learning Malay quatrains. The research showed that primary school students were interested in learning Malay quatrains using the program. The samples of the study were primary school students at two schools in Malaysia. The students were given a multimedia program on Malay quatrains. The results of the research showed that the students were enthusiastic in trying out the program and they managed to answer all the questions pertaining to the Malay quatrain. The result showed that although students have difficulty in understanding the Malay quatrain, through multimedia programs, students gained interest and were willing to try it. The findings of this study (Normaliza Abd Rahim et al, (2012) were the extension of the findings in the study of Siti Musliha Isnain & Normaliza Abd Rahim (2012). According to Siti Musliha Isnain & Normaliza Abd Rahim (2012), primary school students who participated in the study had experienced positive communication between their peers and teachers pertaining to the given task. The subjects were given a task that involved the use of technology in learning and as a result, they were able to communicate well. Student communication was analyzed by using the conversational style approach. It seemed that the study by Siti Musliha Isnain & Normaliza Abd Rahim (2012) revealed that subjects were active in learning when technology was involved. Hence, the use of technology has played an important role in the process of learning (Normaliza Abd Rahim, 2012). The studies above (Normaliza Abd Rahim et al, 2012; Siti Musliha Isnain & Normaliza Abd Rahim, 2012; Hasan Basri, 2007) showed that the use of technology was able to motivate students in learning. Although Hasan Basri (2007) argued that Malay literature should be learnt in a longer period of time but Lach (2006) includes that enjoyment should also be considered to lessen the burden of learning. Therefore, this study has taken into consideration on the studies that involved the technology to promote motivation in learning (Normaliza Abd Rahim et al, 2012 and Siti Musliha Isnain & Normaliza Abd Rahim, 2012) and also include enjoyment (Hasan Basri, 2007 and Lach, 2006) when dealing with Malay literature learning. Although Malay literature consisted of difficult genres but motivation that also related to enjoyment would be appropriate for learning.

This study has two questions pertaining to the objectives of the study. The questions of the study were; What are the subjects' basic knowledge in the Malay literature computer program? What are the subjects' views on the Malay literature computer program?. Therefore, based on the questions arose, the objectives of the study were to identify and discuss the basic knowledge and view towards the Malay literature program by using the computer.

METHODOLOGY

Previously, the teaching of Malay literature was merely on the conventional way of teaching as in using the text book and materials from workbooks to enhance the learning of Malay literature. It seemed that the subjects were not keen in learning the Malay literature where they gave negative feedbacks to the teacher. The subjects wanted new method of learning the Malay literature and the computer would be one of the suggested tools. Therefore, the study focuses on the use of computer in learning Malay literature among learners. The study involved 10 subjects who volunteered from a Malay language class. The subjects volunteered were nine-year-old male and female students from one of the primary schools in Malaysia. The subjects were introduced to a Malay language program by using the computer, which consisted of various Malay literature genres, such as short story, poem, quatrain and drama. The subjects were given tutorials on using the program and they were given one week to try out the tutorials. Then, they were given another one hour a day in one week to try out the program. In the process, the subjects' were observed and interviewed. After one week, the subjects' were interviewed again based on their views and opinions on the program that they had done. Their views and opinions were selected based on the purpose of the study and were analyzed by using the discourse analysis method by Brown & Yule (1983). According to Brown & Yule (1983) discourse analysis examines the language in use in writing and communication. In order to create a well arranged system, language was divided into two basic branches according to its functions. Brown & Yule (1983: 1) listed the functions as transactional, which language serves in expression of 'content' and interactional function, which is involved in expressing social relations and personal attitudes. The transactional function suggests that an addresser's intention is to provide addresses with information, or to induce a reaction of the hearer. Brown & Yule (1983:2) named this particular language as "primarily transactional language". It is widely recognized, that the information, which addressers want to give, should have a clear form in order to be understood without any confusions. Therefore, the results of the study were analyzed based on the content of the discussion among the subjects.

RESULTS AND DISCUSSION

The subjects involved in the study showed that they spent most of their time in front of the computer and they had basic knowledge of the computer task. They felt that the computer has helped them in the process of learning. During class, it was evident that the subjects were happy when they were given a task to study Malay literature by using the computer. In the questions based on their basic knowledge towards the computer, the subjects replied stating that they knew most of the functions in the task given to them.

Table 1: Basic knowledge towards the task of using the computer.

	Malay language	English Language
S1	*Saya tahu apa yang saya lakukan. Saya pernah mencuba lebih dari 10 tugas sebegini.*	I know what I'm doing. I have tried more than 10 tasks that were similar to this one.
S2	*Bahan dalam tugas ini mudah untuk dilakukan. Saya pandai dalam tugas komputer. Tugas ini menarik dan mencabar.*	The task given is really easy. I am good at the computer. This task is interesting and challenging.
S3	*Saya sudah biasa dengan semua ini. Emak dan Ayah saya sudah membeli tugas seperti ini dan sudah mencuba semuanya.*	I am used to this task. My parents bought the programs and I have tried them all.
S4	*Tugas dengan komputer ini sangat menarik. Saya suka mencuba perkara baharu.*	The task using the computer is really interesting. I like to try new things.
S5	*Saya tahu semua fungsi dalam tugas ini. Saya suka mencuba semua ini dahulu.*	I know all the functions for this task. I like to try everything first.
S6	*Biasanya saya akan melihat apa yang perlu dilakukan. Saya suka apabila mencuba perkara yang baharu.*	Usually, I will look at the task first. I like to try new things.
S7	*Saya akan cuba semua dahulu. Saya akan mencatit semua perkara penting supaya tidak lupa.*	I will try everything first. I will write the important things so that I will not forget.
S8	*Saya akan mencuba terlebih dahulu. Saya tidak*	I will try first. I do not want to make any

	mahu melakukan kesalahan pada peringkat awal.	mistakes.
S9	*Saya lebih suka melihat kawan saya membuat tugas ini dahulu. Saya tahu akan tugas ini tetapi saya lebih berwaspada dan tigak mahu melakukan kesalahan.*	I would rather look at my friend who is performing the task. I know this task and I want to be cautious in order to avoid any mistakes.
S10	*Saya pernah melihat tugas seperti ini. Saya sudah mencuba banyak tugas seperti ini dan saya menyukainya.*	I have seen this task before. I have tried several tasks which were similar to this one and I like it.

Table 1 above showed that all the subjects had given their views on their basic knowledge towards the task of using the computer. All the subjects seemed to know about the given task and they were not seen panicking about the new computer task given to them. S1 stated that he knew what to do when the task was given to him. He also stated that he was familiar with the task since he had tried it before previously. He said that he has experienced more than 10 Malay language programs by using the computer and he was really keen in trying the new one in the classroom. This showed that S1 does not have any problem when dealing with computer tasks, particularly in the Malay language. However, S2 was having similar views towards the task given to him. He insisted that the task given was really easy to be dealt with, although he admitted that this was the first time that he had seen the program. He stated that he was brilliant with the computer and any new programs offered to him will be completed in a short time. He also found that the task was interesting and challenging. It was obvious that the views of S2on his basic knowledge showed that he has been trying the Malay language task with the computer. S3 has nearly the same views as S1 and S2. He stated that he was used to the task given to him. He mentioned that he was given the opportunity to try out a Malay language task by using the computer at home since his parents had bought several programs for him to practice. He stated that the task that was given at school was similar with the task that he had tried at home. This showed that he has no problem dealing with the new task given to him.

S4 stated that he found that the task in the computer was interesting. He was so excited when he was given the task. He admitted that he liked to try new things since it would give him the pleasure of trying. He was seen clicking on all the *buttons* on the screen since he wanted to explore the task. S4 was really enthusiastic when given the chance to be in front of the computer and he was really keen in reading all the instructions given. This showed that S4 was really happy to learn with the help of the computer. S5 was seen really confident when he was in front of the computer. He knew the functions of all the tasks and he even smiled when he got the right answers. He seemed to be happy to try out the new functions from the given task and even shared this with his friend next to him. He was willing to share his knowledge with his friend next to him. On the other hand, S6 was really a cautious person. She would read all the instructions given and would scribble on her notebook. She would make sure that everything that read be understood. She was also willing to try new things since she would be happy and contented when she managed to finish what she was doing. She was seen referring to the notes that she had written and even tried out the task again. Similarly, S7 has the same views with S6, where she stated that she would try out everything first. She would also write down all the important things in her notebook so that she would remember the steps. She was really clever in dealing with the task. She stated that learning with the computer was interesting, but she mentioned that she had to be alert with the instruction because if she was not aware of the important things in the task, she would end up getting the wrong answers. This showed that she had prior experience with the Malay language task by using the computer and she was happy to try new ones.

S8's views on her basic knowledge towards the computer task showed that she would try out the task first. She would read the instructions given and make sure that she would not make any mistake throughout the task. She was seen very enthusiastic when providing her views and stressed that any mistakes at the beginning of the task would make her less confident towards the end of the activity. Therefore, she felt that being cautious would be an appropriate behavior, particularly when dealing with the computer. Yet, S9 has different views when dealing with the computer task. She stated that she would first look at how her friend utilized the computer and after she understood the ways, she would try it herself. She also stated that the reason as to why she observed her friend was because she was really careful with the task since she did not want any errors during the process. She would be more confident after she had understood the instructions that she had read. On the other hand, S10 was really confident and stated that she had seen the task before. She stated that she had tried out the task, which was similar to the task given, and she was willing to try it out without hesitation. She mentioned that she had tried a number of tasks and was successful every time. She confirmed that the task was really interesting since she was really concentrating the whole time. At the beginning of the activity, it can be seen that S10 was really confident when dealing with the task.

Hence, subjects were also asked about the Malay literature program that was given to them. The Malay literature program consisted of different genres from Malay literature: short stories, poems, quatrains and dramas. Each genre was divided into three sections with tutorials, exercises and games. The subjects gave their views based on their experience throughout the study. The views were written according to 6 word clues based on their overall perception towards the program.

Table 2: Word Clues on subjects' views on the Malay literature program:

	Short stories	poem	quatrain	drama
S1	I, U, V	U, L, V, B	U, L, V, B	I, U, V, B
S2	I, U, V, B	U, L, V, B	U, L, B	I, U
S3	I, U, V, B	L, V, B	I, C, V, B	I, U, V
S4	I, U, V, B	I, C, V, B	L, V, B	I, U, V
S5	I, U, V	I, C, B	U, L, V, B	I, U, V, B
S6	I, U, V, B	I, C, B	L, B	I, U, V
S7	I, U, V	L, V, B	I, C, V	I, U, V
S8	I, U, V	U, L, V, B	U, V, B	I, U, V
S9	I, U, V, B	U, L, V, B	I, C	I, U, V
S10	I, U, V	V, B	U, V, B	I, U, V

I – interesting content, C- challenging, U – understandable, L- interesting layout, V – new vocabulary, B – beauty of Malay literature

Table 2 above showed the opinions of subjects on the Malay literature program based on words clues. The word clues were stated in their questionnaires. The word clues were I – interesting content, C- challenging, U – understandable, L- interesting layout, V – new vocabulary and B – beauty of Malay literature. The word clues as in 'interesting content' as the content of the program were able to catch the subjects' attention during the process of learning (Heinrich et al, 2005; Normaliza Abd Rahim, 2012), 'challenging' when the questions in the program were able to challenge the subjects' in terms of critical thinking when answering the questions (Normaliza Abd Rahim et al, 2012; Rashidah Rahamat et al, 2011), 'understandable' when the subjects were able to answer all the questions given (Normaliza Abd Rahim et al, 2012), 'interesting' when the subjects gave comments about interesting games included in the program (Normaliza Abd Rahim et al, 2012), 'new vocabulary' when the subjects were seen referring to the online dictionary or to ask the teachers for the meaning of the new words and 'beauty of Malay literature' when the subjects were giving their opinions about the beauty in the word choice and meaning from the poems and short stories (Normaliza Abd Rahim, et al, 2012).

The word clues were stated based on all three sections; tutorials, exercises and games. As for short stories, S1, S2, S3, S4, S5, S6, S7, S8, S9 and S10 stated that it was interesting and understandable. The subjects stated that the stories were so interesting that they managed to answer all the questions that followed. Since the short stories were interesting, they understood the plot as well as the content of the stories. They also played games that were related to the short stories. The games at the end of the program were about the stories that they had read. The games included matching, character, characterization and setting games. The subjects were happy and contented with the short stories in the program. S2, S3, S4, S6 and S9 stated that the short stories also consisted of the beauty of Malay literature. The beauty of Malay literature was meant to be the aesthetic values contained in the stories and moreover, the subjects appreciated and understood the meaning of the values. The beauty was about their feelings towards the stories after they had read it as well as about their understanding the meaning that reflects the good values in a person. The subjects discussed that they understood the meaning based on the views and opinions. They stated that they understood about the aesthetic values after trying out the program.

As for the poem (see table 2), S1, S2, S8 and S9 understood the meaning of the poems. The subjects were able to answer all the questions that followed. Meanwhile, S1, S2, S3, S7, S8 and S9 stated that the poems have an interesting layout. The layout was actually the animation and pictures related to the content included in the poems. This way, the subjects were able to better appreciate the poem with the help of the layouts. Moreover, S1, S2, S3, S4, S7, S8, S9, and S10 stated that the poems consisted of new vocabularies. The subjects were seen referring to the online dictionary in order to find the meaning of the new words that they learned. They were happy to take their time to find the meaning although they knew that it would be difficult to understand new words. Thus, learning new words have made them confident in their understanding of the rest of the poem. This way, they would be in the process of autonomy learning and the effect of understanding would be better. On the other hand, S1, S2, S3, S4, S5, S6, S7, S8, S9 and S10 stated that the poems consisted of the beauty of Malay literature. The subjects were proud to say that is a difference in Malay literature writing and the choice of words had made it to become more beautiful when reciting it. The subjects mentioned that the beauty also lies in the form of aesthetic values, where the meaning of the poems were about nature, love, care and all the good values in life. The subjects were also happy to share their understanding with their peers. They were happy because they were seen smiling and willingly helping their friends. Moreover, the subjects' mentioned that the word 'happy' meant to be about how they felt and it was related to the activity that they carried out.

In regards to the Malay quatrain (see table 2 above), S1, S2, S5, S8 and S10 presented that the subjects understood the meaning of the quatrain and were able to talk about the meaning of the quatrain. They also managed to answer all the questions pertaining to the quatrain. This showed that the subjects understood the underlying meaning of each line. On the other hand, S1, S2, S4 and S5 revealed that the subjects were interested with the layout of the quatrain. The layouts involved animations and pictures that were related to the meaning of the quatrain. Also, the color choice for the background of the page was suitable because they felt relaxed when reading the quatrain. The subjects stated that the color choice was really important since the wrong color will affect their mood in reading the quatrain. Other than that, S1, S3, S4, S5, S7, S8 and S10 stated that the quatrain consisted of new vocabulary. The subjects also mentioned that the new vocabularies helped them to better understand the meaning of the quatrain. They felt it was really challenging when they have to understand the meaning of the new vocabularies in the quatrain. Simultaneously, S1, S2, S3, S4, S5, S6, S8 and S10 stated that they found beauty in Malay literature in the quatrain. The beauties were on the values of love, care and appreciation towards nature, human and surroundings. The subjects seemed to be understanding about the beauty in the Malay quatrain. Here, it can seen that the subjects' were able to describe about their understanding towards the beauty in the Malay quatrain to their friends and teacher. The answers were correct and this showed that they had better understanding with the help of the computer. Furthermore, the subjects discussed that the program had made them understand the lesson better than conventional way of teaching.

As for the drama (see table 2 above), S1, S2, S3, S4, S5, S6, S7, S8, S9 and S10 stated that the drama was interesting. The subjects commented that the characters and characterization from the drama were suitable and relevant. The storyline of the drama was well written, which made it more interesting for them. The drama was also suitable for their age. On the other hand, S1, S2, S3, S4, S5, S6, S7, S8, S9 and S10 stated that the drama was understandable. The plot of the drama seemed to be understood by all subjects. The storylines that reflected the life of a school boy and a girl had made the subjects wanted to be like the characters. This showed that the drama was successful. Also, the subjects managed to answer all the questions that followed successfully. The subjects even tried out the games related to the drama that they watched. In addition, S1, S3, S4, S5, S6, S7, S8, S9 and S10 stated that the drama consisted of new vocabularies. The subjects were seen writing down the difficult words that they heard while watching the drama. The subjects were also seen uttering the words softly since they stated that they heard the words for the first time and were eager to know the meaning of it. Other than that, S1 and S5 stated that the drama consisted of the beauty of Malay literature. The beauty mentioned was based more on the moral values of 'care' towards others. The moral values were inserted in the storyline where the subjects felt the importance of delivering the message to the viewers. This way, Malay drama will have its quality while preserving the identity of Malay culture and virtue.

In summary, the subjects seemed to like learning Malay literature by using the computer. The subjects were also keen in trying out the program and the task was successful, as evident in the feedbacks from the subjects. The subjects were involved in the task in order to show that they were good and brilliant with the computer; moreover, the lesson would be more interesting when they tried the task on their own. The subjects' obsessions towards the computer were not only for games but also for academic programs. The subjects' were also given the chance to discuss and give their views and opinions after the lesson and they stated that they understood the lesson more and happy with the program given to them. This implied that the computer has played a major role in learning Malay literature. The results of the study were parallel to the findings of Normaliza Abd Rahim et al, (2012), Zamri Mahamod & Nur Aisyah Mohamad Noor (2011) and Brinkerhoff (2006); technology can help motivate and enhance the process of learning.

CONCLUSION

This study implicates educators in dealing with students learning Malay literature. The conventional learning of Malay literature has lessened student interest in learning, but with the help of the computer, learning autonomously is noted to be the most appropriate and successful method. Students now feel happy and interested to learn Malay literature. The study revealed that the use of computer in learning the Malay language has given a new and positive perception towards learning the subject. Although most students were obsessed with the computer, educators should take this opportunity to insert teaching Malay literature during the process of such learning. Also, the Ministry of Education should make learning of Malay literature through computer as a major course in the classroom. It is hoped that a future study will focus on the use of other means of technology in learning Malay literature.

REFERENCES

Abdul Razak Habib & Jamaluddin Badusah. (1998). Penggunaan komputer untuk pengajaran dan pembelajaran di sekolah menengah. *Jurnal Pendidikan*, 23, 1-14.

Ashinida Aladdin, Afendi Hamat & Mohd Shabri Yusof. (2004). Penggunaan PBBK (Pembelajaran Bahasa Berbantukan Komputer) dalam pengajaran dan pembelajaran bahasa Arab sebagai bahasa asing: satu tinjauan awal. *GEMA Online™ Journal of Language Studies*, 4(1), 1-16.

Brinkerhoff, J. (2006). Effects of a long-duration, professional development academy on technology skills, computer self-efficacy, and technology integration belief and practices. *Journal of Research on Technology in Education*, 39(1), 22-43.

Chan Mei Yuit & Yap Ngee Thai (2010) Encouraging participation in public discourse through online writing in ESL instruction, 3L Language, Lingusitics and Literature. *The Southeast Asian Journal of English Language Studies*, 16 (2) retrieved 20.10.12 http://ejournal.ukm.my/3l/article/view/997

Hassan Baseri. (2007). Mata pelajaran Kesusasteraan Melayu tidak relevan lagi. *Dewan Sastera*, Jun, 33-35.

Heinich, R., Molenda, M., Russel, J. D. & Smalindino, S. E. (2005). *Instructional media and technologies for learning* (8th Ed.). Ohio: Merril Prentice Hall.

Lachs, V. (2006). *Making multimedia in the classroom*. Muhammad Asyraf Mustaffa (Terj.). Kuala Lumpur: Institut Terjemahan Negara Malaysia Berhad.

Nadzrah Abu Bakar (2007). English Language Activities in Computer Based Environment: A Case Study in ESL Malaysian Classroom, *GEMA Online™ Journal of Language Studies*, 7(1), 33-49

Normaliza Abd Rahim, Arbaie Sujud, Nik Rafidah Nik Affendi & Siti Nur Aliaa Roslan. (2012). A Perspective of Malay Quatrain in Media Technology. *Journal of Public Administration and Social Policy Review*. IV Year, 1(8) / June 2012, 40-49.

Normaliza Abd Rahim. (2012). The Use of Cartoons to Enhance Learning in the Malay Language Classroom. *Wulfenia Journal*, 19 (10), Oct 2012, 125-137

Rozinah Jamaludin. (2005). *Multimedia dalam Pendidikan*. Kuala Lumpur: Utusan Publications & Distributors Sdn Bhd

Rashidah Rahamat, Parilah M. Shah, Sharifahnor Puteh, Rosseni Din & Aidah Abdul Karim (2011). End-Users' Involvement in the Development of Web-based Learning Resources for English Literature, 17 retrieved 21.10.12. http://ejournal.ukm.my/3l/article/view/984

Siti Muslihah Isnain & Normaliza Abd Rahim. (2012). Gaya Ujaran Berbantu Komputer dalam Kalangan Kanak- Kanak Sekolah Rendah. *Jurnal Bahasa*. 12 (1) Jun 2012, 126-150

Zamri Mahamod & Mohamed Amin Embi. (2008). *Teknologi Maklumat dan Komunikasi dalam Pengajaran dan Pemelajaran Bahasa Melayu: Teori dan Praktis.* Shah Alam: Karisma Publication.

Zamri Mahamod & Nur Aisyah Mohamad Noor. (2011). Persepsi Guru Tentang Penggunaan Aplikasi Multimedia Dalam Pengajaran Komponen Sastera Bahasa Melayu, *GEMA Online™ Journal of Language Studies*, 11(3) September 2011, 163- 177

MEASURING ATTITUDES TOWARD COMPUTER AND INTERNET USAGE AMONG POSTGRADUATE STUDENTS IN MALAYSIA

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ABSTRACT
The aim of this study is to investigate and measure postgraduate students' attitudes toward the Internet and computer use. Specifically, the present study sought answers to the following questions: What is the overall profile of postgraduate students' attitudes toward the Internet and computer use? Do postgraduate students' attitudes toward Internet and computer use differ in terms of gender? Do postgraduate students' attitudes toward the Internet and computer use in instruction differ in terms of field of study? Do postgraduate students' attitudes toward the Internet and computer use differ in terms of ethnicity? Do postgraduate students' attitudes toward the Internet and computer use differ in terms of age? A total of 289 postgraduate students participated in this study. Attitudes scales to assess postgraduate student's attitudes toward the use of Internet and computer were used. Results reveal that: (1) participants have a high level perception of the usefulness and their control of the computer and Internet, (2) no significant differences were found between participants' attitudes toward the Internet and computer related with gender, field of study, and ethnicity, and (3) postgraduate student's attitudes toward computer and Internet usage is age related.
Keywords: Affective, Behavioral Intention, Perceived Control, Emotional Response, Usefulness.

INTRODUCTION

Information and Communications Technology (ICT) is becoming increasingly widespread, influencing many aspects of our social and work lives, as well as many of our leisure activities. For instance, ICT dexterities constitute a major part of educational programs (Thomas & Stratton, 2006). In many developed countries, nearly all schools are equipped with the infrastructure to conduct ICT mediated teaching and learning. In Malaysia, the main goals of the Ministry of Education (MOE) in implementing ICT in the education system is to position ICT as a teaching and learning tool, to increase the productivity, efficiency and effectiveness of the management system. To achieve these goals, it is important to ensure students and educators are able to integrate ICT into their teaching and to enable them to adapt their environment and adjust their instructional approaches (Zhang & Espinosa, 1997). Some studies reveal that using ICT consistently develops more positive attitudes toward computers (Delcourt & Kinzie, 1993; Birisci, Metin, & Karakas, 2009; Teo, 2008). So the most important factor that affects teachers' attitudes toward using information technologies in the classroom could be gaining of more positive attitudes. If teachers' attitudes toward ICT are negative, they would not want to use ICT in the teaching and learning process. In particular, Kersaint *et. al*., (2003) have shown that the successful implementation of educational technologies depends largely on the attitudes of educators, who eventually determine how they are used in the classroom. Bullock (2004) found that educators' attitudes are a major influence in the adoption of technology for teaching and learning.

The advent of technology and information systems and their importance in economic development has caused nations to create a more technologically literate workforce. Malaysian government implemented the first computer system in 1966. Since then, the Government has introduced various initiatives to facilitate the greater adoption and diffusion of ICT to improve capacities in every field. Malaysia also has a long-term vision, usually referred to as "Vision 2020" which calls for sustained, productivity-driven growth, which will be achievable only with a technologically literate, critically thinking workforce prepared to participate fully in the global economy of the 21st century (Foong-Mae, 2002).

Malaysia plans a more widespread use of computers and related Information and Communications Technology in educational areas to ensure that graduating students are proficient in the use of such technology. To achieve this objective, the Malaysian government has formulated plans to improve the education system through the implementation of “smart schools.” Smart schools facilitated with multimedia technology and worldwide networking. The curriculum for these schools is to be individually-paced and include self directed learning experiences (i.e. student-centered), and open-ended curriculum (Ministry of Education Malaysia, 1999). In addition to the Smart School project, the Ministry of Education is also attempting to reduce the digital divide that exists in the different parts of the country by providing computer laboratories to thousands of schools. Other ICT-related projects involved the training of teachers, school administrators and other school staff. Innovative projects like the use of electronic books and e-learning are also being piloted to ensure their feasibility before any roll-out to all the schools in the country. Non-governmental agencies are also very much involved in the drive to introduce ICT into schools (Foong-Mae, 2002). Moreover, Malaysian teacher training objectives are all directed towards developing the skills of teachers to use ICT in teaching and learning processes (Tasir et. al., 2012).

The Ministry of Education 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 confirms 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. ICT as part of a subject refers to the use of software in subjects. ICT as a subject refers to the introduction of subjects such as “Information Technology” and “Computerization”. The third policy emphasizes using ICT to increase productivity, efficiency and effectiveness of the management system. ICT will be extensively used to automate and mechanize work processes such as the processing of official forms, timetable generation, and management of information systems, lesson planning, financial management and the maintenance of inventories (Foong-Mae, 2002).

The Ministry of Education is committed to utilizing the following multi-prong strategies to ensure that the objectives of ICT in education are achieved: preparation of sufficient and up-to-date tested ICT infrastructure and equipment to all educational institutions, roll-out of ICT curriculum and assessment and emphasis the integration of ICT in teaching and learning, upgrading of ICT knowledge and skills in students and teachers, Increased use of ICT in educational management, and upgrading of the maintenance and management of ICT equipment in all educational institutions (Ministry of Education Malaysia, 1999; Foong-Mae, 2002). In near future, every students will have access to a 4G network in school through 1BestariNet which serve as virtual learning platform that can be used by teachers, students and parents to share learning resources, run interactive lessons and communicate virtually (Preliminary Report Malaysian Education Blue Print, 2012).

Accordingly, all higher education institutions in Malaysia will be affected by these developments including the Faculty of Education at University of Malaya. The faculty must also be computer literate and competent enough to use those technologies that are available and to become innovative and receptive to change by knowing the strengths and the limitations of the technological tools available. While ICT receives wider acceptance in the field of education than in other fields, some teachers still exhibit a certain degree of anxiety toward ICT usage as a tool to be used in the fields of education and learning (Orhun, 2002; Albion, 2003). If high level of anxiety, low level of self-efficacy, and low level of attitudes toward ICT usage exist among postgraduate students they may choose not to use this computer technology even though they believe that ICT usage will lead to improve teaching and learning processes (Delcourt & Kinzie, 1993). Faculty of Education at university of Malaya is now obligated to be knowledgeable and confident of their ability to use the new emerging computer technologies to deliver instruction more efficiently and effectively. However, little is known about the characteristics of the postgraduate student’s attitude toward ICT usage. With this in mind, there is a need to assess postgraduate student’s attitudes toward ICT usage, and exploring factors relating to postgraduate attitudes toward ICT.

THEORITICAL FRAMEWORK

An attitude refers to one’s positive or negative judgment about a concrete subject. Attitudes are learnt; they are moldable and may change with experience of the stimulus objects and with social rules or institutions (Binder & Niederle, 2007). More recent research indicates that attitude represents a summary evaluation of a psychological object and is described both internally and externally in dimensions such as good-bad, likeable-dislikeable, harmful-beneficial, pleasant-unpleasant (Ajzen & Fishbein, 2000; Eagly & Chaiken 1998). Ajzen (1988) described an attitude as a predisposition to respond favorably or unfavorably to an object, person, or event. As implied in this definition, attitudes possess cognitive (beliefs, knowledge, and expectations), affective (motivational and emotional), and performance (behavior or actions) components.

Attitudes toward ICT usage have been defined as a person's general evaluation or feeling towards ICT and specific computer and Internet related activities (Smith, Caputi, & Rawstone, 2000). The learner attitude toward computer measures a person's capabilities in effective learning. Garland and Noyes (2005) indicated that in the educational context, confidence should lead to more positive attitudes toward computers and Internet, and this will enhance learning and associated activities. Attitude, in turn, constitutes various dimensions. Some examples of these are perceived usefulness, computer confidence, anxiety, and liking. Rogers (1995) identifies four main attributes of technology that affect its acceptance and subsequent adoption: relative advantage, compatibility, complexity and observability. These attributes are investigated as a predictor in determining educators' attitudes toward ICT.

Theory of Planned Behaviour (TPB) as initially designed by Ajzen and Fishbein (1980) attempts to understand peoples' intentions to engage in a number of activities. It appears that the application of the theory of planned behavior deals with the antecedents of attitudes, subjective norms, and perceived behavioral control. These antecedents determine intentions and actions. Human action is influenced by attitude towards the behavior, subjective norm and perceived capability to perform the behavior. In combination, attitude, subjective norm and perceived behavioral control lead to the formation of a behavioral intention. In general, the more positive the attitude towards performing the behavior, along with substantial levels of social pressure to do so and perceived control over one's actions, the more likely the individual is to carry out the behavior. Often behaviors pose difficulties with regard to execution. In this way it is useful to consider perceived behavioral control in addition to intention. Depending on how realistic people are in their judgments of the level of difficulty associated with behaviors, a measure of perceived behavioral control can serve as a proxy for actual control and as such can contribute to the prediction of the behavior in question. When applied to the engagement with ICT, TPB suggests that intentions to engage and interact with a particular ICT activity influenced by attitudes towards ICT usage (Fishbein & Ajzen, 2010; Ajzen & Fishbein, 1980).

The Theory of Reason Action (TRA) proposed by Fishbein and Ajzen (1975) postulates that an individual's behavior is determined by his/her intention to perform that both behavior and intention are influenced jointly by the individual's attitude and subjective norm. Davis (1989) developed the Technology Acceptance Model (TAM) to explain perceived technology usefulness and usage intentions by taking into account social influence and cognitive processes. TAM suggested attitude influences behavioral intention to use, and subsequent actual use. TAM also includes the constructs of perceived usefulness and perceived ease of use. Perceived usefulness is the extent to which a person believes that using a system will enhance their performance, whilst perceived ease of use is the extent to which a person believes that use of the system will be free from effort. These two constructs have an important impact on a person's attitude toward using the ICT but, unlike the TRA, Davis found that attitude did not completely mediate between beliefs and intentions; this suggests that an individual could hold negative attitudes to a system, but would still use it because it has high-perceived usefulness.

Although the TAM model has evolved, the attitude toward behavior, subjective norm and behavioral intention components are common to both TAM and TRA models, acknowledging that attitude and subjective norms have an influence on the intention to use ICT leading to their actual use of ICT. The development of the Theory of Planned Behavior (TPB) (Azjen, 1985), which was developed from the TRA, led researchers to consider the use of the TPB for predicting people's behavior towards technology use. Mathieson (1991) suggested that, while TAM is useful for gathering general information about people's perception of a system, TPB can provide detailed information regarding each of its components that might relate to a specific group of people. The TRA and the TPB have continued to be employed and adapted by researchers to predict behavior towards ICT usage.

Based on the related literature, and the previous models (i.e. TPB, TRA and TAM), the present study assessed the participants' attitudes towards various aspects of computer usage (i.e., Affective, Perceived Usefulness, Perceived Control, and Behavioral Intention). In the present study, Affective refers to feelings toward computers, Perceived Usefulness refers to individual's beliefs about the usefulness of computers in their study, Perceived Control refers to perceived comfort level or difficulty of using computers, and Behavioral Intention refers to behavioral intentions and actions with respect to computers (Teo, 2008). Likewise, attitudes towards Internet are a multidimensional factor (Tsai, Lin, & Tsai, 2001). In the present study, attitudes toward internet usage assessed in term of the perceived usefulness, emotional response and perceived control. Perceived Usefulness refers to individual's beliefs about the usefulness of Internet in their study. Perceived Control refers to perceived comfort level or difficulty of using Internet. On the other hand, Emotional response refers to the level of feelings and anxiety when using the Internet. In the present study, postgraduate students attitudes toward computer and Internet usage investigated through gender, age, ethnicity, and field of study (see Figure 1).

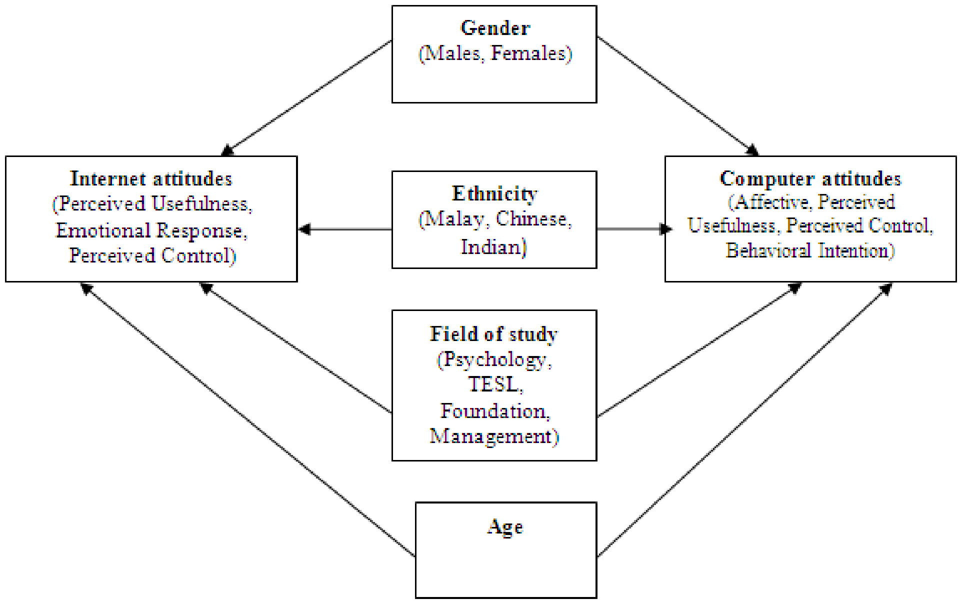

Figure 1: A visual model of the conceptual framework**.**

RELATED LITERATURE

A person's attitude toward a computer is influenced by a variety of aspects, e.g., computer confidence (Teo, 2008), computer anxiety or comfort (Bandalos & Benson, 1990), age and gender (Kutluca, 2010), subject area and years of computer usage (Teo, 2008), For instance, Cavas et. al., (2010) explored Turkish primary science teachers' attitudes towards ICT in education and (then) the relationship between teachers' attitudes and the factors related to teachers' personal characteristics (gender, age, computer ownership at home, and computer experience). The instrument (STATICTE) was developed by researchers and administered to 1071 science teachers. The results indicated that the Turkish science teachers have positive attitudes toward ICT; no gender differences have been traced in their attitudes towards ICT but differences were found in terms of their age, their computer skills (experience) and their ownership of computers at home.

Cultural differences in beliefs need to be taken into account when studying instructional interventions (Brennan, McFadden & Law, 2001). Different cultures and races generate different educational philosophies and beliefs. With this in mind, researchers have studied the appropriateness of adopting Western measuring instruments to be used in non-Western cultural contexts. For instance, Lin and Gorrell (2001) explored pre-service teacher efficacy in Taiwan and clearly argued that teacher efficacy and beliefs are largely shaped by culturally and values. Culture and context have also repeatedly been reported as obstacles to the integration of ICT in education (Chai, Hong, & Teo, 2009; Tearle, 2003). For instance, Chai, Hong, and Teo (2009) argue that culture plays a mediating factor that influences how teachers relate their beliefs to ICT usage.

Since the introduction of ICT related activities have been viewed as a 'male domain' (Panteli, Stack, & Ramsay, 1999). There is a significant body of evidence supporting the notion that gender plays a vital role in actual ICT integration. Previous study findings related to gender differences in attitudes toward computer and Internet are inconsistent. Some of the previous studies reported gender related differences in attitudes toward computers favoring males (Loyd & Gressard, 1986; Blackmore et al., 1992; Al Jabri, 1996; Brosnan and Lee, 1998; Graff, 2003; Shashaani, 1993; Sainz et. al., 2010; Tsai, Lin, & Tsai, 2001). Whereas, other studies reported that gender related differences in attitudes toward computers favoring females (Adebowale et al., 2010; Avraham, 2005; Meelissen & Drent, 2008). For instance, Loyd and Gressard (1986) found male teachers to be more confident and less anxious toward computers usage compared to their female counterparts. In another study, Blackmore et al. (1992) found males appear to be more positive in their attitudes toward computers than females. On the other hand, Pope-Davis and Twing (1991), and Teo (2008) did not find statistically significant gender differences. Since technologies have become a normal part of the workplace setting, a number of researchers argue that computing should no longer be regarded as a male domain (King, Bond, & Blandford, 2002; North & Noyes, 2002). This emphasizes the need to reconsider the potential impact of gender in the context of attitudes toward ICT usage.

The findings from the literature related to the impact of age on attitudes toward ICT usage are mixed. A study of Internet use in an academic library environment found that older librarians were less likely to use the Internet (Rosenthal & Spiegelman, 1996). (Spacey, Goulding, & Murray, 2003) reported that younger workers had higher average intention to use the Internet and ease of use scores than their older counterparts. Positive perceptions of one's computer skills might relate to the familiarity younger workers have with ICT since it is used extensively at school, college and university. As Swann (2003) observes, "Information Communications Technology (ICT) is so recent that most people over the age of 28 have not had the benefit of computer training in their own schooling". Dyck and Smither (1994) found a significant relationship between age and levels of computer anxiety. In another study, Czaja et. al., (2006) out those older and middle-aged adults had lower self-efficacy with respect to use of computers and higher computer anxiety than did younger adults. In his study, Maurer (2001) discovered that older participants reported lower self-efficacy for career-related training, revealing age related declines for specific efficacies. Conversely, Teo (2008) reported that pre-service teacher's attitudes toward compute usage are age-unrelated, whereas participants in different subject domains (Humanities, Sciences, Languages, and General (Primary)) differed in their perceptions of ICT usage.

Mohammad and Alkaraki (2008) indicated that previous studies related to Internet usage revealed: (a) low degree of Internet users in university learning, (b) high degree of Internet usage, (c) significant gender related difference in Internet usage, (d) no significant relationships between major and Internet use with scientific branches predominance, (e) significant relationships between the Internet attitudes and field of studies, (f) the impact of Internet tool in learning process, and (g) the most important aspects of using Internet was e-mail.

THE NEEDS OF THE STUDY

A major reason for studying teachers' attitudes toward ICT is that it is a major predictor of future classroom ICT usage (Myers & Halpin 2002). Woodrow (1992) asserts that any successful transformation in educational practice and process needs the development of positive user attitude toward ICT. Also, Huang and Liaw (2005) stated that teachers' attitudes towards computers affect the successful usage of computers in the classroom. In empirical study, Van Braak, Tondeur, and Valcke (2004) supported that class usage of computers was strongly affected by attitudes toward computers in education. Furthermore, the strong relationship of computer-related attitudes and computer usage in education has been emphasized in many studies (Van Braak, 2001). For instance, Khine (2001) found a significant relationship between computer attitudes and its usage in the institution. Attitudes towards computers influence teachers' acceptance of the usefulness of ICT, and also influence whether teachers integrate ICT into their classroom teaching processes (Akbaba & Kurubacak, 1999; Clark, 2001). Taking the importance of attitudes toward ICT into consideration, it is also important to understand what influences postgraduate' attitudes towards ICT (Fisher, 2000). These attitudes are related to other internal and external variables (e.g. gender, race, age, field of study, experience).

Li (2002) have pointed to a wide range of factors affecting attitudes toward ICT. The variations in the factors identified by different researchers might be attributed to differences in context, participants, and type of research. A large body of literature review further explored the relationship between attitudes toward ICT and demographic variables such as gender, field of study, race, age, academic rank, teaching experience, computer experience, and computer training, which revealed some interesting findings. While there are general consistencies in many of the findings, it should be noted that researchers have not been conclusive in regards to the relationship between attitudes toward ICT and gender. Some studies revealed significant differences between attitudes toward ICT and gender, but others revealed no significant differences. It is hoped that this study will shed some light in regards to the inconclusiveness of such earlier studies. Moreover, it is also hoped that this study will serve as a foundation for other technological studies in Malaysia to further understand factors that may influence integration of ICT among educators. It is also hoped that this study will open a new frontier to achieve the Malaysian government's objective to be a fully developed country by the year 2020 and to provide a technologically skilled and qualified workforce.

Determining postgraduate students' beliefs and attitudes towards computer and Internet usage is so important because most of the postgraduate students at University of Malaya are teachers in schools and some of them will be teachers. Therefore, exploring their attitudes towards computer and Internet usage might help the decision makers at University of Malaya to evaluate students' ICT usage and attitudes. Moreover taking the necessary procedures to enhance postgraduate students' usage of ICT skills will facilitate their professional life and instruction. As such, assessment of students' attitudes toward technology use in teaching and learning is important for future introduction of ICT materials in education. In most cases, the teacher is key to effective ICT implementation in the educational system; given that teachers have tremendous potential to transmit epistemological beliefs and values to students, it is important to understand the biases and stereotypes teachers have about ICT usage and to investigate the variables acting as facilitators to teachers' positive ICT usage (Teo, 2008). Among the variables affecting successful use of computers and the Internet in instruction are teachers' attitudes towards ICT (Huang & Liaw, 2005).

To date, no specific related studies were found at international and local levels. Moreover no direct relationships between ICT attitudes and various demographic variables such as, ethnicity and field of study is found to be reported at national local levels as well. Furthermore, this study reports on the empirical evaluation of two standard scales to assess Malaysian postgraduates' attitudes toward internet and computer usage. To date, no similar instruments have been empirically evaluated in Malaysian community. Most research on gender differences in use of the Internet has been done in western countries (Nai Li & Kirkup, 2007:302).

In the light of the related literature, there is a need to understand the dimensions that influence teacher attitudes toward ICT (computer and Internet) use as a function of gender, field of study, age, and ethnicity. Accordingly, the present study aimed at exploring the overall postgraduate students' attitudes towards computer and Internet usage. Furthermore, the present study tested the following null hypotheses:

1. Postgraduate students attitudes toward computer and Internet usage would not be significantly related to gender.
2. Postgraduate students attitudes toward computer and Internet usage would not be significantly related to ethnicity.
3. Postgraduate students attitudes toward computer and Internet usage would not be significantly related to the field of study
4. Postgraduate students attitudes toward computer and Internet usage would not be significantly related to age.

METHODOLOGY AND PROCEDURES

Participants were informed of their rights, provided an explanation of the purpose of the study, Those who chose to participate were given a packet that included, a brief demographic survey, the computer attitudes scale (CAS), and the internet attitudes scale (IAS). Data was collected from the participants on a voluntary basis during the first semester of the 2011 academic year. At all occasions, the author was present throughout the data collection process. After a brief introduction to the research, the survey questionnaires were distributed to students. On the average, students took about 30 minutes to complete the survey forms. There were also no queries from the participants.

Therefore, this study is considered as a quantitative study with multivariate design. All analyses were conducted using SPSS 20.0 and AMOS 20.0. Traditional psychometric analysis of the CAS and IAS included exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to assess the dimensional structure of each scale followed by reliability analysis. Multi factors MANOVA analyses follow up by univariate analysis were conducted to study the effect of various demographic variables as independent variables (i.e. gender, ethnicity, age, and field of study) on the CAS and IAS subscales scores as the dependent variables.

Samples

The participants in this research were 289 postgraduate students enrolled in four educational Master Degree Programs at University of Malaya (i.e., Educational Psychology and Counseling, Teaching of English as a Second Language (TESL), Educational Foundations, and Educational Management). Of these, 155 were males and 134 were females. Students' ages ranged from 24 to 53 (*Mean*= 31.45, *SD*= 6.76) years old. Table 1 shows the sample distribution by gender, race, and department (field of study).

Table 1: Samples distribution by gender, race, department, and economic level

		Number	Percentage
Gender	Male	155	54
	Female	134	46
Ethnicity	Malay	119	41
	Chinese	124	43
	Indian	46	16
Field of study	Psychology	83	29
	TESL	83	29
	Foundation	36	12
	Management	87	30

Total	289	100

Instruments
This section provides a detailed description of the validation processes of two instruments used to measure postgraduates students attitudes toward Internet and computer usage (i.e. Computer attitudes scale, and Internet attitudes scale).

Computer Attitudes Scale (CAS)
The Computer Attitudes Scale (CAS) (Selwyn, 1997), was used to assess the attitude of students toward computer usage. The scale consists of 21 statements representing attitude towards various aspects of computer (i.e., Affective, Perceived Usefulness, Perceived Control, and Behavioral Intention). In the present study, Affective refers to feelings toward computers, Perceived Usefulness refers to individual's beliefs about the usefulness of computers in their study, Perceived Control refers to perceived comfort level or difficulty of using computers, and Behavioral Intention refers to behavioral intentions and actions with respect to computers (Teo, 2008). Participants responded to the CAS using a five-point Likert scale of *strongly disagree* (1), *disagree* (2), *neutral* (3), *agree* (4), and *strongly agree* (5). Furthermore, the negative items were reverse coded.

Prior to analyzing data using factor analysis, data collected in this research went through Bartlett's Test of Sphericity meant to measure the applicability of factor analysis. Kaiser-Meyer-Olkin Measure of Sampling Adequacy recorded at 0.77 (>0.5), hence it is good enough to use factor analysis in determining the number of factors to be retained and loading factors on the items.

Exploratory factor analysis (*EFA*) and principal component analysis with varimax rotation on the 21 items suggested four interpretable factors: Affective (5 items), Perceived Usefulness (4 items), Perceived Control (4 items), and Behavioral Intention (4 items). Items loading more than ±0.40 were retained on the relevant factor, and items loading less than ±0.40 were omitted (Field, 2000). Thus, item analysis reduced the original 21 items to 17 items with four independent constructs. The results show that the factor loadings range between 0.47 and 0.88 on the Affective subscale, between 0.53 to 0.69 on the perceived usefulness subscale, between 0.41 and 0.79 on the Perceived Control subscale, and between 0.51 and 0.77 on the Behavioral Intention subscale. The Eigen values of the first four factors from principal component analysis were larger than 1: 5.48, 3.49, 1.58, and 1.22 respectively. These four factors accounted for 58.82% of variance in the final version of the scale.

The behavior of individual items in relation to others within the same subscale provides good evidence for content validity because the highest factor loading is central to the domains assessed by these subscales (Francis, Katz, & Jones, 2000). The Cronbach alpha coefficients calculated for the Affective, Perceived Usefulness, Perceived Control, and Behavioral Intention subscales were .77, .78, .77 and .78, respectively, and it was calculated to be .81 for the entire scale. The scale correlation coefficients ranged between .35 and .47 on affective, between .36 and .56 on perceived usefulness, between .34 and .62 on perceived control, between .41 and .61 on Behavioral Intention. It is generally agreed that correlations in the range of .35 to .65 are useful and statistically significant beyond the 1% level, whereas correlations less than .25 are not useful and statistically non significant (Brown 1983; Bryman & Cramer, 1997). Thus, the results show that the alpha coefficients for all subscales were significantly high, suggesting that the internal reliability index of the four constructs and the entire scale is adequate. In addition, the results of inter correlations show that each subscale correlates significantly with other subscales and the entire scale. According to Harrison, Seeman, and Behm (1991), this result provides at least further evidence for the consistency of the entire scale and for the convergent validity of each subscale. Therefore, it can be concluded that the four factors measure Internet attitudes in a coherent way. All subscales correlate significantly at the $p < .01$ level and the coefficients range from .32 to .51. This suggests that the four components were fairly independent to be used as independent variables. This allows us to examine the computer attitudes of students by each subscale.

Moreover, Confirmatory Factor Analysis (*CFA*) seeks to determine if the number of factors and the loadings of measured (indicator) variables on them conform to what is expected on the basis of pre–established theory. A *CFA* was conducted to test the fit between the four–factor model and the data. The maximum likelihood estimation method was used.

Prior to *CFA* analysis, the data were examined for multivariate normality, multicollinearity and outliers. The bivariate correlations, tolerance, and variance inflation values indicated that neither bivariate nor multivariate multicollinearity was present. Because maximum likelihood estimation assumes multivariate normality of the observed variables, the data were examined with respect to univariate and multivariate normality. No items showed skew or kurtosis that exceeded the cutoffs of |3| or |8| (Kline, 2005), respectively, indicating no problems with univariate nonnormality. The Mardias coefficient is a standard measure of multivariate normality and its value obtained in this study is 167.87. This value is less than the recommended value ($p\ (p+2)$) where p= total number of observed indicators; 21(23) = 483) by Raykov and Marcoulides (2008) hence the requirement of multivariate normality is satisfied. On this basis, the data for this study was considered adequate for confirmatory factor analysis.

In general, multiple goodness–of–fit tests were used to evaluate the fit between the hypothesized model and the data to determine if the model being tested should be accepted or rejected. These are Normed Fit Index (*NFI*; Bentler & Bonett 1980), the Comparative Fit Index (*CFI*; Bentler 1990), the Root Mean Square Error Approximation (*RMSEA*; Steiger & Lind, 1980), and the minimum fit function Chi–Square ratio degrees of freedom (*CMIN/DF*, Marsh & Hocevar, 1985). NFI and *CFI* greater than 0.90 indicates a good fit to the data, and the RMSEA of about 0.05 indicates a close fit of the model and 0.08 represents a reasonable error of approximation. *CMIN/DF* valve in the range of 2 to 1 or 3 to 1 are indicative of an acceptable fit between the hypothetical model and the sample data (Arbuckle, 2006). All coefficients are significant at $p<0.01$. *NFI*=0.96; *CFI*=0.97; *RMSEA*=0.05; *CMIN/DF*=1.86

Internet Attitudes Scale (IAS)
The instrument developed to measure the attitudes toward Internet use was adapted from Tsai, Lin, and Tsai (2001) and from Tendency Towards Internet designed by Kilincoglu and Altun (cited in Isman, 2004); it contained 22 items in Likert Type (*strongly agree* = 5, *agree* = 4, *undecided* = 3, *disagree* = 2, *strongly disagree* = 1). Prior to analyzing data using factor analysis, data collected in this research went through Bartlett's Test of Sphericity meant to measure the applicability of factor analysis. Kaiser-Meyer-Olkin Measure of Sampling Adequacy recorded at 0.74 (>0.5), hence it is good enough to use factor analysis in determining the number of factors to be retained and loading factors on the items.

Exploratory factor analysis and principal component analysis with varimax rotation on the 22 items suggested three interpretable factors: perceived usefulness (10 items), emotional response (6 items) and perceived control (5 items). In this study, perceived usefulness was defined as participant's perception of the positive impacts of the Internet on society and the individual, emotional response was defined as the participant's feelings and anxiety when using the Internet and perceived control was defined as participant's confidence in the independent control of the Internet (Tsai et. al., 2001). Items loading more than ±0.40 were retained on the relevant factor, and items loading less than ±0.40 were omitted (Field, 2000). Thus, item analysis reduced the original 22 items to 20 items with three independent constructs. The results show that the factor loadings range between 0.42 and 0.83 on the perceived usefulness subscale, between 0.41 and 0.79 on the emotional response subscale, and between 0.51 and 0.77 on the perceived control subscale. The Eigen values of the first three factors from principal component analysis were larger than 1: 5.11, 3.45 and 1.40 respectively. These three factors accounted for 46.74% of variance in the final version of the scale.

The behavior of individual items in relation to others within the same subscale provides good evidence for content validity because the highest factor loading is central to the domains assessed by these subscales (Francis et. al., 2000). The Cronbach alpha coefficients calculated for the perceived usefulness, emotional response and perceived control subscales were .77, .78, and .76, respectively, and it was calculated to be .81 for the entire scale. The scale correlation coefficients ranged between 0.34 and 0.45 on perceived usefulness, between 0.36 and 0.59 on emotional response, and between 0.38 and 0.69 on perceived control. It is generally agreed that correlations in the range of .35 to .65 are useful and statistically significant beyond the 1% level, whereas correlations less than .25 are not useful and statistically non significant (Brown, 1983; Bryman & Cramer, 1997). Thus, the results show that the alpha coefficients for all subscales were significantly high, suggesting that the internal reliability index of the three constructs and the entire scale is adequate. In addition, the results of inter correlations showed that each subscale correlates significantly with other subscales and the entire scale. According to Harrison et al. (1991), this result provides at least further evidence for the consistency of the entire scale and for the convergent validity of each subscale. Therefore, it can be concluded that the three factors measure Internet attitudes in a coherent way. All subscales correlate significantly at the $p < .01$ level and the coefficients range from .27 to .58. This suggests that the three components were fairly independent to be used as independent variables; it allows us to examine the Internet attitudes of students by each subscale.

Confirmatory Factor Analysis (*CFA*) seeks to determine if the number of factors and the loadings of measured (indicator) variables on them conform to what is expected on the basis of pre–established model. A *CFA* was conducted to test the fit between the three–factor model and the data. The maximum likelihood estimation method was used. Prior to *CFA* analysis, the assumptions of *CFA* were verified. No violations to access *CFA* were found. Moreover, all coefficients are significant at $p<0.01$. *NFI*=0.95; *CFI*=0.95; *RMSEA*=0.05; *CMIN/DF*=1.88.

RESULTS

The overall profile of the participants' attitudes toward computer usage was measured in terms of the Affective, Perceived Usefulness, Perceived Control, and Behavioral Intention. The mean scores and standard deviations were used to explain the participant's attitudes profile. According to Birisci et. al., (2009), ranges of agreement with the attributions on the survey was determined by using the (n-1)/n formula and after calculation the interval width of the range between 1 through 5 was calculated as 0.8. As such, the interval width of 1-1.80 showed very low level, the 1.81-2.60 intervals showed low level, the 2.61-3.40 intervals showed medium level, the 3.41-4.20 intervals showed high level and the 4.21-5.00 intervals showed very high level of agreement with the statement on the survey**.** As can be seen in Table 2, the results of the descriptive statistics indicated that participant' attitudes towards computer as indicated by the mean scores ranging from 3.37 to 4.00 on a five point scale. *Perceived usefulness* dimension had the highest mean value (*M*ean = 4.00, *SD* = 3.03), followed by *perceived control* (*M*ean = 3.54, *SD* = 2.52), then by *affective* (*M* = 3.40, *SD* = 5.46) and then by *behavioral intention* (*M*ean = 3.37, *SD*= 3.65). The means suggest that participants have high level perceptions of the usefulness of the computer and their control of the computer. On the other hand, the participants have moderate level perceptions about their affect towards computers and intention to use computer.

Overall profile of the participants attitudes towards Internet were measured in terms of the perceived usefulness, emotional response and perceived control. *Perceived usefulness* dimension had the highest mean value (*M*ean = 4.03, *SD* = 4.96), followed by *perceived control* (*M*ean = 3.69, *SD* = 2.29), and then by emotional response (*M* = 2.85, *SD* = 4.59). The means suggest that participants have high level perceptions of the usefulness of the Internet and their control of the Internet. On the other hand, the participants have a moderate level of feelings and anxiety when using the Internet (Emotional response).

Table 2: Descriptive statistics for each subscale (n=289)

			Attitudes towards computer				Attitudes towards Internet		
			Affective	**Perceived Usefulness**	**Perceived Control**	**Behavioral Intention**	**Perceived Usefulness**	**Emotional Response**	**Perceived Control**
Gender	Male	Mean	3.51	4.03	3.65	3.48	4.06	2.88	3.74
		S.D	5.63	1.95	2.47	3.55	4.59	4.77	2.45
	Female	Mean	3.27	3.97	3.41	3.24	3.99	2.80	3.63
		S.D	5.19	3.94	2.49	3.72	5.35	4.38	2.06
Race	Malay	Mean	3.28	4.15	3.67	3.38	4.01	2.85	3.62
		S.D	5.49	3.93	2.25	3.70	4.67	4.48	2.40
	Chinese	Mean	3.62	3.87	3.47	3.49	4.02	2.88	3.67
		S.D	5.06	2.27	2.62	3.49	5.38	4.55	2.25
	Indian	Mean	3.12	3.98	3.41	3.15	4.09	2.76	3.93
		S.D	5.89	1.57	2.70	3.81	4.53	5.02	1.84
Department	Psychology	Mean	3.43	4.07	3.59	3.42	4.09	2.93	3.68
		S.D	5.77	2.24	2.82	4.00	5.02	4.65	2.25
	Tesl	Mean	3.24	4.04	3.52	3.32	3.99	2.92	3.61
		S.D	5.48	4.70	2.51	3.87	5.23	3.87	2.09
	Foundation	Mean	3.04	3.97	3.49	3.14	4.02	2.56	3.68
		S.D	4.41	1.61	2.44	3.20	3.65	4.77	1.66
	Manageme	Mea	3.67	3.91	3.53	3.46	4.00	2.82	3.79

nt	n							
	S.D	5.25	1.90	2.28	3.21	5.13	4.96	2.68
Total	Mean	3.40	4.00	3.54	3.37	4.03	2.85	3.69
	S.D	5.46	3.03	2.52	3.65	4.96	4.59	2.29

Assumptions were checked before conducting Multivariate analysis (MANOVA). MANOVA has seven assumptions: sample size, independence of observations, normality, outliers, linearity, multicollinearity and singularity, and homogeneity of variance-covariance matrices. No violations were found on multivariate normality and equality of variance.

A multivariate analysis was conducted to investigate the effects of gender, field of study, and ethnicity on participants' attitudes towards computer usage. In order to evaluate multivariate significance, Wilks Lambda statistic was used. MANOVA results regarding gender, field of study, and ethnicity are presented in Table 3. The results indicated no statistically significant effect of gender on the combined dependent variables (F (4, 284) = 1.12, Wilks lambda = 0.94, partial Eta = 0.06, p = 0.36). The partial eta squared value of 0.06 represented that 6% of the variance in dependent variables could be explained by gender. Moreover, no statistically significant effect of ethnicity on the combined dependent variables (F (8, 280) = 2.04, Wilks lambda = 0.80, partial Eta = 0.10, p = .07). The partial Eta squared value of 0.10 showed that the 10% of the variance in dependent variables could be explained by ethnicity. Furthermore, no statistically significant effect of field of study was observed on the combined dependent variables (F (12, 276) = 1.61, Wilks lambda = 0.77, partial Eta = 0.08, p = 0.09). The partial Eta squared value of 0.08 showed that the 8 % of the variance in dependent variables could be explained by field of study.

Table 3: MANOVA Results for Gender , field of study, and ethnicity (computer)

Effect	Wilks lamda	*F*	Hypothesis df	Error df	*p*-value	Partial Eta Squared
Gender	.94	1.12	4.00	71.00	.36	.06
Ethnicity	.80	2.04	8.00	142.000	.07	.10
Field of study	.77	1.61	12.00	188.14	.09	.08

In order to investigate on which dependent variables participants in different group of gender, field of study, and ethnicity differed in their attitudes towards computer usage, multivariate analyses of variance between groups was conducted. Table 4 shows the summary results of MANOVA analysis. As seen in Table 4, males and females are similar in affective F (1, 287) = 1.58, $p > .05$; Perceived usefulness F (1, 287) = 1.17, $p > .05$; Perceived control F (1, 287) = 0.38, $p > .05$; and Behavioral intention F (1, 287) = 2.74, $p > .05$. Moreover, the three groups of ethnicity are similar in affective F (2, 286) = 2.30, $p > .05$; Perceived usefulness F (2, 286) = 2.78, $p > .05$; Perceived control F (2, 286) = 2.79, $p > .05$; and Behavioral intention F(2, 286)= 0.93, $p > .05$**.** Also, participants in different field of study are similar in affective F(3, 285)= 2.91, p>0.05; Perceived usefulness F(3, 285)= 2.20, $p > .05$; Perceived control F(3, 285)= 0.22, $p > .05$; and Behavioral intention F(3, 285)= 0.48, $p > .05$**.**

Table 4: Results of MANOVA Analysis for Differences Between the Means of the Participants attitudes towards computer usage with respect to gender, field of study, ethnicity, and economics level.

Source	Dependent variable	Type III Sum of Squares	*df*	Mean square	*F*-value	*p*-value	Partial Eta Squared
Gender	Affective	30.88	1	30.88	1.58	.21	.02
	Perceived Usefulness	4.68	1	4.68	1.17	.28	.02
	Perceived Control	2.04	1	2.04	.38	.54	.01
	Behavioral intention	26.56	1	26.56	2.74	.10	.04
Ethnicity	Affective	89.89	2	44.95	2.30	.11	.06
	Perceived Usefulness	22.25	2	11.13	2.78	.07	.07
	Perceived Control	22.27	2	11.14	2.79	.06	.08
	Behavioral intention	18.02	2	9.01	.93	.40	.02

Field of study	Affective	170.81	3	56.94	2.77	.07	.11
	Perceived Usefulness	26.39	3	8.80	2.20	.10	.08
	Perceived Control	3.50	3	1.17	.22	.88	.01
	Behavioral intention	13.88	3	4.63	.48	.70	.02

A multivariate analysis was conducted to investigate the effects of gender, field of study, and ethnicity on participant's attitudes towards the internet usage. In order to evaluate multivariate significance, Wilks Lambda statistic was used. MANOVA results regarding the gender, field of study, and ethnicity are presented in Table 5 The results indicated no statistically significant effect of gender on the combined dependent variables (F(3, 285)= 2.40, Wilks lambda= .91, partial Eta= .09, p= .08). The partial eta squared value of .09 represented that the 9 % of the variance in dependent variables could be explained by gender. Moreover, no statistically significant effect of ethnicity on the combined dependent variables (F (6, 282)= .98, Wilks lambda=.92, partial Eta =.04, p= .44). The partial Eta squared value of .04 showed that the 4 % of the variance in dependent variables could be explained by ethnicity. On the other hand, no statistically significant effect of field of study on the combined dependent variables (F (9, 279) = .83, Wilks lambda=.90, partial Eta =.03, p= .59). The partial Eta squared value of .03 showed that the 3 % of the variance in dependent variables could be explained by field of study.

Table 5: MANOVA Results for gender , field of study, age, and ethnicity (Internet)

Effect	Wilks lamda	*F*	Hypothesis df	Error df	*p*-value	Partial Eta Squared
Gender	.91	2.40	3.00	72.00	.08	.09
Ethnicity	.92	.98	6.00	144.00	.44	.04
Field of study	.90	.83	9.00	175.38	.59	.03

In order to investigate on which dependent variables participants with different gender, field of study, and ethnicity differed in their attitudes towards Internet usage, multivariate analyses of variance between groups was conducted. Table 6 shows the summary results of MANOVA analysis. As we seen in Table 6, males and females are similar in perceived usefulness F (1, 287) = 2.10, p>0.05; emotional response F (1, 287) = 3.10, p>0.05; and Perceived control F (1, 287) = .16, p>0.05. Moreover, the three groups of ethnicity are similar in usefulness F (2, 286) = 1.51, p>0.05; emotional response F (2, 286) = .84, p>0.05; and Perceived control F (2, 287) = .23, p>0.05. Furthermore**,** participants in different field of study are similar in perceived usefulness F (3, 285) = .73, p>0.05; emotional response F (3, 285) = 1.43, p>0.05; and Perceived control F (3, 285) = .58, p>0.05. Also, participants at different economic levels are similar in usefulness F (2, 286) = 2.07, p>0.05; emotional response F (2, 286) = 1.26, p>0.05; and Perceived control F (2, 287) = 1.12, p>0.05.

Table 6: Results of MANOVA Analysis for Differences between the Means of the Participants attitudes towards Internet usage with respect to gender, field of study, ethnicity, and economics level

Source	Dependent variable	Type III Sum of Squares	*df*	Mean square	*F*-value	*p*-value	Partial Eta Squared
Gender	perceived usefulness	37.82	1	37.82	2.10	.15	.03
	emotional response	52.81	1	52.81	3.10	.08	.04
	perceived control	.78	1	.78	.16	.69	.00
Ethnicity	perceived usefulness	54.37	2	27.18	1.51	.23	.04
	emotional response	28.73	2	14.36	.84	.44	.02
	perceived control	2.19	2	1.10	.23	.80	.01
Field of study	perceived usefulness	39.09	3	13.03	.73	.54	.03
	emotional response	73.00	3	24.33	1.43	.24	.06
	perceived control	8.38	3	2.79	.58	.63	.02

Univariate analysis was conducted to investigate the effects of age on participant's attitudes towards the internet and computer usage. As we seen in Table 7, participants in different group of ages are differ in their attitudes toward computer usage (F (2,286) =53.06, p<0.05); and their attitudes toward internet usage (F (2,286) =3.76, p<0.05). The partial Eta squared showed that the 27 % of the variance in participant's attitudes toward computer usage could be explained by age. On the other hand, the partial Eta squared showed that the 5 % of the variance in participant's attitudes toward Internet usage could be explained by age.

Furthermore, Post hoc analysis indicated that the mean scores of participant's attitudes toward computer and Internet usage were significantly related to age, with lower age related to higher mean scores (see Table 8, and Table 9). As we seen in Table 8, the youngest participants (< 30 years old) significantly scored higher than the participants in the older groups of age. Table 9 shows that the youngest participants (< 30 years old) significantly scored higher than the participants in the older group (more than 40). In general, postgraduate students toward computer and Internet usage decrease by the increase of age.

Table 7: Results of Univariate Analysis for Differences Between the Means of the Participants attitudes towards Internet and computer usage with respect to the Age

Variable	Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Computer	Age group	14367.37	2	7183.684	53.06	.00**
	Error	38722.78	286	135.394		
	Total	942672.00	289			
	Corrected Total	53090.15	288			
Internet	Age group	7106.70	2	3553.35	3.76	.02*
	Error	269675.31	286	942.92		
	Total	609236.00	289			
	Corrected Total	276782.01	288			

Table 8: Results of Post hoc Analysis for Differences between the Means of the Participants attitudes towards computer usage with respect to the Age

Group of Age by years	Less than 30	From 30 to 40	More than 40
Less than 30	--	14.35**	15.57**
From 30 to 40	-	-	1.22
More than 40	-	-	-

Table 9: Results of Post hoc Analysis for Differences between the Means of the Participants attitudes towards computer usage with respect to the Age

Group of Age by years	Less than 30	From 30 to 40	More than 40
Less than 30	--	9.37	11.20**
From 30 to 40	-	-	1.83
More than 40	-	-	-

DISCUSSION

In general, postgraduate students showed positive attitudes toward computer and Internet usage. The overall positive level of computer and Internet attitudes could be attributed to the availability and accessibility to computers and Internet given to postgraduate students at the University of Malaya. Moreover, in Malaysia, the Ministry of Education (MOE) has given approval to implement ICT in education. Therefore, the Malaysian government has facilitated computer integration in schools to improve the usefulness of the student's education on a personal and national level. Chronologically, the participants of this study would have benefited from the goals of the *Plan of Implementing ICT* in ways that may have shaped their ICT attitudes in a positive direction, and contributed towards increasing home computer ownership among them, which could have promoted greater opportunities with ICT (Teo, 2008). Moreover, the reason for these high attitudes toward computer usage can be attributed to high usage of the computer and its various applications in instruction and being assigned homework and various tasks requiring computer usage. The moderate emotional response mean scores for participants were indicative that they were likely to be less anxious about future usage of the Internet.

Further, results reveal no gender related differences of postgraduate students' attitudes toward computer usage. These findings are consistent with the earlier studies (Teo, 2008). Moreover, North and Noyes (2002) felt that increased usage of computers for teaching and learning in schools has worked against the development of gender differences. Contrary to the findings of these studies, previous studies reporting sex related differences in attitudes toward computer (Adebowale et. al., 2010; Sainz et. al., 2010; Meelissen & Drent, 2008; Avraham, 2005; Graff, 2003; Brosnan & Lee, 1998; Shashaani, 1993). Also, results revealed gender related differences of postgraduate students' attitudes toward Internet usage. The results of this study are consistent with the earlier studies (Duggan et. al., 2001; Luan, Fung & Atan, 2008; Odell et. al., 2000; Shaw & Gant, 2002). For instance, Duggan et. al., (2001) reported that university students usually used the Internet for term paper research, retrieval of course notes and spent longer hours on these functionalities. Luan et. al., (2008) reported that the lack of gender differences could possibly be attributed to the sample being studied. The participants involved in this study were students at University of Malaya. They were likely to posses some experience in using the Internet. Additionally, the university has continued to upgrade the Internet infrastructure to enhance Internet accessibility around the campus, making these services readily available to all students. With the improved facilities, both females and males have equal access and opportunities to use the Internet with no disparity between them.

Further, results indicate no significant differences existed in postgraduate student attitudes toward Internet and computer usage by field of study and ethnicity. This is expected as the respondents were university students and their search in the Internet would have been related to the fulfillment of their educational tasks. Moreover, Malaysia is a multiethnic society where all races have the same opportunities in ICT practice and training at schools and universities. Moreover, all participants were from Faculty of Education, so further studies are needed to assess postgraduates students from different faculties.

Finally, data analysis indicates existence of significant differences between postgraduate students' age and their perceptions toward computer and Internet. In conclusion, ceteris paribus, participant's attitudes toward computer and internet usage decreased as a function of age. This means those students' attitudes toward computer and Internet increase as their age decreases. The significance differences between the age and attitudes toward ICT are probably due to the presence of a wide age gap among postgraduate students. Contrary to these findings, Teo (2008) reported no significant relation between student's age and attitude toward computers.

CONCLUSION

The advantage of this study is that it allows for establishment of comparability with many studies in different cultures and languages. Results from this study may benefit educational authorities and universities by suggesting factors that may affect postgraduate students' attitudes toward computer and Internet. In addition, this study represents a replication of two attitude scales in a culturally different environment, which may be of particular benefit in cross-cultural studies. Variables including gender, field of study, age, and ethnicity were analyzed in this study.

This study provides a glimpse of selected variables that affect the attitudes toward computer and Internet usage of postgraduate students. Our research revealed possible subject differences to the attitudes of postgraduate's students that have not been identified by previous research. Such differences will have practical implications for University of Malaya aiming to promote ICTs among postgraduate's students. This research has raised several interesting questions that might be subject of future studies. Does ICTs using provide educational value and high level of attitudes towards ICT usage over and above traditional way without using ICTs? Which subjects have most attitudes toward ICT usage from using ICTs? Do the Science subjects have most attitudes toward ICT usage than the Arts subjects? Do learning styles influence the attitudes toward ICTs tools? Moreover future research needs to examine the relationship between ICT attitudes and ICT usage to determine the effects of attitudes on ICT usage and under what circumstances positive or negative attitudes can predict effective ICT usage in schooling.

The findings of this study will contribute to technology adoption by University of Malaya and help in implementing successful frameworks of embedding e-learning in University educational system. University of Malaya is therefore called on to take the issues of ICT training seriously, as experienced teachers enhance successful implementation of ICT. Similarly, courses in computing and computer based instruction should be made compulsory for students at Faculties of Education. This will surely enhance acquisition of knowledge and practical skills in computer usage.

The advantage of this study is that it allows for establishment of comparability with many studies in different cultures and languages. Results from this study may benefit educational authorities and universities by suggesting factors that may affect postgraduate students' attitudes toward computer and Internet. The findings of the research enable the researcher to measure the postgraduate student's attitude towards computer and Internet usage.

The result of this study enable lecturers to planed ICT skills training program at different level, instructions, activities, syllabus of ICT courses based on the age, background and prior knowledge of postgraduate students. The research data enable lecturers to use suitable type of teaching method, strategies and technique in presenting their lessons and instruction.

The studies developed and validate two skills (computer and Internet) among postgraduate students. This is the first in the field and in Malaysian version of instrument in measuring postgraduate student's attitude in computer and Internet usage. Both postgraduate students which will be future teachers have high level in attitude encourage positive attitude towards computer and Internet and motivated future teachers to implement ICT in school.

In addition, this study represents a replication of two attitude scales in a culturally different environment, which may be of particular benefit in cross-cultural studies. Variables including gender, field of study, age, and ethnicity were analyzed in this study.

Limitations of the study

The results of the current study may be subject to the following limitations: Firstly, the data collected was through self reports and this may lead to a common method variance. Secondly, the sample size was not large enough to allow for cross validation of results. Additional research will be needed to validate the results of the current study. Furthermore, factor analytic results are inherently subjective in nature, as the numerous decisions regarding factor extraction, rotation, and interpretation can lead to different outcomes. Thirdly, the data were collected using a cross-sectional, single administration design and it was not possible to establish the stability of the participants' attitudes. Moreover, Some reasons from the limitation of study, postgraduate students showed positive attitudes toward computer and Internet usage on account of the availability and accessibility to computers and Internet given to postgraduate students at the University of Malaya. Fourthly, the variables chosen in this study were limited in number. As a result, other significant variables that influence computer and internet attitudes are excluded. Future studies could add other variables to examine their impact on computer and internet attitudes. Finally, the study is limited because it was conducted in a specific university and only at the Faculty of Education. Replicating this study with a large and more representative sample of postgraduate students from different faculties and subjects from different universities and with a more rigorous design is likely to shed more light on differences of mean computer and Internet attitude score in relation to gender, field of study, age, and ethnicity.

REFERENCES

Adebowale, O. F., Adewale, I. A., & Oyeniram, F. M. (2010). Computer interest, approval and confidence of secondary school students in three selected local governments of Lagos State (Nigeria): Implications for global computerization. *International Journal of Education and Development using Information & Communication Technology (IJEDICT), 6*(1).

Ajzen, I. & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliff, NJ: Prentice Hall.

Ajzen, I. (1988). *Attitudes, personality, and behavior.* Bristol, UK: Open University Press.

Akbaba, S., & Kurubacak, G. (1999). Teachers' attitudes towards technology. *Computers in the Social Studies*, 7(2), 833–836.

Albion, P. R. (2003). PBL + IMM = PBL2: Problem-based learning and interactive multimedia development. *Journal of Technology and Teacher Education*, Vol. 11(2), 243-257.

Al-Jabri, I. M. (1996). Gender differences in computer attitudes among secondary school students in Saudi Arabia. *Journal of Computer Information Systems, 37*, 70-75.

Arbuckle, J.L. 2006, *AMOS* (version 7.0), [Computer software], SmallWaters, Chicago.

Avraham, L. (2005). Differences in the way males and females perceive computers, retrieved from http://eserver.org/course/spring97/76100o/contributions/avraham/

Azjen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckman (Eds.), Action control: From cognition to behavior (pp. 11–39). New York: Springer Verlag.

Bandalos, D. & Benson, J. (1990). Testing the factor structure invariance of a computer attitude scale over two grouping conditions. *Educational and Psychological Measurement*, 50(1), 49-60.

Bentler, P. M. (1990). Comparative fit indices in structural models. *Psychological Bulletin*, 107, 238–246.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588–606.

Binder, M., & Niederle, U. (2007). Institutions as determinants of preference change- A one way relation? Retrieved from https://papers.econ.mpg.de/evo/discussionpapers/2006-07.pdf

Birisci, S., Metin, M., & Karakas, M. (2009). Prospective elementary teachers' attitudes toward computer and Internet use: A sample from Turkey. *World Applied Science Journal, 6*(10), pp. 1433-1440.

Blackmore, M., Stanley, N., Coles, D., Hodgkinson, K., Taylor, C., & Vaughan, G. (1992). A preliminary view of students' information technology experience across UK initial teacher training institutions. *Journal of Information Technology in Teacher Education,* 1(2), 241–254.

Brennan, R., McFadden, M., & Law, E. (2001). Review of research. All that glitters is not gold: Online delivery of education and training. Leabrook: National Centre for Vocational Education Research.
Brosnan, M., & Lee, W. (1998) A cross-cultural comparison of sex differences in computer attitudes and anxieties: The United Kingdom and Hong Kong. *Computers in Human Behavior, 14*(4), 559-577.
Brown, F. (1983). *Principles of educational and psychological testing* 3rd ed. New York, NY: Holt, Rinehart & Winston.
Bryman, A., & Cramer, D. (1997). *Quantitative data analysis with SPSS for Windows: A guide for social scientists*. London, UK: Routledge.
Bullock, D. (2004). Moving from theory to practice: an examination of the factors that preservice teachers encounter as they attempt to gain experience teaching with technology during field placement experiences. *Journal of Technology and Teacher Education*, 12(2), 211-237.
Cavas, B., Cavas, P., Karaoglan, B. & Kisla, T. (2010). A study on science teachers' attitude toward information and communication technologies in education. *The Turkish Online Journal of Educational Technology, 8*(2), 20-32.
Chai, C. S., Hong, H. Y., & Teo, T. (2009). Singaporean and Taiwanese pre-service teachers' beliefs and their attitude towards ICT: A comparative study. *The Asia-Pacific Education Researcher*, 18(1), 117–128.
Clark, K. D. (2001). Urban middle school teachers' use of instructional technology. *Journal of Research on Computing in Education*, 33(2), 178–195.
Czaja, S., Charness, N., Fisk, A., Hertzog, C., Nair, S., Rogers, W. (2006). Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement. *Psychology and Aging, 21*(2), 333-352.
Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technologies, *MIS Quarterly*, *13*(3), 319–340.
Delcourt, M. A. B., & Kinzie, M. B. (1993). Computer technologies in teacher education: The measurement of attitudes and self-efficacy. *Journal of Research and Development in Education*, *27*(1), 35-41.
Duggan, A., B. Hess, D. Morgan, S. Kim, & Wilson, K. (2001). Measuring students' attitudes toward educational use of the Internet. *Journal of Educational Computing Research*, *25*(3), 267-281.
Dyck, J. L., & Smither, J. A. A. (1994). Age differences in computer anxiety: The role of computer experience, gender and education. *Journal of Educational Computing Research, 10*(3), 239-248.
Field, P. (2000). *Discovering statistics using SPSS for Windows: Advanced techniques for the beginner*. London, UK: Sage.
Fishbein, M., & Ajzen, I. (1975*). Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley. Retrieved 9 June, 2011 from http://people.umass.edu/aizen/f&a1975.html
Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. New York: Psychology Press (Taylor & Francis).
Fisher, M. (2000). Computer skills of initial teacher education students. *Journal of Information Technology for Teacher Education,* 9(1), 109–123.
Foong-Mae, C. (October, 2002). ICT in Malaysian schools policy: Policy and Strategies. Seminar/Workshop on the Promotion of ICT Education to Narrow the Digital Divide, Tokyo, Japan. Retrieved from http://unpan1.un.org/intradoc/groups/public/documents/gaid/unpan033365.pdf.
Francis, L., Katz, Y., & Jones, S. (2000). The reliability and validity of the Hebrew version of the Computer Attitude Scale. *Computers & Education, 35*(2),149-59.
Garland, K. J., & Noyes, J. M. (2005) Attitudes and confidence towards computers and books as learning tools: A cross-sectional study of student cohorts. *British Journal of Educational Technology, 36,* 85-91.
Graff, M. (2003). Cognitive style and attitudes towards using online learning and assessment methods. *Electronic Journal of e-Learning Methods, 1*(1), 21-28.
Harrison, J., Seeman, J., & Behm, R. (1991). Development of a distance education assessment instrument. *Educational Technology Research and Development, 39*(4), 65-77.
Huang, H. M., & Liaw, S. S. (2005). Exploring user's attitudes and intentions toward the web as a survey tool. *Computers in Human Behavior, 21*(5), 729-743.
Isman, A., & Dabaj, F. (2004). Attitudes of students towards Internet. *Turkish Online Journal of Distance Education - TOJDE, 5*(4). Retrieved from http://tojde.anadolu.edu.tr/tojde16/articles/dabaj.htm
Kersaint, G., Horton, B., Stohl, H., & Garofalo, J. (2003). Technology beliefs and practices of mathematics education. *Journal of Technology and Teacher Education*, 11(4), 549-577.
Khine, M. S. (2001). Attitudes toward computer among teacher education students in Brunei Darussalarn. *International Media, 28*(2), 147-153.
Kline, R. B. (2005). Principles and practice of structural equation modeling. (2nd Edition). New York: The Guilford Press. Kuhn, D. (1999). Metacognitive development. In L. Balter & C. S. Tamis-LeMonda

(Eds.), Child psychology: A handbook of contemporary issues (pp.259-286). Ann Arbor, MI: Taylor and Francis.
King, J., Bond, T., & Blandford, S. (2002). An investigation of computer anxiety by gender and grade. *Computers in Human Behavior*, 18, 69–84.
Kutluca, T. (2010) Investigation of teachers' computer usage profiles and attitudes toward computers. *International Online Journal of Science, 2*(1), 81-97.
Li, N. (2002). Culture and gender aspects of students' information searching behaviour using the Internet: a two-culture study of China and the United Kingdom', Doctoral thesis, Open University United Kingdom, ProQuest Digital Dissertations.
Lin, H. L., & Gorrell, J. (2001). Exploratory analysis of pre-service teacher efficacy in Taiwan. *Teaching and Teacher Education*, 17(5), 623–635.
Loyd, B., & Gressard, C. (1986). Gender and amount of computer experience of teachers in staff development programs: Effects on computer attitudes and perceptions of the usefulness of computers. *AEDS Journal*, 19, 302–311.
Luan, W., Fung, N., & Atan, H. (2008). Gender Differences in the Usage and Attitudes toward the Internet among Students Teacher in a Public Malaysian University. *American Journal of Applied Sciences, 5*(6), 685-697.
Marsh, H.W. & Hocevar, D. (1985). Application of confirmatory factor analysis to the study of self–concept: First– and higher–order factor models and their invariance across groups. *Psychological Bulletin*, 97, 562–582.
Mathieson, K. 1991. Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. *Inform. Systems*, Res. 2, 173-191.
Maurer, T. J. (2001). Career-relevant learning and development, worker age and beliefs about Self-efficacy for development. *Journal of Management*, 27(2), 123-140.
Meelissen, R. M., & Drent, M. (2008). Gender difference in computer attitudes: Does the school matter? *Computer in Human Behaviour, 24*(3), 969-985.
Ministry of Education Malaysia (MOE), (1999). The Malaysia smart school: An MSC flagship application, a conceptual blueprint. Retrieved January 15, 2006 from http://www.msc.com.my/smartschool/downloads/blueprint.pdf.
Mohammed, J., & Al-Karki, J. (2008). Integrating Internet into traditional education: A practical study of university students' usage and attitudes. *The International Arab Journal of Information Technology, 5*(3), 45-63. Myers, J. M., & Halpin, R. (2002). Teachers' attitudes and use of multimedia technology in the classroom: Constructivist-based professional development training for school districts. *Journal of Computing in Teacher Education*, 18(4), 133–140.
Nai Li & Kirup G. (2007). Gender and cultural differences in Internet use: A study of China and the UK. *Computer & Education*, 48, 301-317.
North, A. S., & Noyes, J. M. (2002). Gender influences on children's computer attitudes and cognitions. *Computers in Human Behavior, 18*(2), 135-150.
Odell, P., Korgen, K., Schumacher, P., & Delucchi, M. (2000). Internet use among female and male college students. *CyberPsychology & Behavior, 3*(5), 855-862.
Orhun, E. (2002a). Computer-Based Cognitive Tools. In E. Orhun, & P. A. M. Kommers (Eds.), Information and communication technologies in education: a focus on cognitive tools, Turkiye: Ege University Press, 17-26.
Panteli, N., Stack, J., & Ramsay, H. (1999). Gender and professional ethics in the IT industry. *Journal of Business Ethics*, 22(1), 93–101.
Preliminary Report Malaysian Education Blue Print 2013-2025. (September, 2012). Retrived from www.moe.gov.my/userfiles/file/PPP/Preliminary-Blueprint-Eng.pdf.
Pope-Davis, D. B., & Twing, J. S. (1991). The effects of the age, gender, and experience on measure of attitude regarding computers. *Computer in Human Behaviour, 7,* 333-339.
Raykov, T., & Marcoulides, G. A. (2008). An introduction to applied multivariate analysis. New York: Taylor and Francis.
Rogers, E.M. (1995). Diffusion of innovations, 4th edition, The Free Press, New York.
Rosenthal, M., & Spiegelman, M. (1996). Evaluating use of the Internet among academic reference librarians. *Internet Reference Services Quarterly, 1*(1), 53-67.
Sainz, M., & Saez, M. L. (2010). Gender differences in computer attitude and the choice of technology related occupations in a sample of secondary students in Spain. *Computers & Education, 54*(2), 578-587.
Selwyn, N. (1997) Students' attitudes toward computers: Validation of a computer attitude scale for 16-19 education. *Computers and Education,* 35-41.

Shashaani, L. (1993). Gender-based differences in attitudes toward computers. *Computers and Education*, *20*(2), 169-181.
Shaw, L., & Gant, L. (2002). Users divided? Exploring the gender gap in Internet use. *CyberPsychology & Behavior, 5*(6), 517-527.
Smith, B., Caputi, P., & Rawstone, L. (2000). Differentiating computer experience and attitude towards computers: An empirical investigation. *Computers in Human Behavior, 16*, 59-81.
Spacey, R., Goulding, A., &. Murray, I. (2003). ICT and change in UK public libraries: Does training matter? *Library Management*, 24 (1-2), 61-69.
Steiger, J. H., & Lind, J. C. (1980). Statistically based tests for the number of common factors. *Paper presented at the Psychometric Society Annual Meeting*, Iowa City, IA.
Swann, D. (2003). ECDL for educators: ICT skills training in context. *Computer Education, 103*, 16-17.
Tasir, Z., Mohammad El Amin Abour, K., Abd Halim, N, & Harun, J. (2012). Relationship between teachers' ICT competency, confidence level, and satisfaction toward ICT: A case study among postgraduate students. *TOJET: The Turkish Online Journal of Educational Technology*, 11(1). 138-143.
Tearle, P. (2003). ICT implementation: What makes the difference? *British Journal of Educational Technology*, 34(5), 567–583.
Teo, T., (2008). Pre-service teachers' attitudes towards computer use: A Singapore survey. Australasian *Journal of Educational Technology*, 24(4), 413–424.
Thomas, A., & Stratton, G. (2006). What we are really doing with ICT in physical education: A national audit of equipment, use teacher attitudes, support, and training. *British Journal of Educational Technology, 37*(4), 617-632.
Tsai, C., Lin, S. S. J., & Tsai, M. (2001). Developing an internet attitude scale for high school students. *Computers & Education, 37*, 41-51.
Van Braak, J. (2001). Individual characteristics influencing teachers' class use of computers. *Journal of Educational Computing Research*, 25(2), 141–157.
Van Braak, J., Tondeur, J., & Valcke, M. (2004). Explaining different types of computer use among primary school teachers. *European Journal of Educational Psychology*, 19(4), 407–422.
Woodrow, J.E. (1992). The influence of programming training on the computer literacy and attitudes of pre-service Teachers. *Journal of Research on Computing in Education*, 25 (2), 219-200.
Zhang, Y., & Espinoza, S. (1997). Affiliations of computer self-efficacy and attitudes with need for learning computer skills. *Journal of Educational Computing Research, 17*, 371-383.

MLEARNING SCAFFOLDING MODEL FOR UNDERGRADUATE ENGLISH LANGUAGE LEARNING: BRIDGING FORMAL AND INFORMAL LEARNING

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ABSTRACT
Learning using mobile devices also known as mLearning is the current buzz word in the present debates over the use of technology in education. Although mLearning has a high prospect for future education, it is yet to be incorporated widely in mainstream formal education. The lack of a contemporary theory of learning and model for the mobile era has been one of the main issues hindering the incorporation. Although past studies have discussed learning theories and models for mLearning at great length, there is a wide gap in the investigation of theory and model for language-learning in the mobile context. Hence, this paper aims to describe how learners could be assisted in language-learning via supportive scaffolding using mobile devices at the undergraduate level using Gilly Salmon's five-stage scaffolding model. This model is supported by Vygotsky's Zone of Proximal Development as the basis of learning theory. A case study was conducted on undergraduate language-learning in a private university in an attempt to seek how this model could be applied for mLearning. The results from the study revealed improvement in learners' language performance but more importantly the results also suggested some adaptations to be made to the model in order to adapt it to language-learning in the mobile context. As mLearning should include informal learning, the key characteristic of the adapted model shows how formal learning and informal learning can be interwoven using mLearning.
Keywords: mLearning, Scaffolding, Zone of Proximal Development(ZPD), Scaffolding model

INTRODUCTION

The learning society has been transformed from 'wired society' to become 'mobile society' with the advent of wireless technology. The design of learning across the mobile contexts, especially for mainstream education need to be guided by theory in defining the education practice across this context and also because of the ability of theory in defining research agenda and producing predictions and generalizations (Traxler, 2009). Although past studies have discussed learning theories and models for mobile learning (mLearning) at great length (Collins & Thomas, 2010), there is a wide gap in the investigation of a specific mLearning theory or model for the learning of a particular knowledge field or skill such as language-learning, considering that learners use different learning approaches for different knowledge subjects or skills.

MLearning models from past studies mainly focus upon mLearning infrastructure and access system (Kinshuk & Lin, 2004), tutoring system (Bull & McEvoy, 2003; Kazi, 2005) or mLearning adoption and policy (Barker, Krull & Mallinson, 2005). However, these models are techno centric in nature, which are useful within the context of how mLearning could be delivered technically. Although studies on the aspects of pedagogical learning model exist such as by Brown (2005) or Shih & Mills (2007), the learning models describe mLearning process for learning in general for any areas of knowledge, course or skill. Though Chen & Hsu (2008) presents an mLearning model for English Language-learning, the model actually focusing on a personalized tutoring system in support of language-learning rather than the learners' learning process of language skills. Hence, the focus of this paper is to propose a pedagogical mLearning model for language-learning, which describes how the learning process of the learner is mediated through mLearning. The model focuses on the learner's learning which foregrounds technology support (technical system, infrastructure, technology or mobile devices), but at the same time not to discredit the role of technology. However, the model at the same time should be able to address the learning and teaching problems as this ability would result in effective instruction (Isman, 2005). Thus, we adopted Gilly Salmon's Five-stage model to describe undergraduate language-learning, capitalizing on interaction as the medium of learning. The key characteristic of the model shows how formal learning and informal learning can be interwoven using mLearning in view of incorporation of mLearning in mainstream education. This is important because mLearning is also about creating a seamless space in bridging formal and informal learning (So, Kim, & Looi, 2008). In justifying the use of the model, section 2 of this paper elaborates on interaction as the essential component in learners' language-learning via mLearning. We support the adoption of Gilly Salmon's Five Stage model with past existing learning theory such as Vygotsky's Theory of Zone of Proximal Development (ZPD), bridged by 'scaffolding' as the central theme of learning.

In the literature, there is a lengthy discussion on how mLearning should be theorized, but the discussions are mainly centered on theories describing mLearning in general (Keskin & Metcalf, 2011; Naismith, Lonsdale, Vavoula, & Sharples, 2004) leaving a large gap in mLearning theories for a specific field of knowledge or course subject. Thus, in this paper, we propose to adopt Vygostsky's ZPD to view how students generally learn via mLearning through interaction. Based on this theory, through interaction, the notion of scaffolding is introduced to describe how learners were aided in achieving their language-learning goals. Since studies focusing on scaffolding learning in classroom setting is scarce (Kim & Hannafin, 2011), this study would help in filling the gap exclusively with the incorporation of mLearning in undergraduate language classroom via scaffolding. Hence, in section 3, we employ Gilly Salmon's Five Stage scaffolding model to describe the process involved in assisting learners to reach their learning aims. In investigating further the relevancy and effectiveness of this model in the learning process, we conducted a case study as elaborated in section 4. Section 4.1 describes the results and discussion of the case study which reveals the effectiveness of the model for mLearning but more importantly on the adaptations needed to be amended on the model. The paper ends with the conclusion in section 5, which discusses the contribution and implication of the model in language-learning via mLearning in future education besides proposing further recommendations for the study.

THEORETICAL FRAMEWORK : VYGOTSKY'S THEORY OF ZONE OF PROXIMAL DEVELOPMENT (ZPD)

ZPD is one of the three major themes in Vygotsky's Social Development Theory (1978). According to Social Development Theory, Vygotsky envisages that social interaction precedes development where consciousness and cognition is the end product of socialization and social behavior. Vygostky defines the ZPD as "The distance between the actual developmental level as determined by individual problem-solving and the level of potential development as determined through problem- solving under adult guidance or in collaboration with more capable peers" (Vygostky, 1978:86). In other words, referring to Figure. 1, ZPD is the distance between the most difficult task someone can do alone and the most difficult task someone can do with help (Vygotsky in Mooney, 2000:83).

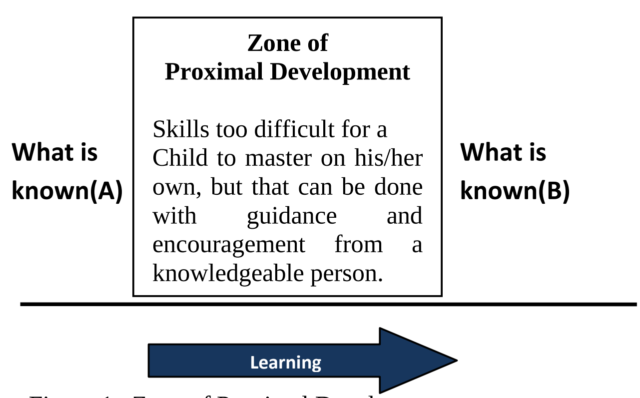

Figure 1. Zone of Proximal Development

In his theory, Vygotsky stresses that interaction is vital for a learner in the edge of learning where the learner can benefit from the interaction to enhance his or her learning achievement. He stresses that interaction between the learner and other more skilful peers could effectively aid in developing the learner's skills and strategies. In the context of this study, lecturers may include cooperative language activities where skilful peers could help less competent language learners within the learners' zone of proximal development. Now, these more skilful peers are what Vygotsky terms as the More Knowledgeable Other (MKO). MKO is an important concept that relates to the difference between what a student can achieve on his own and what the student can achieve with the guidance and encouragement from a more skilled partner. This concept implies that not necessarily higher interlocutors such as lecturers or instructors but other students qualify to be the MKO too. The assistance given by the more skilled learners here is what is also termed as 'scaffolding'. However, Vygotsky never used the term scaffolding in his theory, but the term was first introduced by Wood, Bruner, & Ross (1976)(cited in Tharp & Gallimor, 1988) as a metaphor to idealize the role of a teacher. Vygotsky suggests that when a student is at the ZPD, he should receive the appropriate assistance (scaffolding) by an MKO just enough to achieve the task. Once this student gain mastery of the task, the 'scaffolding' may be removed, and he would be able to face the task on his own again. This is likened to scaffolding as a metaphor taken from building construction where the scaffolds are use to support workers to construct a building, and the scaffolds will be removed after the building is completed (Johnson, Christie, & Wardle, 2005). However, in education, this metaphor is argued as more suitable for a "well-defined end" and is teacher-centered (Duffy & Cunningham, 1996, p.183). This type of scaffolding is known as 'Directive' scaffolding where students are expected to acquire standard skills and knowledge taught through series of specified content and strategies designed by an instructor. Conversely, in practice, scaffolding should be a learner-centered strategy where learning ends are determined by the learners' needs. This type of scaffolding, better known as 'Supportive' scaffolding, which manifests in instructions tailored to students needs based on their own ability and interest (Lenski & Nierstheimer, 2002). In scaffolding, the ZPD actually serves as a critical concept.

ZPD concept was originally applied in face-to-face tutoring but later it was found to be also successful in other settings where computer software could serve as scaffolding support. For example, a software design framework, the Learner Centered Design (LCD) was developed based on scaffolding as main support for learners (Soloway, Jackson, Klein, Quintana, Reed, Spitulnik, Stratford, Studer, Eng, & Scala, 1996; Wood, Bruner, & Ross, 1976) and also the ECOLAB (Luckin, 1999), a tutoring system developed based on the Vygotskian design framework which provides interactive environments to assist children aged 10-11 years to learn about food chains and webs. ECOLAB is found effective in assisting the children through providing appropriate challenging activities. The learner model is also able to track the learners' individual capability and potential in order to provide the right amount of collaborative assistance during the activities. In this way, ECOLAB not only assists learners in reaching beyond what they could not achieve alone through the activities but also explicitly direct them through the activities with success. Other examples like QUADRARIC (Wood, H. & Wood, D., 1999) offers assistance when needed by the learners where a tutor would continually monitor their activities logged into the system in order to response when help is needed and also to determine the type of help whereas DATA (Wood, H., Wood, D., & Marson, 1998) would offer online assessments to learners and offer tutoring to them based on evidence of errors made. One of the most recent studies was one conducted by Zhang & Quintana (2012) who design the Digital IdeaKeeper, a scaffolding software tool to assist students with online inquiry. The software tool resulted in students' online activity to be more systematic, integrated, efficient, continuous, and focused. Furthermore, the online environment which facilitates the students' activity allows them to participate and manage their own learning (Isman, 2004). All these tutoring systems capitalize on scaffolding the learners to reach their projected learning outcomes where assistances are offered based on the learners' individual needs, level and pace within their ZPDs.

In all the examples given above, the MKO plays a significant role in providing the scaffolding for the learners to deal with their ZPD and the MKOs are usually a more capable peer, a tutor, or a lecturer. However the MKO may not necessarily be in human form. As an example of this, John Cook (2010) presents an augmented context for development mediated by mobile phones in reconceptualizing Vygotsky's notion of ZPD. He argues that the context of learning for the century is augmented and accelerated by mobile devices and technologies through new digital tools and media. This actually supports augmentation as a fundamental way in conceptualizing mLearning (Metcalf, 2006 in Quinn, 2011; Quinn, 2011).

As Vygotsky's Theory of ZPD postulates learning on social interactions in facilitating learners' learning and cognitive development, the theory supports mLearning as mLearning also thrives on interaction and communication among individuals for learning too. Interestingly, if taken in the opposite perspective, mLearning could in turn support this learning theory. For example, one of the criticisms of ZPD is that it is impossible for a teacher or an instructor to attend to all his students' ZPD in the classroom due to factors like time constraint and large class size. To add to the odds, different students would have distinct ZPD and time taken to attend to each of the ZPD depends on the students as each of them would have a different learning pace. However, through mLearning, via mobile technologies and devices, there is a larger repertoire of communication channels which the students could resort to seek help from more 'experts'(MKO) other than their teachers or instructors to interact with in order to meet their learning needs at their own pace in or beyond the classroom walls detached from time constraint.

In the scope of this study, Vygotsly's ZPD was employed to theorize mLearning which capitalized on interaction where scaffolding serves to aid learners to achieve their learning goals as discussed in this subsection.

CONCEPTUAL FRAMEWORK: THE ADAPTATION OF GILLY SALMON'S FIVE-STAGE SCAFFOLDING MODEL

However, the main issue underlying Vygotsky's ZPD theory is how learners could actually be aided through scaffolding in overcoming their ZPD to reach the next level of knowledge or skills from point A to point B as shown in Figure 1. In other words, what would be the learning process or stages that the learners should go through before they reach their learning target? Thus, we propose Gilly Salmon's Five-Stage Scaffolding model to be adapted to conceptualize how learners could be aided using mLearning to overcome their ZPD. This forms the conceptual framework of the study as shown in Figure 2.

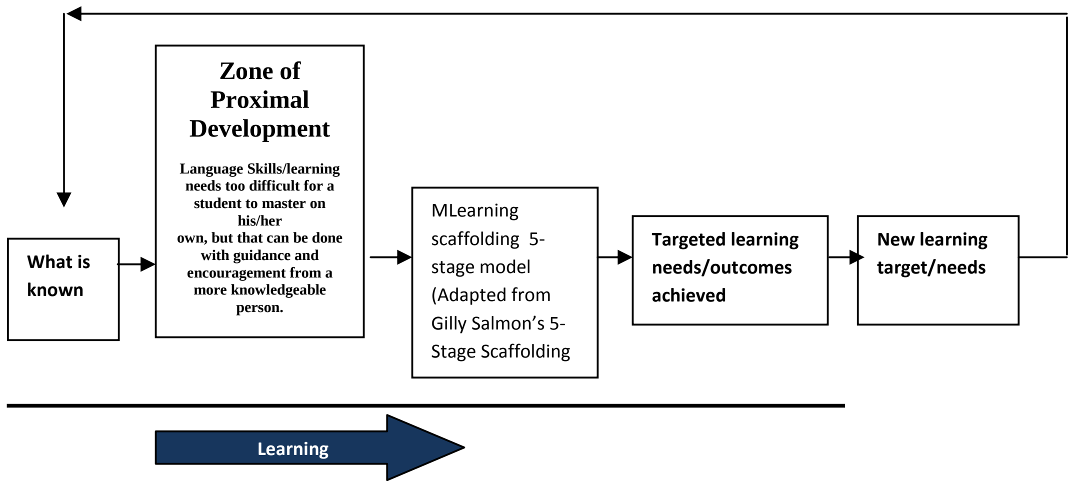

Figure 2. Scaffolding MLearning Conceptual Framework

The Gilly Salmon Five-stage model as shown in Figure 3 is chosen based on four reasons. First, although the model was originally developed for eLearning, it supports social learning theory which capitalized on meaningful interaction based on Salmon's key premise. The premise holds that the learners' ability to learn online goes beyond the boundaries of technical aspects, encompasses an underpinning social learning principles, where every individual surrounding the learner plays an important role in learning through his or her relationship with them under the support and guidance of a moderator. This aligned with the theory of mLearning as discussed in this paper which saddles on interaction as medium of learning. Second, similar to Salmon's key premise on eLearning, mLearning concept should not be techno centric or conceptualized in terms of technology or devices, rather learning should be perceived as a result of interactions among learners, teachers, mobile devices, knowledge, and the learning context (Abdullah & Saedah, 2010). Third, Salmon's model links to the theory discussed earlier as it could also be regarded as an extension of Vygotsky's ZPD (Attwell, 2006). According to the model structure, the moderator gradually shifts the responsibility of learners' development to the learning community guidance while the learner eventually takes charge on his learning by developing own scaffolding through relationship with other members of the community an as well beyond the community.

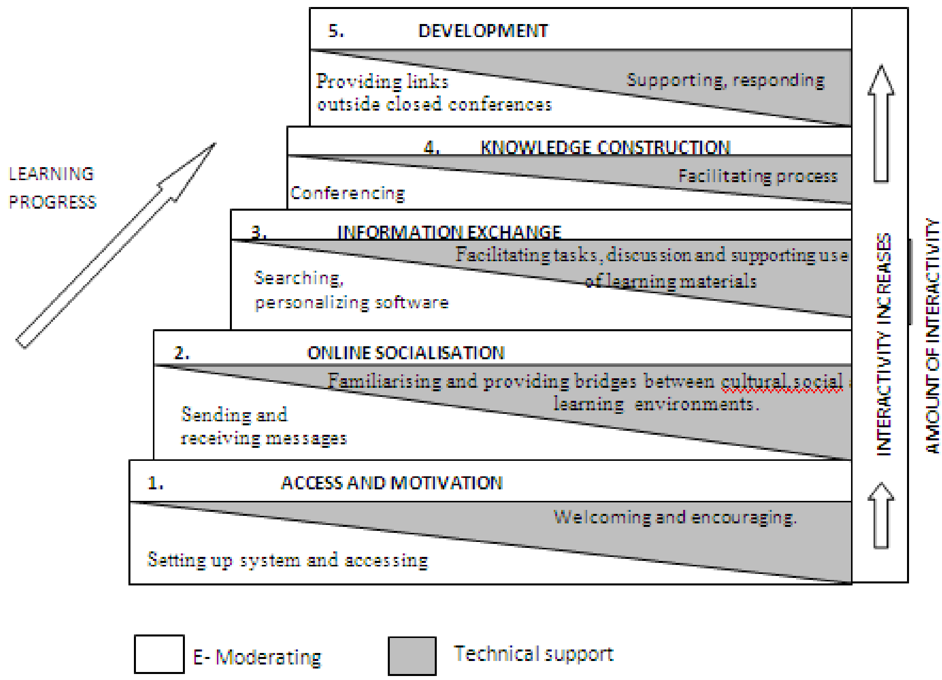

Figure 3. Gilly Salmon's five-stage model (Salmon 2004).

Another crucial reason why this model is chosen is that as mLearning should include informal learning, the key characteristic of the model shows how formal learning and informal learning can be interwoven in a mobile context in aiding learners to reach their learning goals (Abdullah & Saedah, 2011) . Briefly, about the model; in Stage 1, the aim is to encourage and guide students to participate in the online conference. Technical support is given to the students as the main focus task of the instructor. Stage 1 ends with students' first posting of message. Stage 2 aims to get students to establish their identities and initiate interaction and familiarize with it. Stage 3 is where interaction heightens with the use of learning management software for networkings. In Stage 4, participants develop group discussions and collaboration among themselves in negotiation of knowledge and solutions to individual needs of learning. Finally, Stage 5 promotes individual reflection of what they have learned and achieved as well as critical thinking to advance to next learning goals. In investigating how this e-learning based model could settle in language-learning through mLearning, the paper describes a small-scale case study using the model in an undergraduate English Language course as described in the following section.

THE CASE STUDY: ADAPTING GILLY SALMON'S FIVE STAGE MODEL FOR MLEARNING UNDERGRADUATE LANGUAGE LEARNING

The main aim of the study is to investigate how this model could suit mLearning and deduce from the results what changes could be identified if any, by comparing activities done by students with activities in the model. The model was used on 'Professional Communication Skills (PCS)' course, an undergraduate English Language course in a private university. It is a compulsory subject to be taken in fulfillment of a four year undergraduate study among engineering students. This course emphasizes the theory and practice of professional communication at the interpersonal level, in teams and to a large group. The course serves to build upon the students' academic and professional knowledge acquired through other core engineering or technical courses and aim to enable them to be highly effective in expressing themselves and in imparting their professional and technological expertise in a variety of jobs, business and professional settings. The whole course was designed to last fourteen weeks for each semester and divided into four parts: Process Description (Group Poster presentation), Technical Oral Presentation (Individual presentation), Business Meeting (Group presentation) and Persuasive Oral Presentation (Individual presentation). The course has been conducted in formal classroom settings complemented with eLearning. However, the eLearning facility was largely used by students to access notes and powerpoint slides for course content uploaded by lecturers and for administrative announcements. Since the course was still conducted in traditional face-to-face classroom setting, students were strictly required to adhere to the minimum 80% physical class attendance. Due to this regulation, we were only given permission by the university to select one of the four parts during the course to conduct the study. We selected the Persuasive Oral Presentation component to facilitate the study. There were 25 participants (maximum number allowed) in the course. The students were observed following their use on mobile devices in going through the presentation component for 48 days (remaining time for the semester allotted for the course component).

In a conventional classroom, for the Persuasive Oral Presentation component, students will be given some lectures on guidelines on the effective persuasive speech aided by examples of authentic samples of effective and non-effective presentation. There are opportunities given to students to have a mock trial on persuasive presentation before their evaluation but due to time constraint and affective factors (embarrassment, lack of confidence, etc.), there is usually room for the most two students to volunteer for the trial. Their presentation will be evaluated by the lecturer as a guide to other students but comments will be limited to students' individual presentation; in other words, the strength and weaknesses of the particular students may not be similar to other students who have not the opportunity to present. All these happened on the first week of lecture for the component. The subsequent week until the end of the time allotted for this persuasive presentation component will be for evaluation of students' presentation. All students were given one turn to present and receive their evaluation marks in the course. Students who get to present later will be more fortunate as they could learn from the strength and weaknesses of their friends' earlier presentation as a guide for other students to present better. In other words, students were largely not given the opportunity to improve on their presentation output in the conventional classroom.

For the mLearning version of the course, students will be briefed on the course design on the first day. The students were told that there were no physical classroom contact hours in the course (a great motivation for them to participate in mLearning) as they did not have to attend any classes. However, the students only have to attend classes for the last three consecutive days towards the end of the course for summative evaluation by their lecturer. However, learning would take place anytime or all the time wherever they were. We were the participant observers in this study. Students were divided into groups of five per group. Every student conveniently owned a smart phone. A standard mobile blog for the course using 'BlogmeNow' mobile apps was set up to be shared by everyone, including the lecturer. Students may post and respond to messages, upload and share notes and even videos of presentation. Students were encouraged to set up their group or inter group mobile blogs to interact, but they have to inform and share it with the lecturer for observation purposes. These individual blogs if set up would be for a particular scope of discussion shared through common interest among a particular group of students. The groups of students were given tasks similar to what is shown in Table 1 which were based on the five-stage model in Figure 3.

Table 1: *Sample mLearning Tasks Based on Gilly Salmon's Five-stage Model*

Stage and Duration	*Sample of Tasks*
Access and Motivation (3 Days)	Access the blog through BlogmeNow apps: PCS Persuasive Moblog by signing up creating own username and password. Lecturer initiate by posting the first message: 'Alright, welcome to PCS Persuasive Moblog. Maybe you could share with us how do you feel about going through this course using your phones?
Online Socialization (2 Days)	Make sure you have let others know your blog identity. You may discuss about the power point slide on Persuasive Presentation and evaluation guide attached to the blog by posting questions or suggestions on the blog. You may even discuss about your topic of presentation and elicit comments from other friends for suitability of the topic or improve on it.
Information Exchange (7 Days)	Study the evaluation form on what to expect from you in presenting an effective persuasive presentation. Discuss and post suggestions on how to meet the criteria. Focus on one criterion at a time. Suggestions may in a form on a sample video presentation obtained from YouTube or even a website link to resources.
Knowledge construction (30 days)	By now you should have chosen a topic for your presentation. Make a 7 minute video presentation, record it and post it on the blog. Elicit comments. You may also comment other students' work too compare the presentations. Identify common or shared problems or weaknesses which you want to rectify. You are encouraged to form a separate blog on your own with your friends and discuss the problem in detail. Remember to elicit help and comments from others. Who knows you may come out with new technique of your own in resolving the problem or weaknesses to improve on your presentation. Try it out to see how effective they are. Ask your friends to vote for effectiveness of your presentation after you have rectify the problems. You are strongly suggested to access 'urtak.com/' for quick survey result on your presentation.
Development (3 Days)	Have you found the best solutions to your problems? Are you satisfied with your achievement? Do you think the solutions were the best in the book or because it fits your presentation style? Share these experiences with your friends

This is to facilitate the observation and analysis of data to investigate what happened throughout the stages in mLearning in order to evaluate how the model fits in mLearning. The tasks shown are just samples to guide the student and their lecturer in the conduct of their learning in mobile environment. Students were told that they would be evaluated for participation in the blogs (ongoing assessment) and on their final presentation (summative assessment) at the end of the course. Students' participations in blogs were graded according to their level of engagement as described in Table 2. Data derived from this study were analyzed using content analysis and triangulated using responses from focus group interviews. In analyzing the content of messages, we concentrated on understanding the behavior of learners which occur naturally while interacting through the blogs. Blogs promote natural interaction because, students could assume anonymous identity and this allowas them the liberty to express their ideas and feelings without social threats. Ideas and expressions would be authentic and this facilitates reliable data in gauging any aspects of students' learning skills. For example, a recent study conducted by Norlidah, Saedah, Mohd Khairul, and Zaharah (2013) revealed that the use of social blogs such Facebook could enhance the creativity of Islamic Studies students in formal educational settings through their analysis on students conversation exchanges through the social sites. In this study, we used 'idea units' for analysis (Potter and Wetherell, 1989 in Salmon, 2000).

Table 2: *Participation in Blogs According to Level of Engagement*

Level	*Types of Engagement*	*Example of activities*
1	Observing and following	Observe and respond to blog messages either asking questions, or adding comments.
2	Contributing	Actively responding to blog messages, upload and share information on effective presentation or even post own presentation to elicit comments.
3	Owning	Form or participate in new blogs to discuss specific issues and problems shared commonly among them and seeking help either from peers or lecturers.
4	Leading	Take the initiative to seek other students having problems and offer assistance. This student could share the same problem and gather them to form a blog to rectify the problem.

The statements posted by the students and lecturer were letter-coded according to aspects listed in Table 3.

Table 3: *Coding Category of Blog Messages*

Aspects	Code	Description/Examples
Technical	T	connection and accessing blog content, software, configuring mobile devices, etc
Learning	L	Eliciting comments on oral presentation and reflect on them, proper phrases to be used in delivering speeches, techniques of persuasion, gestures, etc.
Moderating	M	Usually it is the task for the instructor/lecturer. Example of moderating would be encourage students to post messages and participate in blogs, ensure continuity of active participations by posting tasks or offer directions to solve problems, guide and direct students to stay focus on relevant discussion.
Teaching/Instruction	I	Commenting on presentations of other students. Giving advice on suitable techniques, appropriate gestures, or even correcting grammar errors.
Non-related	NR	Messages which are not related directly to the course such as invitation for an event, expression of boredom or frustration, expression of gratitude, happiness or satisfaction, etc. Some of these messages are worthwhile to be analyze; for example in detecting the language needs of the students such as when a student express his frustration on not be able to relate to his audience.

This letter-coded method would help us to categorize the messages according to tasks and activities for every stage to provide a better understanding of the progress of students' learning and use of scaffolding from one stage to another. This would also aid in re-categorizing of the stages to suit mobile language-learning. Besides analysis of students' messages, we conducted focus group interviews with all the students to improve understanding of students' experiences (Morgan, 1988 in Salmon, 2000) in using their mobile devices in enhancing their language-learning. This would also ensure reliability of data collection. Based on the results, adaptations made in the model were presented to a panel of experts for evaluations.

There were sixteen(16) experts with at least 15 years of teaching experience in language teaching, and either have experience in evaluating new technology in instruction or evaluating language content materials. Eight of the experts were course instructors of the course subject being studied. The experts are required to indicate their responses based on 5 point Likert scale for each proposed adaptations in each stage in the questionnaire. They are also allowed to contribute any additional comments for the items in the space provided at the end of each stage. Responses from the experts will be analyzed for median and inter-quartile range. The use of median aligned with the literature which favours the use of median scores (Jacobs, 1996 cited in Hsu & Sanford, 2007) in best reflecting convergence of experts' opinion. In this study, median score of 5 is considered the highest point of agreement and vice versa median score of 1 is considered the lowest point. In another point of view, Boonan (1979) supported inter-quartile range as having higher precision compared to mean score in describing differences in experts' views on each items. In this study, consensus of experts was determined using inter-quartile range following the levels as below:

a) High consensus : Inter Quartile Range between 0 and 1
b) Moderate consensus : Inter Quartile range between 1.01 and 1.99
c) No consensus : Inter Quartile Range 2.0 and above.

FINDINGS AND DISCUSSION

The results revealed high level of students' activity in the mLearning course (refer to Table 4). The average number of postings recorded was 29 per student in this course component. In the preliminary stages 1 and 2, the lecturer's postings were more in numbers and frequency to initiate students' participation in their mobile blogs and also due to the reason the students were still new to the mode of learning (mLearning). Responses (message posted) from students were mostly short at these stages. When probed in the focus group interviews, one student commented,

> *" Actually…I want to see what is actually going on first… to have some idea how to start. Most of us observe more but it seems exciting."*

(Transcript A1: 00:23:24)

One of the students who responded to the lecturer's earlier postings in Stage 1 has this to remark in the focus group;

> *"At the same time, we feel being left out if we wait longer. But we could not think what to say except, 'Yes… or I agree too'. Maybe we replied anyway… because fearing being left out."*

(Transcript A1: 00:18:15)

However, as more postings were uploaded especially in discussion of the course component, the lecturer's postings decreased in numbers and in frequency, dominated by students' postings especially in Stage 3 and 4. Overall at these stages (Stage 3 & 4), the ratio of students' posting to the lecturer is 5:1. Students seemed to gain more confidence and more engaged in the discussions, especially to improve on their presentations.

Students at large also reported their appreciation in the lecturer's virtual presence either in welcoming them, posting comments, asking questions and giving suggestions, etc.) as one of them commented in the blog:

> *" I know that I have something to say… but could not figure out what it is, but when Dr Razol (their lecturer) keeps on asking questions, it changes everything. I finally get the idea what I want to talk about."* (NR)[1]

(Transcript A1: 01:15:25)

This stressed the important role of the moderator [2]. Not only had the number of students' postings increased, but the postings were longer and gaining quality as some students even assumed the role as a moderator or an instructor to other students as they commented on their presentations. For example, one of the comments was:

[1]NR- Refer to Table 3

[2] Referring also to More Knowledge Others (MKO) mentioned in Vygotsky's ZPD

" I observed that in your video presentation, whenever you begin to refer to written notes in your hand, you paused more frequent and this disrupt the flow of your presentation. This reflects that you are not confident and ready though you are. I think you can present better without notes unless you can handle notes without pausing.." (I)

Table 4: *Comparison of Blog Postings Between Students and Lecturer/Technician(MKOs)*

STUDENTS'	Stage 1		Stage 2		Stage 3		Stage 4		Stage 5		TOTAL	
POSTINGS	f	%	f	%	f	%	f	%	f	%	f	%
Technical	15	14.7	21	9.8	25	10.8	21	8.2	8	6.3	90	9.7
Learning	5	4.9	16	7.4	78	33.6	82	32.2	22	17.2	203	21.8
Moderating	2	2.0	14	6.5	38	16.4	46	18.0	14	10.9	114	12.2
Teaching/Instruction	2	2.0	2	0.9	28	12.1	68	26.7	15	11.7	115	12.3
Non-related	12	11.8	46	21.4	11	4.7	15	5.9	38	29.7	122	13.1
Total	36	35.3	99	46.0	180	77.6	232	91.0	97	75.8	644	69.1
LECTURER'S/ TECHNICIAN'S POSTINGS (MKOs)												
Technical	23	22.5	22	10.2	12	5.2	8	3.1	5	3.9	70	7.5
Learning	8	7.8	8	3.7	12	5.2	4	1.6	12	9.4	44	4.7
Moderating	18	17.6	48	22.3	15	6.5	8	3.1	8	6.3	97	10.4
Teaching/Instruction	12	11.8	38	17.7	6	2.6	3	1.2	3	2.3	62	6.7
Non-related	5	4.9	0	0.0	7	3.0	0	0.0	3	2.3	15	1.6
Total	66	64.7	116	54.0	52	22.4	23	9.0	31	24.2	288	30.9
GRAND TOTAL	102	100	215	100	232	100	255	100	128	100	932	100

Another side result of this study was that the students seems to averagely score higher in Persuasive Presentation component which employed this scaffolding model via mLearning compared to other components (Process Description, Technical Oral Presentation, Business Meeting) which were conducted in conventional classroom environment. This is indicated in Table 5 which shows a higher mean score in the Persuasive component (86.7) compared to the other components (Poster-79.5, Technical Presentation -76.9 and Business Meeting- 75.1).

Nevertheless, further studies need to be conducted to obtain conclusive evidence to determine a positive increase in students' performance in a language course that employed the scaffolding model. Proper experimental studies which involve both control and experimental groups need to be conducted to establish the evidence. However, since the focus of this paper is to evaluate the model, the findings shown in Table 5 only aims to suggest further studies in the investigation of the effect of the model on students' performance in their competence rather to report an evidence.

Table 5: *Students Scores in PCS Components*

	Poster	*Technical*	*Business*	*Persuasive*
Mean	79.5	76.9	75.1	86.7
Standard Error	1.361678	1.118087	1.689305	0.83043942
Median	77.5	76.7	75	86.7
Mode	77.5	73.3	75	88.3
Standard Deviation	6.808389	5.590435	8.446523	4.1521971
Sample Variance	46.35417	31.25296	71.34375	17.2407407
Minimum	67.5	65.8	60	80
Maximum	90	85	87.5	95
Sum	1987.5	1921.8	1877.5	2168.3
Count	25	25	25	25

4.1.2 Adaptations of Gilly Salmon's Five-stage model to form the MLearning Scaffolding Model for language-learning

Based on the results from the content analysis, focus group interviews and experts' views, there were some adaptations proposed to be made in the model to suit language-learning via mLearning as shown in Figure 4. Based on this model (Figure 4), learners are expected to master the required different technical skills in each stage that involves different moderating for each stage as described above.

The running bar 'interactive bar' indicates the increasing amount and the frequency of interactions among learners, content and context as the learners progress from one stage to another. For instance, at Stage 1, the student may interact with one or two students through a couple of electronic messages and gradually increase to more students more frequently with more messages and types of messages throughout the five stages which also constitute his or her learning process. Usually at Stage 5, the acquisition of new level of knowledge and competency will lead to new learning pursuit of the learner. Probing into the details, comparing the models on Figure 3 and Figure 4, the following changes at each stage that could be observed are as follows:

Stage 1 : Similar to the original model, this stage aims to promote individual learners' access and participation in social conference by welcoming them and providing technical support to facilitate use of mobile technology and devices in learning. Technical support could be shared with instructors, system providers as well as from other learners. An example of this support is indicated below (taken from an SMS message received by students):

" You need to download 'Blogmeaway' apps into your phone. It's free. Sign up an account and you may begin to use it immediately. Please refer to me or your other friends for assistance. Remember to use your real name for your network identity."

(SMS Input 12-26)

Students moved on to Stage 2 once they posted their first messages.

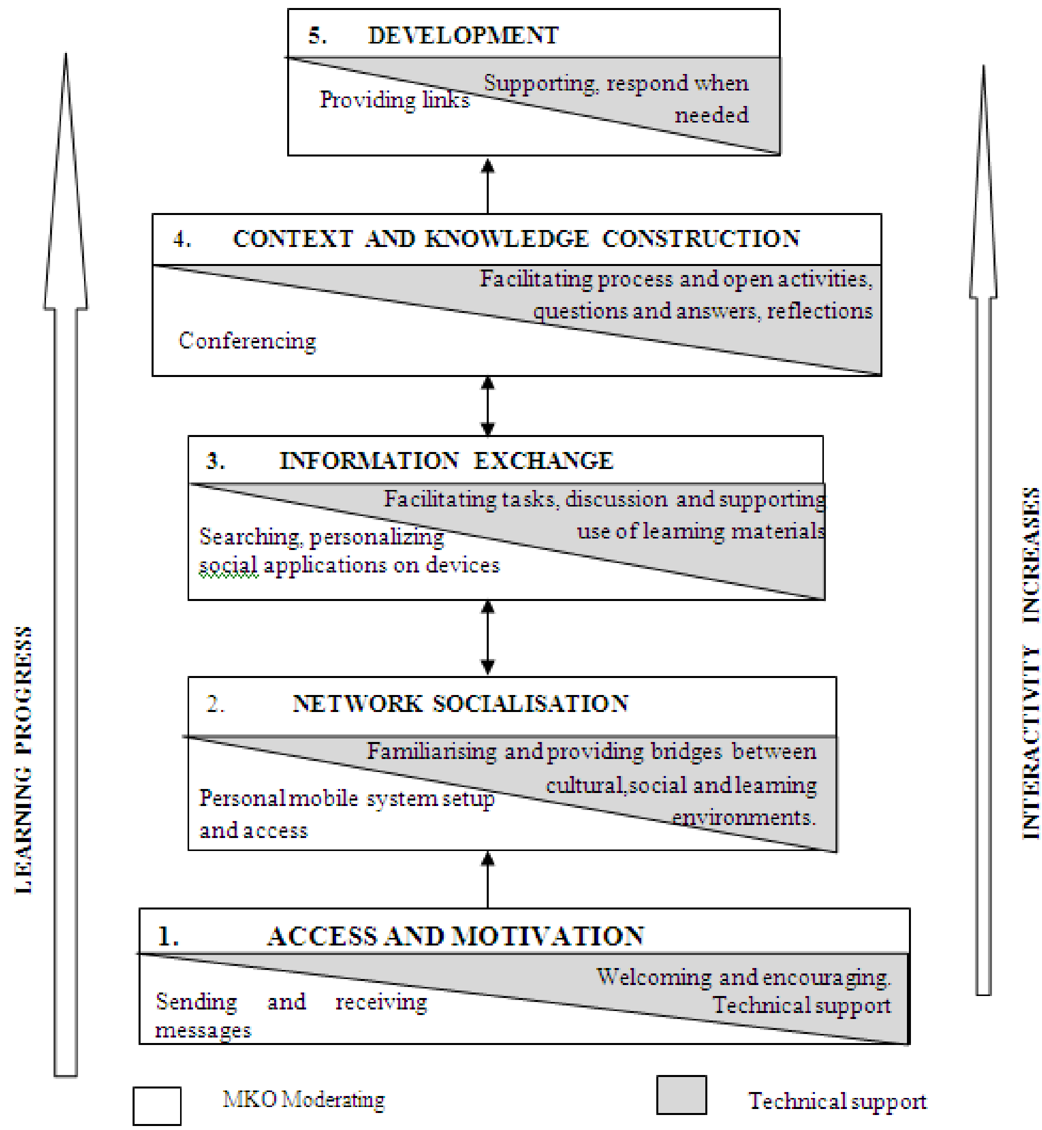

Figure. 4. MLearning Scaffolding Five-stage model (Adapted from Gilly Salmon's Model)

Stage 2: The experts propose the term 'Online Socialization' to be replaced with 'Network Socialization' to accommodate mLearning in this stage. This stage involves the students to establish their network identities rather than online identities and choose their social groups to interact by signing up as members or participants of a virtual community or even collaboratively creating own social groups relating to mutual learning needs with other individuals. Learning needs could be broad themes like socializing and writing or on specific needs like effective technical oral presentation or writing engineering research report. The term 'Network Socialization' replaced Salmon's 'Online Socialization' due to two premises:

1) Online is usually associated to connectivity to computer technology and communications which specifically refers to states or conditions of device or equipments or other electronic functional units (Federal Standard 1037C, 1996). This implies that online socialization relies on connectivity of computers and devices which is an essential factor for e-learning; thus an 'offline state' would compromise the learning process.

2) Network refers to a system of connectivity not only of technology devices, systems and applications but also of people. In the adoption of Salmon's model, network implies a shift of focus on technology to the act of individuals forming and generating communication networks among themselves to interact mediated by technology devices and applications. MLearning should place a primary focus on the learners, their mobility and interactions rather focusing on technology; hence learner-centered learning.

In the learning process, the learning environment and interaction among the learners should be the main foreground of the learners whereas the technology devices should be the background. In other words, the learning process continues with or without the connectivity of technology devices (online).

Stage 3: Stage 3 involves initial scaffoldings to facilitate students' development in their presentation skills where they begin to interact and cooperate with each other by exchanging learning experiences to support individual's learning goals. The focus of learning here should be on creating sustainable networks of human interaction to facilitate learning needs where the technology devices qualify only as medium. Information exchanges could be initiated back and forth among social softwares such as moblogs or podcasts, instant messages through Short Messages System (SMS) or Multimedia Messaging System (MMS), and voice calls on mobile devices, and face-to-face classroom interaction. Example of initial scaffoldings could be observed in the blog exchanges below:

" Student 1 : What to say first in our presentation ? So, that, people would give their attention...once we start.? Help...

Student 2 : I've got this nice idea... click on this link 'http://www.youtube.com/watch?v=7Zo1xE5a4vQ'on Steve Job's presentation. He went straight to the point announcing Iphone 4 accompanied with a simple but fantastic slide presentation with special effects."

(Blog B2)

However, the experts viewed that Stage 3 and Stage 2 should complement each other, hence the double direction arrow sign shown in Figure 4 unlike a one way follow up stage from Stage 2 to 3 in Gilly Salmon's model. As mLearning is more robust than eLearning in terms of access to learning (Saedah, Fadzilah & Muhammad Helmi, 2011), there will exist not singular but multiple social networks of separate groups of a whole community of learning which co-exist to cater various needs of learning. This is due to the mobility of the devices together with the learners coupled with robust 'push' and pull technology compared to eLearning stationary online technology, students at any time or place could effortlessly form own social groups and invite others to join. Thus, students especially at the earlier stage would move back and forth between stages 2 and 3 with the liberty to choose from a wide array of social groups before settling down on selected group to engage further into information exchanges. There are possibilities students would move back and forth between stages along their learning process while maintaining learning engagements of multiple social groups. In eLearning, due to the stationary online technology, students only learn after logging in a computer with network facilities; thus due to lack of mobility of both technology and learners, forming multiple social groups would be time consuming and students usually settle in one or two major social groups formed by the course administrator. Hence the one way advance from stage 2 to 3 in Gilly Salmon's model.

Stage 4: The experts propose the term 'Knowledge Construction' to be replaced by 'Knowledge and Context Construction'. This is the stage where interactions among students becoming more collaborative where students act on information shared in Stage 3 to form specific group discussions on mutual subjects. Students not only embark on knowledge constructions as in eLearning but in mLearning, they would also generate learning context on site that would also lead to more knowledge construction; the students may share common learning environment or context and develop the digital representation of the site or context using mobile technology. The site or context may not necessarily be a physical environment where the students is placed but could also be a network space or even a conceptual or abstract place such as a mutual learning subject or a learning problem (Nonaka, 1966). An example of this could be reflected through the blog exchanges below:

" Student 1 : Shakeel, I noticed that you are seeking help in overcoming 'stage fright... I and Suria have just form a new blog just to discuss and practice on ways to fight 'stage fright'. It's exciting. Some of our new members have even solve their problems... cool technique they used. We use live video feeds to practice and discuss ... Come, join us. (M)

Student 2 : Hey, thanks... How to join ?"(L)

(Blog B3)

Here, in the example, the students had created their separate blog on dealing with 'Stage fright' as shared context of learning dedicated for students who shared the same learning needs. Laurillard (2007) terms this act of learning through generating context as 'digitally-facilitated site-specific learning' which is an intrinsic nature of mobile technologies which is not shared by other distance learning technologies such as desktop and landlines. This type of learning is very motivating as it offers learners a high degree of ownership and control. Through digitally-facilitated site-specific, the learners could share common grounding instantaneously through digital representation of the learning environment or sites through video clips or pictures delivered to their mobile devices via MMS, podcasts, moblogs or bluetooth technology. This will consequently lead to meaningful interactions among learners to better achieve learning goals.

Again, similar to Stages 2 and 3, the experts viewed that stages 3 and 4 complement each other creating a bidirectional movement between stages as shown in Figure 4. Similarly, due to the robust mobile technology and mobility of both tools and learners, students are able to move effortlessly back and forth between stages of information exchange and knowledge constructions. In the process of constructing knowledge collaboratively, students need to continuously exchange information to allow sufficient inputs in constructing knowledge. For example, in constructing best practices in oral presentations, students need to have continuous support from each other and mobile networks to gain inputs in terms of good expressions, verbal and non-verbal language, visual aids and other essential criteria to produce effective presentations. Knowledge construction should not be time consuming and continuously developing and this is made possible with the mobility of tools and learners unconstrained by time and space unlike eLearning. Though collaborative knowledge construction is possible in eLearning environment, the stationary online networking and commitment of students to be with the computers would be time consuming and usually students would be put off by this idea.

Stage 5: This final stage is where the students reflect on what they have learned or acquired to help them achieve their learning goals. The reflection would lead to students' critical thinking to develop better or newer skills in developing higher competencies. For example, by reflecting on their learning process in Stage 4, learners would be able to understand better the elements to become better speakers and ways to utilize the new acquired skills to achieve their goals. This would also lead to new learning goals to develop further from their new acquired competency level. Another notable observation of students at this stage was that students became more responsible in their learning as they took charge in their own learning as their non-related aspect postings decrease significantly beginning at stage 3 onwards compared to stages 1 and 2. This was fairly understood as students were still familiarizing not only with the use of their mobile devices in capturing learning but also with the new mobile learning environment specifically in engaging themselves in socializing 'academically' with their peers. Although the students were familiar in using their mobile phones in socializing with others but most of the conversations were about personal and non-academic matters. They found it somewhat awkward at first to engage conversations on academic matters with their friends at first as one of the student said in one of the focus group interviews:
" I don't know about you guys... but it's weird to all of the sudden talk formal things with your friends, you know, SMS , blog or talk using phones. It's like during our school days when we were used to talk to our friends in Malay for years and force to speak to them in English all of the sudden in class. Awkward, isn't it...something like that... that's why at first I write something else at first in the blog..."

(Transcript A2: 00:25:25)

However, as the students progressed further in the stages, they became more responsible and the focus of their postings were more about Persuasive presentation matters, partly due to time constraint and deadline which the students had to meet. In Stage 5, the students were not only more focused and responsible on their learning but there were those developed critical thinking and had the ability to assess the mLearning approach as the students indicated in another focus group interview:

"Student 1 :For once I felt rewarded... rewarded to have this opportunity to socialize wirelessly with you all in learning something. I knew that we can learn something from phones but I never bargained to get a whole lot more. It brings new meaning to study in the university.

Student 2 :Yeah... you are given the trust to handle what you need to learn. I feel like my own boss.

Student 3 :"Another...in class, although I was with my friends studying together, but I felt strangely alone. Yeah...when it comes to understanding what the lecturer says, it is up to you whether you understand or not actually. Of course, we can ask questions, but I wouldn't ask if I thought everybody knows. I feel stupid to ask. That is what I mean by alone. But... through this new blog way using phones, it breaks that loneliness... it allows me to connect with others anytime having same problem and talk about the way out. In fact, I solve one of my slide presentation problems while in the bus. I learn more..."

Student 4 : I wish, we have this for all subjects in the university..."

(Transcript A3: 00:35:25)

These students were assessing how mLearning contributed to learner-centered learning giving them the opportunity to manage their on learning according to their style, pace and needs. The conversation above describes the effect of sense of ownership to students' learning. Sense of ownership is about giving choices in learning and this motivates students to learn as they could do things which they chose to rather than being told to do so (Truby, 2010; Dlodlo, Tolmay, and Mvelase,2012) although this means that the customary role of teacher-student is challenged where students take charge of the learning process instead of the teacher (Isman et al, 2012). Another point to be highlighted is that in Robiatul's conversation above, she was actually talking about 'digitally-facilitated site-specific learning' through context mutually generated by learners in achieving common goals of learning as mentioned in Stage 4. Laurillard (2007) defines digitally-facilitated site-specific learning as a unique learning advantage through mobile devices because of the degree of ownership and control afforded and this is motivating to students towards learning.

The proposed adaptation to Gilly Salmon's model to suit language-learning in the mobile context as discussed above, received high consensus level of experts' opinion in agreeing to the adaptations where their opinions are as consistent for every stage in the model as shown in Table 6.

Table 6: *Experts' Evaluation on Proposed mLearning Scaffolding Model*

Stage	*Proposed adaptation based on study*	*Median*	*Mode*	*IQR*
1	Maintain(similar to original model)	5	5	0
2	Network Socialization replace Online socialization	5	5	0
3	Maintain(similar to original model)	5	5	1
4	Knowledge and Context Construction replace Knowledge Construction	5	5	0
5	Maintain(similar to original model)	5	5	1

*IQR- Inter-quartile range

LIMITATION OF THE STUDY

This study was conducted using case study method based on context-based. Adaptation of the model was done based on a small case study among ESL undergraduates of a private university based on a component of a communication skills course subject. The duration of the case study was conducted for 48 days due to logistics and the institutional concerns. However, the reliability and the validity of the adaptations made rely heavily on the experts' consensus opinion. In addition, more than half of the experts were also course instructors of the course subjects being studied.

CONCLUSION

The theory and the model discussed in this paper were adopted and adapted to describe how undergraduate language learners learn through peer interactions at the tertiary level in the context of mLearning in undergraduate language-learning. Theorizing mLearning should be based on the instructional problem or goals and then select the most appropriate theory options to help address the problem or goals of instructions. This paper adopted Vygotsky's Zone of Proximal Theory to view how students learn in general via mLearning, and to support further specifically on how students fulfill their language learning needs. Gilly Salmon's five-stage model was adapted and proposed to describe how learners learn language via mLearning based on the proposed Vygotsky's theory.. The adaptation made was made based on the case study conducted on undergraduate language learners in a private university as presented in this paper. In terms of the use of the scaffolding model, it was encouraging to find a high level of participation among students as they progressed from one stage to another, not only in terms of numbers and frequency but also in terms of length and quality. Quality here means that the students progressed from asking questions or seeking help, to giving comments as moderators or assumes the instructor's role in responding to their peers' oral presentation or problems. Negotiation of knowledge in meeting their learning goals through interaction among themselves is the key element in this scaffolding model.

The results also revealed that students' performance in the persuasive presentation component using this scaffolding mLearning model averagely scored higher grades than other course components. It would be worthwhile to investigate more in-depth the effectiveness of the model compared to conventional face-to-face classroom approach to the course. However, students also provided critical reflection and constructive feed-back on the learning process as indicated in their blog postings, especially in giving their views on how mLearning helped them in reaching their learning goals. Nevertheless, there were some limitations of the study. First, there were of course other modes of communication used among students besides blog messages: SMS, MMS and voice calls. Unfortunately, recording of these data for analysis were very limited to us. The duration of study is short due to administrative constraint as explained in this paper. A few students especially with lower language competence failed to progress through all five stages due to the short period of time. Although, the time allowed for us to conduct the study was not enough as some students failed to work on all stages, the implementation of the model was considered successful judging from the average higher grades obtained by the students in this course component.

Based on these experiences, the adapted MLearning scaffolding five-stage model would suggest a few implications in language instruction and learning through mLearning for future education:

a) The model could be use as an example to define the uniqueness of mLearning where the focus of learners are not primarily on technology (it is not about having full courses in the mobile phone), but on learning itself (for example, context of learning, learning needs and aims, etc) mediated by the technology;
b) As the model interweaves both formal and informal learning, it could aid in the incorporation of mLearning for language-learning in mainstream education as an effort to resolve the issue of its incorporation such as the use of mobile phones in schools, the change in teachers' and students' role, etc.;
c) Implication to the design of mLearning for language-learning. For example, the model could be used as a guide in designing learning activities in a mobile environment which emphasizes on scaffolding to aid students engage in effective interaction, which leads to collaboration in meeting individual and shared learning goals;
d) Implication to the roles of instruction where moderating would be seen as a replacement of teaching. As a moderator, the teacher or the lecturer would be part of the learning system or as the co-learner in mLearning as described in this study. The moderator would not only guide, share knowledge, learn together but also motivate by posting appropriate questions, tasks and information to students in encouraging them to participate in social learning or triggering some ideas to move forward. The moderator would further guide the students in identifying their learning needs and aims too. This change in the role would define further the concept of a facilitator in learner-centered learning. Teacher training would take a new leaf to become moderator training then to accommodate a new learning trend, learning context, environment and as well as a new genre of technology; and
e) The model could also be adapted to design learning in other areas of learning such as science, history or even sports.

Hence, we would also like to propose using the model adapted as an approach for further development of language courses in the university to complement mainstream classroom instruction to begin with. There are equally important opportunities for further development of the proposed adaptation of the MLearning scaffolding five-stage model. For instance, it is suggested to develop standard criteria to assess 1) the quality of students' input in the mLearning activities; 2) students' construction of shared learning context, especially in their motivation to do so and their selection of approaches; 3) students' ability in giving critical reflection on views and arguments and how they develop these skills; 4) how students progress from one stage to another especially whether it is self-directed o directed with the aid of others. These criteria also serve as areas for further research in the use of the model which also may lead to further enhancement of the model. Further studies could also be conducted to find out whether other variables such as gender or language competency do affect the quality of participation of students. It would certainly be equally interesting to find out whether students' achievement in language-learning using this model via their mobile devices would continue to progress significantly compared to conventional classroom approach when the novelty factor of technology wears off. These research areas would bring great impact in the defining better learning solutions for future language learners which ideally shift learning ownership to learners themselves, one which allow these learners the liberty to choose suitable ways to fulfil their learning needs according to their ability, competence and pace. In this point of view, mLearning secures a better chance in paving the direction for future learning and the proposed adaptation of the five-stage model discussed in this paper facilitate the way forward.

REFERENCES

Abdullah, Muhammad Ridhuan Tony Lim and Siraj, Saedah (2010). M-learning for Future Curriculum: Prospect and Implementation. *International Journal of Multidisciplinary Thought*, 1 (2). pp. 1-11. ISSN 2156-6992.

Abdullah, Muhammad Ridhuan Tony Lim and Siraj, Saedah (2011). The Four C's Of Mobile Capability As Guiding Principle For Mlearning Design: A Shift Of Learners' Focus Away From Technology. *Masalah Pendidikan (Issues in Education)*, Special edition . pp. 105-114. ISSN 0126-5024

Andrea Barker, Greig Krull and Brenda Mallinson (2005) A Proposed Theoretical Model for M-Learning Adoption in Developing Countries. Available on: http://www.mlearn.org.za/CD/BOA_p.14.pdf .

Brown, T.H. (2005). Towards a model for m-learning in Africa. *International Journal on E-Learning*, 4(3), 299-315.

Bruner, J. (1985). *Vygotsky: A Historical and Conceptual Perspective.* In Wertsch (Ed.), Culture, Communication and Cognition: Vygotskian Perspectives. Cambridge: Cambridge University Press.

Chen, C.-M., & Hsu, S.-H. (2008). Personalized Intelligent Mobile Learning System for Supporting Effective English Learning. *Educational Technology & Society*, *11* (3), 153-180.

Collins N. Udanor and Thomas A. Nwodoh. (2010). A Review of M-Learning Models. *Indian Journal or Computer Science and Engineering*, 1(4), 426-435.

Cook, J. (2010). Mobile phones as mediating tools within augmented contexts for development. in Pachler, N. (ed) Mobile learning in the context of transformation. *Special Issue of International Journal of Mobile and Blended Learning.*

Duffy, T. M., and Cunningham, D. J., (1996). Constructivism: Implications for the design and delivery of instruction, In D. H. Jonassen, (Ed.) Handbook *of Research for Educational Communications and Technology*, NY: Macmillan Library Reference USA

Gokhale, A.(1995). Collaborative learning enhances critical thinking. *Journal of Technology Education, 7,* 22-30.

Johnson, J., Christie, J., & Wardle, F. (2005). *Play, development, and early education*. Boston, MA: Allyn and Bacon.

Hsu, C. & Sanford, B.A. (2007).The Delphi Technique: Making Sense Of Consensus. *Practical Assessment, Research & Evaluation,* 12(10). Available on: http:// http://pareonline.net/pdf/v12n10.pdf.

Isman, A. (2004). Roles of the Students and Teachers in Distance Education. *Turkish Online Journal of Distance Education 4(5).* Retrieved from http://tojde.anadolu.edu.tr/tojde16/pdf/isman.pdf.

Isman, A. (2005). The Implementation Results Of New Instructional Design Model: Isman Model. *Turkish Online Journal of Distance Education 4(4).* Retrieved from ocw.metu.edu.tr/file.php/118/Week7/ isman.doc

Keskin, N.O. and Metcalf, D. (2011). The Current Perspectives, Theories and Practices of Mobile Learning. *The Turkish Online Journal of Educational Technology*, 10(2), 202-208.

Kim, M. C., & Hannafin, M. J. (2011). Scaffolding problem solving in technology-enhanced learning environments (TELEs): Bridging research and theory with practice.*Computers & Education,* 56(2), 403–417.

Kinshuk, Taiyu Lin (2004). *Improving mobile learning environments by applying mobile agent technology.* Massey University, Palmerstone North, New Zealand. Available on: http://www.col.org/pcf3/papers/pdfs/kinshuk_lin_2.pdf.

Laurillard, D. (2007). Pedagogcal forms of mobile learning: framing research questions. In N. Pachler (Ed.), Mobile Learning: towards a research agenda (Vol. 1, pp. 33-54). London: WLE Centre, Institute of Education.

Lenski, S. D., & Nierstheimer, S. L. (2002). Strategy instruction from a sociocognitive perspective. *Reading Psychology*, *23*(2), 127-143.

Luckin, R. (1998). *'ECOLAB': Explorations in the Zone of Proximal Development* (CSRP Technical Report 486): School of Cognitive and Computing Sciences, University of Sussex.

Mooney, Carol Garhart. 2000. *Theories of Childhood: An Introduction to Dewey, Montessori, Erikson, Piaget, and Vygotsky*. Redleaf Press.

Naismith L., Lonsdale P., Vavoula G., and Sharples, M. (2004) *Literature Review in Mobile Technologies and Learning*, Report 11, Future lab Series, http://www.futurelab.org.uk/research/reviews/ reviews_11_and12/11_01.htm

Nonaka, I, and Takeuchi, H. (1966). *The Knowledge-Creating company.* Oxford: Oxford University Press

Norlidah Alias, Saedah Siraj, Mohd Khairul Azman Md Daud & Zaharah Hussin. (2013). Effectiveness Of Facebook Based Learning To Enhance Creativity Among Islamic Studies Students By Employing Isman Instructional Design Model. *The Turkish Online Journal of Educational Technology*, 12(1), 60-67.

Quinn, C. N. (2011). *Designing mLearning: tapping into the mobile revolution for organizational performance.* San Francisco, CA: Pfieffer

Sabbir Ahmed Kazi (2005) *VocaTest: An Intelligent Tutoring System for Vocabulary Learning using the "mLearning" Approach.* Centre for Research in Pedagogy and Practice National Institute of Education. Available on: http://conference.nie.edu.sg/paper/Converted%20Pdf/ab00283.pdf .

Saedah Siraj, Fadzilah Siraj, & Muhammad Helmi Norman (Eds.). (2011). *mLearning: a new dimension of Curriculum advancement (1st ed.).*Kuala Lumpur: University Malaya Press.

Salmon, G. (2000). *E-moderating*. London: Kogan Page.

So, H. J., Kim, I. S., & Looi, C. K. (2008). Seamless mobile learning: Possibilities and challenges arising from the Singapore experience. *Educational Technology International*, 9(2), 97-121.

Soloway, E., Jackson, S., Klein, J., Quintana, C., Reed, J., Spitulnik, J., Stratford, S. J., Studer, S., Eng, J., & Scala, N. (1996). *Learning theory in practice: Case studies of learner centred design.* Paper presented at the CHI 96 Human Factors in Computing Systems: Common Ground, Vancouver. pp 189-196.

Spear, K.I.(1988). *Sharing Writing: Peer Response Groups in English Classes.* NH: Boynton/Cook Publisher.

Susan BULL, Adam Thomas McEVOY (2003). *An Intelligent Learning Environment with an Open Learner Model for the Desktop PC and Pocket PC*, in Proceedings of International Conference on Artificial Intelligence in Education, IOS Press, Amsterdam.
Tharp, R.G. and R. Gallimore. (1988). *Rousing Minds to Life: Teaching, Learning and Schooling in Social Context.* Cambridge: Cambridge University Press.
Traxler, J. (2004). Mobile learning- it's here but what is it? *Interactions* 9, 1. Warwick: University of Warwick.
Tu, H. C., & Hsiang, J. (2000). An architecture and category knowledge for intelligent information retrieval agents. *Decision Support Systems*, 28, 255–268.
Vrasidas, C., & McIsaac, M. (2000). Principles of pedagogy and evaluation of Web-based learning, *Educational Media International*, 37(2), 105-111
Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.
Williams, J. (1957). *Teaching Writing in Second and Foreign Language Classroom*. NY: McGraw Hill.
Wood, D. J., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry, 17*(2), 89-100.
Wood, H. A.,& Wood, D. J. (1999). Help seeking, learning and contingent tutoring. *Computers & Education, 33*(2/3), 153–170.
Wood, H., Wood, D., & Marston, L. (1998). *A computer-based assessment approach to whole number addition and subtraction.* (Technical Report No. 56). Nottingham, UK: Centre for Research in Development, Instruction & Training, University of Nottingham.
Yang, Y.C., Newby, T., & Bill, R. (2008). Facilitating interactions through structured web-based bulletin boards: A quasi-experimental study on promoting learners' critical thinking skills. *Computers & Education*, 50(4), 1572-1585.
Yuhsun Edward Shih and Dennis Mills (2007). Setting the New Standard with Mobile Computing in Online Learning. *International Review of Research in Open and Distance Learning*, 8(2).
Zeng, Y. (2006). Peer Feedback in College SLW Classroom. Sino-US English Teaching, *ISSN 1539-8072, USA. Mar.2006, Volume 3, No.3 (Serial No.27)*
Zhang, M. and Quintana, C. (2012). Scaffolding strategies for supporting middle school students' online inquiry processes. *Computers & Education*, 58(1), 181-196.

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PRE-SERVICE TEACHERS' OPINIONS ABOUT THE MICRO-TEACHING METHOD IN TEACHING PRACTISE CLASSES

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ABSTRACT
The main purpose of this study is to examine microteaching practices on the contribution of teacher qualifications according to pre-service teachers' views based on their teaching experiences. In this way, it is investigated that if there is any differences about pre-service teachers' views of after micro-teaching practices. The participants of the study are 10 undergraduate students who are in the Department of Computer and Instructional Technology Education in the 2011-2012 education years. Ten students made a presentation with using micro-teaching methods at the secondary school. At the end of the practice, semi-structured interview form and the survey were used to learn the views of pre-service teachers about teaching in the classroom. The results of the interviews show that the pre-service believed that the micro-teaching method gives a chance to evaluate their strong and weak aspects in teaching. At the same time, the interview results show that pre-service teachers are developed timing, planning, asking questions, management of class, using different materials and examples and physical appearance during the teaching process.

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INTRODUCTION
Today the developed countries give great support to education as they know in the future it is only possible for them to have power and voice by educating people who are experts in their own fields. Different factors have effect in education of qualified people. And without a doubt one of the most important one of these factors is the teacher. The teacher has the key role in education process. The most important role of the teacher in a school is to guide students while providing knowledge. With this role, the teacher shapes the terminal behaviors of the students, helps the student to have positive relationships and makes them skillful. Besides, the roles such as being a disciplinarian, judge or confidentiality are also expected from the teacher with the feeling of worthiness. The teachers need to believe in the objectives and general principles of the education process and they need to have tolerance in order to develop the individual entrepreneurship and creativeness. Each component of the education is tied and appreciated. 'Raising teachers' is a multidimensional and universal issue. The concept of training teachers includes sub-subjects such as the selection of the teacher candidates, their prevocational trainings, internship term, observing and evaluating studies during this term and in-service training.

Microteaching Technique in Education
Microteaching is a method that has been used since 1960s in teaching- learning environments. Microteaching is a remarkable factor used in teaching practices of pre-service teachers (Görgen, 2003). Microteaching method offers new and different opportunities to pre-service teachers about the planning and implementation of new teaching strategies. Microteaching has an important place in preparation for the teaching profession because of its potential to emphasize the relationship between theory and practice (Ajayi-Dopemu and Talabi, 1986). Microteaching is a technique in teacher education which provides a transition from theory to real teaching situations (Çelik, 2001). Allen and Eve (1968) defined microteaching as "A system of controlled practice that makes it possible to concentrate on specific teaching behavior and to practice teaching under controlled conditions". Microteaching is one of the efforts by the pre-service teachers to transfer the knowledge and skills into action, and thus, they try to bridge the gap between the theory and practice (Gürses, Bayrak, Yalçın, Açıkyıldız & Doğar, 2005).

In microteaching practice, lesson duration is short (5-20 minutes) and the number of the students is few (not more than 20) (Külahçı, 1994). In respect to subject, teachers work to meet only one teaching skills. Microteaching is a cycle which is started with a planning. As shown in Figure 1, the cycle is; process of teaching, criticizing, re-planning, re-teaching and re-criticizing (Peker, 2009).

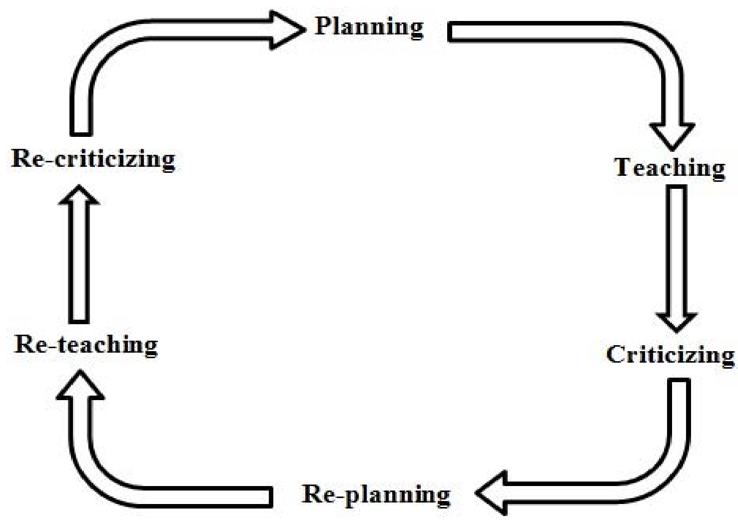

Figure 1. Stages of Microteaching

In the process of cycle, pre-service teachers prepared the lesson plan that the subject is determined before. In teaching stage of cycle, the pre-service teachers perform micro lessons to real students that were planned and prepared by them. Also, lectures are recorded by video camera or portable receivers. After that pre-service teachers watch and hear by self from the video recording at the end of the lecture. In critique stage, pre-service teachers' micro lessons are reviewed, discussed, analyzed and evaluated (Çelik, 2001). Pre-service teachers take criticisms and suggestions from the guide teacher and their friends. According to the suggestions, pre-service teachers prepared the lesson plan again and re-teach micro lessons to same group. Also, the second micro lessons are recorded by video camera or portable receivers. After the watching second micro lessons from recording, the teacher and peers present their critiques which are about the worst or better sides between first and second micro lessons. The end of the cycle, microteaching practices give pre-service teachers have opportunity to evaluate their strengths, weaknesses and try to improve weak sides (Kpanja, 2001; Sarı, Sakal & Deniz, 2005; Ekşi, 2012). It seemed that most of the fears of teachers disappeared at the end of the application, and extended micro-teaching practices are seen to be equivalent to a one-year trainee teacher is emphasized (Peker, 2009).

The Purpose and Importance of Microteaching

Microteaching was first used in medicine at Stanford University in 1960s to promote the quality of students (Cruickshank & Metcalf, 1993) and then it was applied in teacher training for the same purpose (He & Yan, 2011). Görgen (2003) states that pre-service teachers can experience real teaching situations with microteaching, and they have the opportunities to transfer their teaching knowledge into practice. Thus, it can be said that microteaching can provide the possibility of forming a trial situation for teaching activities. In microteaching, pre-service teachers find opportunities to develop skills to prepare lesson plans, choose teaching goals, take students' attention, speak in front of group, ask questions, managing time effectively, and assessment techniques (Kılıç, 2010). In this way, pre-service teachers improve their classroom management skills. It provides expert supervision and a constructive feedback and above all if provides for repeated practice without adverse consequences to the teacher or his students (Ananthakrishnan, 1993). The micro-teaching practices improved both student's and teachers' self-confidence and the teaching skills are emphasized (Şen, 2009; Şen, 2010). There have been researched indicating that microteaching is useful, pre-service teachers can gain much in case of using microteaching and that their views on teaching can improve much with the help of microteaching. Görgen (2003), in his research with 24 pre-service teachers, found out that the views of pre-service teachers pose some differences before and after teaching practice. Similarly, He & Yan (2011), in the research with 60 stıdents, indicated that microteaching has remarkable effect on the professional development of the students. Küçükoğlu, Köse, Taşgın, Yılmaz, & Karademir (2012) carried out a research to determine the effect of microteaching on teaching skills. It was an experimental study with 40 pre-service teachers. The findings of the research show that the pre-service teachers who applied microteaching in training had fewer challenges than those who had no microteaching activities. This implies that microteaching contributes positively to the teaching skills of pre-service teachers.

Microteaching Application Process
Ananthakrishnan (1993) summarized microteaching process in nine stages;

- Lesson planning: having clear cut objectives, and an appropriate planned sequence.
- Set induction: the process of gaining pupil attention at the beginning of the class.
- Presentation: explaining, narrating, giving appropriate illustrations and examples, planned repetition where necessary.
- Stimulus variation: avoidance of boredom amongst students by gestures, movements, focusing, silence, changing sensory channels etc.
- Proper use of audio: visual aids.
- Reinforcement: recognizing pupil difficulties, listening, encouraging pupil participation and response.
- Questioning: fluency in asking questions, passing questions and adapting questions.
- Silence and nonverbal cues (body language)
- Closure: method of concluding a teaching session so as to bring out the relevance of what has been learnt, its connection with past learning and its application to future learning.

Problem Statement and Purpose
The aim of the microteaching practice research is to prepare pre-service teachers better by themselves in teaching practice lesson. As a result of the process of preparation, pre-service teachers prepare and present the lesson with less anxiety and feeling comfortable are the feelings that are expected to be observed in the class. The main purpose of this study is to examine micro-teaching practices on the contribution of teacher qualifications according to pre-service teachers' views based on their teaching experiences.

METHODOLOGY
This qualitative research aims to compare the views of the prospective students before and after microteaching application.

Participants
Participants were 10 students of the Computer and Instructional Technology Education Program in the Faculty of Education in Necmettin Erbakan University. In the research, easy accessible sample technique was used. This technique increases the speed and it is preferred when the sample is easily accessible by the researcher (Yıldırım & Şimşek, 2006). The data were obtained from 10 pre-service teachers who were willing to be involved in the research after being exposed to microteaching application by the researchers.

Research Instrument
In this study, the tool used to gather data with semi structured interview form. End of the semester, 8 questions were asked to pre-service teachers to evaluate microteaching about computer training. After the microteaching period in which microteaching was applied as a part of teacher training lessons, eight different questions about computer teaching were asked to the participants so that they could evaluate the microteaching application they already had.

Data Analysis
The data were obtained with the help of the interview with the participants. The data then were transferred into the computer to form the digital data. Then content analysis was used with the percentage and frequency values.

FINDINGS
The findings resulting from the answers given by the pre-service teachers for the questions in the semi-structured interview form are given below.

The Views of the Pre-service Teachers Regarding Their Concerns about the Application
The first question was "Did you think that you have difficulties in teaching computer before you started to teach in practice schools?". The Majority of the participants (%80) remark that there will be challenges for them. 2 out of 10 students think that they will not have any difficulties. 8 students think they will have problems. The sample statements for this question are given below.

"Yes, I do. Every student is in different level so I can't decide with which level I have to start." (Y.Ş.A.)

"Yes, people believe that every student know how to use a computer. Therefore, I think that students don't want to listen to me." (A.G.)

"Yes. I was thinking there were a lot of things about the computer; I didn't believe that I have enough control." (A.C.)

"No. I thought that I had enough technical information and self-efficacy in usage of computer so I shouldn't be so excited." (M.T.H.).

The Views of the Pre-service Teachers Regarding the Contribution of Microteaching Videos
The second question was "Do you think that watching the presentation videos of the microteaching practices with your friends provides benefits to you?". In addition, there were some drills to explore the benefits. 90% of the students stated that video watching is useful for them. Also, they said that it is easier to evaluate advantages and disadvantages of microteaching practices. Only one student (%10) thinks that video watching altogether is not useful. The sample statements for this question are given below.

"Sure. Taking other peoples' ideas objectively provides recognizing weak sides of my own." (E.T.)

"Yes I do. It is so useful to recognize my own and others' weaknesses and fix them. This situation increases my level of success." (S.K.)

"Although we have a lot of mistakes during the lecture, we can't realize them because of the excitement we have. We have a chance to watch ourselves in good or bad manner. After that we will not do the same mistakes again."(B.Ç.)

"Yes, I believe that watching videos of microteaching application contribute us in a good way. I could see my mistakes in videos very clearly." (Y.Ş.A.)

"It must have contributed but it hadn't. The main reason of this is my friend's hesitation to tell others' weak sides." (M.T.H.)

The Views of the Pre-service Teachers Regarding the Difference between the First and Second Presentations
The question was "Do you think that there is any difference between your first and second presentation?". Thus, the researchers aimed to draw results about the importance of the application. All students in the research think that their second presentation is more successful than the first one.

"In first presentation, I was inexperienced. In the second one I was more comfortable and didn't do the same mistakes." (A.G.)

"Yes, I was inexperienced and excited in the first presentation. I felt more like a teacher in the second one." (A.C.)

"I was very excited in the first presentation and I couldn't adjust my voice. After the first presentation, according to the feedbacks I lessened my excitement and control my gesture better in the second presentation." (S.Ç.)

"Sure. The practice is so different then the real teaching. Actually, we have a 4 year education at the university but it was so exciting to feel like a teacher with real students in the real school. I think that correcting my mistakes, providing class control, having dialogues with students is better in the second presentation." (S.K.)

"I believe that the first and second presentations were so different. I saw my mistakes in the first presentation and I try not to make them in the second presentation." (Y.Ş.A.)

The Views of the Pre-service Teachers Regarding the Contribution of the Videos of Other Classmates
In order to find out the effect of watching the each other's videos on their teaching experience, the question "Do you think that watching the presentation videos with using microteaching technique of your friends contributes you?" was asked. All pre-service teachers participated in research think that watching the presentation videos which use microteaching technique of other pre-service teachers was beneficial to them. For example;

"I think. As a result, technology renews itself every day and we as a teacher of technology use it in every lecture. If other friends watch videos, they can have an idea of how to use technology in the lecture and organize it." (S.Ç.)

"I think that it is helpful my friends to assessment themselves objectively." (E.T.)

"Of course. We discuss what mistakes did our friends and how could they correct them?" (H.Ö.)

"After seeing the weaknesses of my other friends also I noticed that I have the same mistakes. I think that we corrected our mistakes in unity of common view." (Ç.S.)

The Views of the Pre-service Teachers Regarding the Microteaching Method for Teaching Experience

The question "What do you think about the use of the microteaching method in the teaching practice lesson?" was asked to evaluate the microteaching method. All pre-service teachers who participated in the research think that the microteaching method of watching themselves and their friends objectively, seeing their mistakes and correcting it, should be used in future lectures.

"It is an application to all pre-service teachers do. It is a useful practice to evaluate and correct our weakness." (S.K.)

"It helped me to see my mistakes and be careful to avoid the same mistakes. I think that it is useful for every pre-service teacher." (B.Ç.)

"I think that it is a useful practice. We have a lot of experience when we are watching our friends' activity in the classroom." (Y.Ş.A.)

"The method should be applied. Watching yourself in a second eye provides a good opportunity to develop oneself. Watching other friends can prevent possible deficiencies." (M.T.H.)

"First of all, I didn't have a positive look. After the application, I think that it is useful practice for teachers to see themselves through the eyes of someone else." (A.C.)

The Views of the Pre-service Teachers Regarding the Possible Challenges/Limitations of Microteaching Application

In order to find out the views of the pre-service teachers regarding the possible challenges faced during microteaching application, the question "What are some limitations of the application of micro-teaching techniques of teaching practice?" was asked. The pre-service teachers who participated in the research said that the idea of recording in microteaching practice increased their excitement and anxiety.

"The fact that you are in an actual classroom environment, with real students, and the conscious knowledge that you are a teacher together with the responsibility this gives you is all very good but the fact that the lesson is being recorded increases levels of excitement and anxiety. I think this is the only limitation. (S.K.)

*"Pre-service teachers can't behave spontaneously due to the idea of recording with a camera. The recording may be reasons why students can't behave naturall*y." *(B.Ç.)*

"We are excited about being recorded during the lecture and watching the recording after the lecture." (Y.Ş.A.)

"The camera makes us nervous and that can be a problem from the first moment but I don't think that it has very limitations. As a result, practice is better than theory every time."(M.T.H.)

The Suggestions of the Pre-service Teachers Regarding the Microteaching Application

The suggestions of 10 participants were considered to contribute to better applications. The teacher candidates who took part in the research using micro-teaching techniques on their teacher candidate friends should have a command over the tools and equipment as well as the materials before the class commences, they should behave in a relaxed and natural way, and they should listen to the criticism and try to make amend their deficiencies.

"The pre-service teachers, who are implementing microteaching, should have technical and formation knowledge. First of all we must be willing to do this and arrange the necessary equipment and materials before the lecture." (S.K.)

"Pre-service teachers can't behave spontaneously due to the idea of recording with a camera. They should behave naturally." (B.Ç.)

"Listen to the criticism of your friends so you don't make the same mistakes and correct your weakness in other lectures." (Y.Ş.A.)

"It will be beneficial to students if they try to minimize the fact that they are going to be recorded and behave naturally." (A.G.)

"When they give the lecture, they should feel like a teacher not a student. It will be more efficient." (S.Ç.)

The Suggestions of the Pre-service Teachers towards Academic Staff

To find out the suggestions, the question "What is your suggestion to advisor of academic staff about the implementation of the microteaching method?" was asked. The teacher candidates who took part in the research suggest to the faculty member advisers using micro-teaching techniques in the teaching application classes to use this technique to help the students relax and behave normally whilst giving the lesson, to give constructive criticism, and to enlighten teacher candidates on the topic of micro-education techniques.

"As we found it beneficial to sit and watch the recording that our teacher made via the video camera with our other teacher candidate friends I can make a similar suggestion to other faculty member advisors." (Ç.S.)

"Advisor of academic staffs should help students relax during the recording. They should help students behave naturally. In addition, I think that they should make positive criticism to students without hurting their self-efficacy during the evaluation of microteaching practice." (B.Ç.)

"The criticism should be positive. They should be careful about this while they are watching the recording." (Y.Ş.A.)

"I suggest that they should motivate students. Also, they should provide the necessary equipments and information to the students." (A.C.)

"Before the implementation, advisor of academic staff should make a pre-speech about the advantages, disadvantages and objects of microteaching practice. They should use constructive and polite language during the criticism." (E.T.)

RESULTS AND CONCLUSION

Microteaching is an important education component that gives chances of teaching practice to pre-service teachers (Allen and Wang, n.d.). Therefore, microteaching presents advantages like self confidence, seeing and fulfilling the shortcomings, learning different methods and techniques (Ananthakrishnan, 1993). So, the place of microteaching in education is important. This is a result indicated by different researches (He & Yan, 2011; Peker, 2009; Güngör, 2003). However, doing more researches on microteaching applications by pre-service teachers will contribute positively to this lesson to go on more usefully and efficiently. To this end, this research was carried out with 10 participants and following results came out.

Pre-service students at the department of computer teacher training, as a result of microteaching activity, remark that they will have challenges in teaching. That's to say, they say that they will have some kind of teaching anxiety following teaching experience. Regarding the microteaching application, majority of the students agree that video watching is useful. Similarly, all the participants state that watching the videos of all classmates together contributes much to eliminate the concerns mentioned above. These two findings are in parallel with the findings of other researches on the usefulness of video watching (Şen, 2010; Hauge & Norenes, 2009; Lazarus & Olivero, 2009). The participants sate that there is difference between their first and second presentations and the second presentations indicate that they are more experienced and thus they make fewer mistakes. Another finding is that all the pre-service teachers find that microteaching application in useful and essential. Watching their own videos and friends' videos helps them to see what they do right or wrong, and this will contribute much to their future lessons. These two findings are in parallel with the ones that indicate that microteaching promotes their teaching experience and skills (He & Yan, 2011; Güngör, 2003). The pre-service teachers see "recording the lesson" as one of the possible problems. They state that recording causes concern and excitement and this is a problem for them. Ananthakrishnan (1993) agrees that recording can be a problem for the students but it is necessary for observation. The last parts of the questions are related with the suggestions of the students towards microteaching application and academic staff. The pre-service teachers stress on the importance of equipment use in the class as well as lesson materials before starting the lesson. Flexibility in the class is another point mentioned by the participants. As for the suggestions for academic staff, they should help the students to feel comfortable and relaxed during microteaching. Their criticism should be constructive and helpful. Similarly, Peker (2009) and Külahçı (1994) suggest that academic staff should be a guide while planning microteaching and they should help them to feel relaxed.

Based on these descriptions and findings, microteaching method in school experience is the expansion of all the departments at the university, the fact that particularly the teaching profession can be said to be beneficial. However, the method of micro-teaching practices, additional time should be provided for the preparation of pre-service teachers. Pre-service teachers acquiring knowledge and skills at faculty is an effective way, candidates should be concentrated in the profession, should see himself as a teacher, working compatible with teachers of practice, teaching topics and concepts in the curriculum, school administration and practice of teacher must help to pre-service teachers in any way, should provide a wide range of materials and the possibility of laboratory, faculty should take serious application of pre-service teachers, practice of teacher should follow pre-service teachers at the school.

REFERENCES

Ajayi-Dopemu, Y. & Talabi, J. K. (1986). The Effects of Videotape Recording on Microteaching Training Techniques for Education Students. *Journal of Educational Television*, 12 (1), 39-44

Allen D.W. & Wang, W. (n.d.). *Microteaching - The New Microteaching: Simplified, Variants of Microteaching,Microteaching Models of Teaching Skills, Microteaching Courses.* Retrieved October 1, 2012, from http://education.stateuniversity.com/pages /2227/Microteaching.html.

Allen, D. W. & Eve, A. W. (1968). Microteaching. *Theory into Practice, 7*(5), 181-185.

Ananthakrishnan N. (1993). Microteaching as a Vehicle of Teacher Training--Its Advantages and Disadvantages. *Journal of Postgrad Medicine.*142-143.

Cruickshank, D., & Metcalfe, K. (1993). Improving Preservice Teacher Assessment Through On-Campus Laboratory Experiences. *Theory and Practice* 32 (2), 86-92.

Çelik, Ş. (2001). The Attitudes of The Student Teachers Towards Microteaching Technique As A Tool For Reflection In A Teacher Education Programme. (Unpublished master's thesis). University of Uludag, Bursa.

Görgen, İ. (2003). The Effect of Microteaching Practises on Student Teachers’ Views Of Giving Lessons In The Classroom. *Journal of Hacettepe University Education Faculty*, 24, 56-63.

Gürses, A., Bayrak, R., Yalçın, M., Açıkyıldız, M., & Doğar, Ç. (2005). Investigation of Effectiveness of Microteaching at Practicum. *Kastamonu Education Journal*, 13 (1), 1-10.

Hauge, T.E. & Norenes, S.0. (2009) Changing Teamwork Practices: Videopaper as a Mediating Means for Teacher Professional Development, *Technology, Pedagogy and Education*. 18 (3), pp. 258-268.

He, C. & Yan, C. (2011). Exploring Authenticity of Microteaching in Pre-Service Teacher Education Programmes. *Teaching Education*, 22(3), 291-302.

Higgins, A & Nicholl, H. (2003). The Experiences of Lecturers and Students in The Use of Microteaching as A Teaching Strategy. *Nurse Education in Plactice*, 3, 220-227.

Ekşi, G. (2012). Implementing an observation and feedback form for more effective feedback in microteaching. *Education and Science, 37* (164), 267-282.

Kılıç, A. (2010). Learner-Centered Micro Teaching in Teacher Education. *International Journal of Instruction,*3(1).

Kpanja, E. (2001). A Study of Effects of Video Tape Recording in Microteaching Training. *British Journal of Educational Technology*, 32(4), 483-486.

Küçükoğlu, A., Köse, E., Taşgın, A., Yılmaz, B. Y., & Karademir, Ş. (2012). The teacher candidates’ opinions regarding the effect of microteaching implementation on teaching skills. *Journal of Educational Sciences Research, 2* (2), 19–32.

Külahçı, Ş.G. (1994). *Mikroöğretimde Fırat Üniversitesi Teknik Eğitim Fakültesi Deneyimi I. Model Geliştirme*. Eğitim ve Bilim. 18(91), 12-23.

Lazarus, E. & Olivero, F. (2009) ‘Videopapers as a tool for reflection on practice as initial teacher education’, *Technology, Pedagogy and Education*. 18 (3), pp. 258-268.

Peker, M. (2009). Pre-service Mathematics Teacher Perspectives about the Expanded Microteaching Experiences. *Journal of Turkish Educational Science, 7*(2), 353-376.

Sarı, Y., Sakal, M., & Deniz, S. (2005). The Effectiveness of Micro-teaching in Preschool Teacher Education. *Gaziantep University Academic Information 2005 Conference,* 112-113.

Şen, A.İ. (2009). A Study of Effectiveness of Peermictoteaching in a Teacher Education program. *Eğitim ve Bilim-Education and Science*, 34(151), 165-174.

Şen, A.İ. (2010). Effect of Peer Teaching and Micro Teaching on Teaching Skills of Pre-Service Physics Teachers. *Eğitim ve Bilim-Education and Science,* 35(155), 78-88

Yıldırım, A. & Şimşek, H. (2006). *Qualitative Research Methods in Social Sciences.* Ankara: Seckin Press.

QUESTIONING FACULTY USE OF INFORMATION TECHNOLOGY BY CONTEXT OF NETS-T STANDARTS IN BOLOGNA PROCESS

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ABSTRACT
Using technology in and out of class has been becoming more and more important recently. University settings also become more dependent to technology. Bologna process requires university and faculty diffuse and disseminate information quickly. In this research it is aimed to examine faculty use of information technology in bologna process in the context of NETS-T standards. Results show that faculty are experienced computer and internet user and they can use information technology to foster their students learning experiences. And their use of technology is not differing by gender, age category, computer experience and internet experience.
Keywords: NETS-T, Information Technology, Faculty

INTRODUCTION

By information society requirement and lifelong learning strategy, frame of university education re-defined (Bjekic, Krneta& Milosevic, 2010). Information society requires new abilities and new proficiencies. Information societies workforce should work in group and take job responsibility, and also requires computer, information, technology and digital literate person. Technology usage in educational settings help to improve students' and teachers' digital literacy level (Starcic, 2010).By improving students' digital literacy level students can study in a group by using information technology (IT) and teachers should support these processes.

Bologna process main goal is to set up a European Higher Education Area by harmonizing the higher education system of the 46 countries, and Turkey has been included in this process since 2001 (Sakarya&Kahraman, 2011). Bologna Process requires countries and universities establish educational and administer standards. To increase standards universities should document all processes and should inform all stakeholders about related processes. The bologna process has established Europe-wide higher education area to facilitate individual cross-borders mobility, coordinated national quality assurance, the transparency and recognition of duration and degrees of study courses (Powell, Bernhard & Graf, 2011). A university that would like to be a part of Bologna Process should define academic program competencies, course competencies, course and program outcome, student evaluation criteria, objectives, lesson plans and course documents.

Making standards and learning objectives explicit to the students is part of the effective technology implementation (Cradler, McNabb, Freeman & Burchett, 2002). By web sites established by university, faculty can declare all the requirement for their courses and students can examine each courses not only by course name and teacher name but also can examine by all requirements of course.

Our university unite some phases of Quality Management processes and Boogna Processes and established web sites to facilitate work done in both processes. With in the scope of quality improvements movement, it was aimed to provide instructors to conduct their educational, instructional and academic studies online (Elmas, 2012). To facilitate quality management and bologna process university set up four different information systems. These systems are;

- Sakarya University Academic Information System (SAÜ AkademikBilgiSistemi – SABİS) :

Via SABİS one can access to open course material, personal information services, student information services, personal web site management, course and exam programs etc.

- Educational Information System (EğitimÖğretimBilgiSistemi – EBS)

Via EBS instructors can edit and add academic program competencies and objectives, lesson plans, course outcomes, evaluation criteria, lecture notes and etc. student can see all these documents and can examine all courses university wide. And someone from outside of university can see all these documents.

- Strategic Management Information System (StratejikYönetimBilgiSistemi – SYBS)

Via SYBS, performance of units calculated in terms of strategies, objectives, sub-objectives, performance indicators and activity projects.

- SAU Campus Automation Web Information System (SAU CAWIS)

CAWIS has nine sub system and faculty, staff and students reach their personal information and their mailboxes.

To fulfill bologna processes and quality managements processes faculty and staff should use the systems which are defined above. In this research faculty use of information technology in terms of NETS-T standards was examined.

RESEARCH PURPOSE

The purpose of this study is to examine faculty use of information technology in terms of NETS-T standards. After determining faculty use of information technology,

- Gender differences
- Age category differences
- Computer usage experience differences
- Internet usage experience differences were examined.

DATA COLLECTION TOOL

To collect research data a survey was developed by researcher. Survey contains seven questions which examine demographic data of participants. And second section of the survey contains 37 questions which are specialized from ISTE NETS-T standards.

Research survey was distributed by hand and participants were given one week to complete the survey. Finally 91 survey was returned.

FINDINGS

In this section findings revealed from the data will be summarized and interpreted. Summarized data were presented as tables and each table inferred regarding research context

Table1Demographic Data of ResearchParticipants

		Frequency	Percent
Gender	Male	56	69.1
	Female	25	30.9
Did you get any computer training	Yes	53	65.4
	No	28	34.6
Title	Prof.Dr.	6	7.4
	Assoc. Prof. Dr.	11	13.6
	Assist. Prof. Dr.	34	42.0
	Lecturer	30	37.0
Faculty	Faculty of Education	6	7.4
	Faculty Of Art And Sciene	3	3.7
	Faculty of Fine Arts	9	11.1
	Faculty of Technical Education	4	4.9
	Faculty of Engineering	11	13.6
	Faculty of Administrative Sciences	17	21.0
	Faculty of Technology	8	9.9
	Faculty of Business Administration	22	27.2

As can be seen in Table 1, at the end of the survey administering process 81 survey were returned from the participants. And %69 of the research participants were male and %31 of the participants were female. Over the half of the participants, %65,4, got some courses or training programs regarding computer after graduation and during their teaching work.Research participants title can be seen in Table 1; %7,4 of participants are Prof.Dr. , %13,6 of the participants are Assoc. Prof.Dr., %42.0 of the participants are Assist. Prof.Dr. and %37.0 of the participants are Lecturer. Participants faculty is the last demographic data and %27.2 of the participants are work ate Faculty of Business Administration and %21.0of the participants work at Faculty of Administrative Sciences.

Table2 Explorative data of somedemographic data

	Age	Computer Experience	Internet Experience
Mean	35.84	14.87	11.76
Median	34.00	15.00	10.00
Minimum	23	2	2
Maximum	54	32	30
Range	31	30	28

Table 2 summarizes explorative data of three demographic data. To understand participants deeply Age, Computer Experience and Internet Experience were analyzed. Mean of participants age is 35.84 year and youngest participant is 23 years old and oldest participants is 54 years old. Participants have average 14.87 year computer experience and the less experienced computer user have been used computer for two years and the most experienced computer user have been used computer for 32 years. Context of internet usage, participants have average 11.76 years interne usage experience.

Table3Recodeddemographic data of participants

		Frequency	Percent
Age Category	Younger	44	54.3
	Older	33	40.7
Computer Experience Category	Inexperienced	31	38.3
	Experienced	47	58.0
Internet Experience Category	Inexperienced	38	46.9
	Experienced	40	49.4

Table 3 summarizes recoded data of participants demographic data. As can be seen in table 3 %40.7 of the participants older and %54,3 participants are younger. Based on computer experience, %38.3 of the participants are inexperienced computer user and %58 of the participants are experienced computer user. Context of internet usage, % 46,9 of the participants are inexperienced internet user and % 49.4 of the participants are experienced internet user. Since some of the participants did not indicate their age, computer experience or internet experience cumulative percentage is not equal to %100.

Table4Responses of researchparticipantstosurveyquestions

		Strongly Disaggree	Disagree	No Idea	Aggree	Strongly Aggree
I promote my students critical thinking abilities	Frequency	3	7	8	43	20
	Percent	3.7	8.6	9.9	53.1	24.7
I support my students critical thinking abilities	Frequency	2	7	6	45	21
	Percent	2.5	8.6	7.4	55.6	25.9
I engage my students to solve real world problem using digital tools	Frequency	3	7	10	47	14
	Percent	3.7	8.6	12.3	58.0	17.3
I promote my students reflection using collaborative tools to clarify students' conceptual understandings	Frequency	4	5	11	46	15
	Percent	4.9	6.2	13.6	56.8	18.5
I promote my students reflection using collaborative tools to clarify students' thinking	Frequency	2	6	7	53	12
	Percent	2.5	7.4	8.6	65.4	14.8
I promote my students reflection using collaborative tools to clarify students' planning	Frequency	2	6	8	53	12
	Percent	2.5	7.4	9.9	65.4	14.8
I try to be a model in collaborative knowledge construction	Frequency	3	4	14	41	19
	Percent	3.7	4.9	17.3	50.6	23.5
I design relevant learning experiences that incorporate digital tools to promote student learning	Frequency	4	8	19	43	7
	Percent	4.9	9.9	23.5	53.1	8.6
I develop technology-enriched learning environments that enable students to pursue their individual curiosities	Frequency	3	8	23	42	5
	Percent	3.7	9.9	28.4	51.9	6.2
I develop technology-enriched learning environments that enable students to become active participants	Frequency	2	10	22	38	9
	Percent	2.5	12.3	27.2	46.9	11.1
I customize learning activities to address students' diverse learning styles using digital tools	Frequency	2	10	19	43	7
	Percent	2.5	12.3	23.5	53.1	8.6
I customize learning activities to address students' diverse working strategies using digital tools	Frequency	3	9	20	41	8
	Percent	3.7	11.1	24.7	50.6	9.9
I customize learning activities to address students' diverse abilities using digital tools	Frequency	3	7	19	46	6
	Percent	3.7	8.6	23.5	56.8	7.4
I provide students with multiple assessments aligned with content standards	Frequency	3	6	25	39	8
	Percent	3.7	7.4	30.9	48.1	9.9
I provide students with multiple assessments aligned with technology standards	Frequency	2	7	22	43	7
	Percent	2.5	8.6	27.2	53.1	8.6
I use assessment results to inform my students regarding their learning	Frequency	3	6	9	50	13
	Percent	3.7	7.4	11.1	61.7	16.0

I demonstrate fluency in technology system	Frequency	6	6	11	43	15
	Percent	7.4	7.4	13.6	53.1	18.5
I can transfer my current knowledge to new technologies	Frequency	6	5	9	44	17
	Percent	7.4	6.2	11.1	54.3	21.0
I can transfer my current knowledge to new situations	Frequency	6	3	10	47	15
	Percent	7.4	3.7	12.3	58.0	18.5
I can collaborate with students using digital tools to support students success	Frequency	4	5	10	49	13
	Percent	4.9	6.2	12.3	60.5	16.0
I can collaborate with peers using digital tools to support students success	Frequency	4	6	15	44	12
	Percent	4.9	7.4	18.5	54.3	14.8
I can collaborate with parents using digital tools to support students success	Frequency	2	7	17	45	10
	Percent	2.5	8.6	21.0	55.6	12.3
I can transfer relevant information effectively to students using a variety of digital age media	Frequency	1	6	11	47	16
	Percent	1.2	7.4	13.6	58.0	19.8
I can transfer relevant information effectively to parents using a variety of digital age media	Frequency	3	4	20	42	12
	Percent	3.7	4.9	24.7	51.9	14.8
I can transfer relevant information effectively to peers using a variety of digital age media	Frequency	2	6	12	49	12
	Percent	2.5	7.4	14.8	60.5	14.8
I can facilitate current digital tools to locate information resources	Frequency	2	5	12	49	13
	Percent	2.5	6.2	14.8	60.5	16.0
I can facilitate current digital tools to analyze information resources	Frequency	1	7	10	50	13
	Percent	1.2	8.6	12.3	61.7	16.0
I can facilitate current digital tools to evaluate information resources	Frequency	2	6	12	47	14
	Percent	2.5	7.4	14.8	58.0	17.3
I can facilitate current digital tools to use information resources	Frequency	1	5	18	45	11
	Percent	1.2	6.2	22.2	55.6	13.6
I can teach legal use of digital information and technology	Frequency	3	8	19	45	6
	Percent	3.7	9.9	23.5	55.6	7.4
I can teach ethical use of digital information and technology	Frequency	3	5	25	39	9
	Percent	3.7	6.2	30.9	48.1	11.1
I can address the diverse needs of all learners by using learner-centered strategies	Frequency	6	4	17	43	9
	Percent	7.4	4.9	21.0	53.1	11.1
I can promote responsible social interactions	Frequency	4	6	16	46	9
	Percent	4.9	7.4	19.8	56.8	11.1
I can participate global learning communities to explore newer applications of technology	Frequency	3	7	23	38	9
	Percent	3.7	8.6	28.4	46.9	11.1
I can exhibit leadership by demonstrating a vision of technology	Frequency	2	11	28	34	6
	Percent	2.5	13.6	34.6	42.0	7.4
I can evaluate current research on a regular basis to make effective use of existing digital tools	Frequency	1	11	19	38	12
	Percent	1.2	13.6	23.5	46.9	14.8
I can contribute to the effectiveness of teaching profession	Frequency	3	5	13	43	17
	Percent	3.7	6.2	16.0	53.1	21.0

Responses to survey questions by research participants can be seen in Table 4. Over the %75 of the participants state that they can support their students critical thinking abilities, they promote their students reflection using collaborative tools and they can transfer information using various media, they can use digital tools to analyze information, they can transfer their knowledge to new technologies and faculty state they engage their students to solve real world problems. On the other hand %10 or less participant's state that they can facilitate digital tools to use information resources, they are a role model in collaborative knowledge construction,

Survey questions were analyzed by using t-test procedures to understand is there any differences by gender. Based on t test results there is no differences by gender for each survey questions. It can be said that gender is not the significant factor using information technology in and out of classroom settings and college professor can use information technology independently from gender.

Table5 t-test results of surveyquestionsbyagecategory

		N	Mean	t	df	Sig. (2-tailed)
I promote my students critical thinking abilities	Younger	44	3.66	-2.719	75	.049
	Older	33	4.12			
I support my students critical thinking abilities	Younger	44	3.66	-2.743	75	.008
	Older	33	4.24			
I promote my students reflection using collaborative tools to clarify students' conceptual understandings	Younger	44	3.52	-2.586	70.642	.012
	Older	33	4.06			
I promote my students reflection using collaborative tools to clarify students' planning	Younger	44	3.64	-2.119	73.466	.038
	Older	33	4.03			
I can teach legal use of digital information and technology	Younger	44	3.75	2.184	75	.032
	Older	33	3.30			

In table 5 t-test results of survey questions by gender are summarized and just statistically significant differences were reported. Based on results there is a significant difference between older and younger participants responses to "I promote my student critical thinking abilities" question ($t_{(75)}$=-2.719, p<.05).Older participants (M=4.12) state more positive responses than younger participants (M=3.66). There is a significant difference between older and younger participants responses to "I support my students critical thinking abilities" question ($t_{(75)}$=-2.743, p<.05). Older participants (M=4.24) state more positive responses than younger participants (M=3.66). There is a significant difference between older and younger participants responses to "I promote my students reflection using collaborative tools to clarify students' conceptual understandings" question ($t_{(70,642)}$=-2.586, p<.05). Older participants (M=4.06) state more positive responses than younger participants (M=3.53). There is a significant difference between older and younger participants responses to "I promote my students reflection using collaborative tools to clarify students' planning" question ($t_{(73,466)}$=-2.119, p<.05). Older participants (M=4.03) state more positive responses than younger participants (M=3.64). There is a significant difference between older and younger participants responses to "I can teach legal use of digital information and technology" question ($t_{(75)}$=2.184, p<.05). Younger participants (M=3.75) state more positive responses than older participants (M=3.30).

Table6 t-test results of surveyquestionsbycomputertrainingstatue

		N	Mean	t	df	Sig. (2-tailed)
I support my students critical thinking abilities	Yes	53	3.74	-2.734	79	.008
	No	28	4.32			
I can exhibit leadership by demonstrating a vision of technology	Yes	53	3.53	2.037	79	.045
	No	28	3.11			

In table 6 t-test results of survey questions by computer training statue are summarized and just statistically significant differences were reported. Based on results there is a significant difference between participants who got computer training and who did not, responses to "I support my students critical thinking abilities" question ($t_{(79)}$=-2.734, p<.05). Participants who did not get computer training (M=4.32) state more positive responses than participants who gotcomputer training (M=3.74).There is a significant difference between participants who got computer training and who did not, responses to "I can exhibit leadership by demonstrating a vision of technology" question ($t_{(79)}$=2.037, p<.05). Participants who got computer training (M=3.53) state more positive responses than participants who did not get computer training (M=3.11).

Table7 t-test results of surveyquestionsbycomputerexperiencecategory

		N	Mean	t	df	Sig. (2-tailed)
I can transfer relevant information effectively to students using a variety of digital age media	Inexperienced	31	4.13			
	Experienced	47	3.70	2.203	76	.031

In table 7 t-test results of survey questions by computer usage experience are summarized and just statistically significant differences were reported. Based on results there is a significant difference between experienced computer user and inexperienced computer user participants responses to "I can transfer relevant information effectively to students using a variety of digital age media" question ($t_{(76)}$=2.203, p<.05). Inexperienced computer user participants (M=4.13) state more positive responses than experienced computer user participants (M=3.70).

Table8 t-test results of surveyquestionsby internet experiencecategory

		N	Mean	t	df	Sig. (2-tailed)
I can collaborate with parents using digital tools to support students success	Inexperienced	38	3.89	2.219	76	.029
	Experienced	40	3.45			

In table 8 t-test results of survey questions by internet usage experience are summarized and just statistically significant differences were reported. Based on results there is a significant difference between experienced internet user and inexperienced internet user participants responses to "I can collaborate with parents using digital tools to support students success" question ($t_{(76)}$=2.219, p<.05). Inexperienced internet user participants (M=3.89) state more positive responses than experienced internet user participants (M=3.45).

RESULTS

In this research faculty use of information technology in bologna process is examined and participants are 35 years old averagely, and they have 15 years computer experience and 12 years internet usage experience. Participants are younger and experienced computer and internet user.

Based on survey question answers most of the faculty can support students critical thinking abilities, can promote students reflection skills, can use various media and can engage students to solve real world problems by using technology. And faculty state that they can be a role model to their studentsregarding technology usage. Finally faculty use of technology can differ significantly by age, computer experience and internet experience.

REFERENCES

Bjekic, D., Krneta, R. & Milosevic, D. Teacher Education From E-Learner To E-Teacher: Master Curriculum. *TOJET: The Turkish Online Journal of Educational Technology*, 9(1). 202– 212

Cradler, J., McNabb, M., Freeman, M. & Burchett, R. (2002). How does Technology Influence Student Learning?.L.earning& Leading with Technology. 29(8). 46 – 56

Elmas, M. (2012). Faculty' Technology Barriers Faced Within The Framework Of Quality Processes: SAU Sample. *TOJET: The Turkish Online Journal of Educational Technology*, 11(4). 188 - 194

Powell, J.J.W., Bernhard, N. & Graf, L. (2012).The Emergent European Model in Skill Formation : Comparing Higher Education and Vocational Training in the Bologna and Copenhagen Processes. *Sociology of Education*, 85(3), 240–258.

Sakarya, A. O. &Kahraman, Z. E. H. Collaboration in Bologna Process: The Experience of Department of Interior Architecture in Çankaya University. Procedia - Social and Behavioral Sciences 30 (2011) 1312 – 1317

Starcic, A. I. (2010). Educational Technology For The Inclusive Classroom.*TOJET: The Turkish Online Journal of Educational Technology*, 11(4). 26– 37

SUCCESS FACTORS OF E-LEARNING PROJECTS: A TECHNICAL PERSPECTIVE

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ABSTRACT
The aim of this study is to identify the success factors of e learning programs in King Saud University from an engineer and technician’s point of view. An extensive study of existing literature was done to determine the 11 success factors of e learning program. The factors identified as success factors are: Sufficient Users Training, Organization Commitment. Management Support, Technical Support, Positive attitude of users, Easy To Use tools, Sufficient Training to Engineers, Sufficient e learning initiatives, Sufficient Manpower, Availability of Info on E learning Website, Support from other Departments. A survey was conducted to evaluate these success factors in King Saud University. Personal interviews were also conducted with some of the engineers.

All the factors were tested to determine whether they are important for the implementation of e learning programs in King Saud University. The levels of importance of success factors were determined on the basis of quantitative methods.
Keywords: E-learning, Success Factors, Implementation, Engineers, King Saud University

1. INTRODUCTION

Traditionally, Education was based on attending classes, listening to lecture and appearing in exams (Albarrak, 2007). This traditional method of imparting education is evolving and new methods are developed day by day. The introduction of information technology in education is viewed as one of the important means of meeting the need's students, universities and society as a whole. Fry, 2001 suggests that universities must embrace new technological advancements, which are capable of transforming educational and business in order to survive in a global higher-education market (Fry, 2001, p.236). The constant and rapid development of Information and communication technology has led to the introduction of E-learning systems in the system of education. E-learning is now the main focus of introducing and using new and advanced technologies in the field of higher education. E-learning has been defined in different literatures in distinctive ways (Wagner, Hassanein & Head, 2008). In general, E-learning can be defined as an educational system that delivers the information using the Information technology resources like the Internet, intranet, satellite broadcast and multimedia applications(Albarrak, 2007 and Urdan,& Weggen, 2000). The main aim of e-learning systems is to improve the whole educational system and to enhance the interaction between students and teachers (Nycz &Cohen, 2007).
E-learning systems are often used in distance-learning education in different countries enabling students to obtain degrees online. In 2006, about 3.5 million students in United States were taking online courses at the different level of their higher-education (Nagy, 2005). According to the recently conducted report by Sloan consortium, Over 6.1 million students in United States have taken an online course during fall 2010. Another result of their study was that over 65% of higher educational institutions regarded online-learning as a critical part of their longtime strategy (Allen & Seaman, 2011). The future delivery of education is seen through e-learning systems providing teachers with superior and enhanced teaching tools.

Most major universities all around the world provide some kinds of e-learning systems to enhance overall education system and to improve the performance of students. The e-learning systems used can systems can be as simple as a projector or an interactive board to a complex and sophisticated system like a learning management system or an online portal (Abouzahra, 2011).

Given the role of e-learning systems in the world of modern education and its importance in improving the performance of students, King Saud University decided to implement the e-learning systems in various collages, deanships and departments of the universities. King Saud University is one of the biggest universities in the world. It stands as Number one University in Middle East and Africa (Shanghai, Webometrics, QS World University Rankings, 2012). The university has around 38000 students and around 5000 faculty staff. The University in 2010 established the “Deanship Of E-Learning and Distance-learning” which is responsible for the implementation of e-learning projects all over the university. The university received United Nations prize for public service 2010 – Western Asia region for the successful implementation of e-learning systems in the university (King Saud University and United Nations Public Service Awards, 2010).

This paper will describe the success factors of e-learning programs in King Saud University from a technical point of view.

2. BACKGROUND

E-learning is one of the largest sub sectors of global education market. There are a wide variety of e-learning definitions. So it's difficult to estimate the size of the e-learning market (Wagner, Hassanein & Head, 2008). Global Industry Analysts, Inc. (GIA) in 2010 published a report which estimates the worldwide e-learning market to reach $ 107.3 billion by 2015.

The success factors of e-learning have been mentioned in a wide variety of literatures. It has been found that a wide variety of factors can have effect on the success of e-learning. The institute of higher education in 2000 conducted a study named "Quality on the line: Benchmarks for Success in Internet-Based Distance Education" which identified the following as critical factors for the success of e-learning:

- *Institutional support:*
  Benchmarked the technological infrastructure issues
- *Course Development:*
  Benchmarked the development of courses by faculty on campus or by experts.
- *Teaching/ Learning:*
  Benchmarked on the way of teaching and learning.
- *Course Structure:*
  Benchmarked on the basis of self-motivation and commitment to learn.
- *Student Support:*
  Benchmarked on the basis of information provided to students. This included information about admission, tuition, fee, books and student support services
- *Faculty Support:*
  Benchmarked on the basis of technical support available to the faculty included transition from classroom teaching to the online teaching
- *Evaluation and assessment:*
  Benchmarked on the basis of overall effectiveness of the e-learning systems. This includes reviewing the intended outcomes regularly to ensure the utility of e-learning systems

Volery and Lord (2007) conducted a study on an online management course in Australian university and found Instructor, technology and previous use of technology by a student as critical factors for the success of online e-learning systems. Papp in 2000 identified intellectual property, suitability of course content, building e-learning course, suitability of e-learning course, e-learning platform and measuring the success of e-learning courses as critical success factors for any e-learning system. Le blanc and wands (2001) categorized the success factors of e-learning systems as follows:

- *Organizational factors***:**
  Include technological infrastructure and Management support to e-learning.
- *General factors*:
  Include-learning principles, defined outcomes, learning pathways and assessment of the e-learning system
- *Cognitive factors***:**
  Include access to help, user control, user interface, use of multimedia and presentation of complex information.

Sela and Sivan (2009) divided the success factors of e-learning as "Must have factors" and "Nice to Have Factors"

Must have Factors Include

1. Usefulness and Ease of use:
- Easy to use for learners
- Engaging employees
- Short course duration

2. Marketing
- Understanding the reason for e-learning
- Awareness to e-learning tools

3. Management support
- Top Management support to employees.
- Management assistance to employees

4. Organizational culture
- Learning culture
- Change in study habits
- Making people understand how to e learn

5. Real need
- The organizations motive behind the e-learning implementation.

Nice to have factors include

1. Time to learn
- Allocate sufficient time for e-learning
- Make e-learning a routine

2. Support
- Provide technical support on how to use the e-learning system

3. Mandatory usage
- Integrate e-learning into organization policy
- Enforce e-learning

4. Incentives
- Recognition to e-learning usage
- Provide materials that are otherwise unavailable

There are also some challenges and issues faced in the successful implementation if e-learning in an organization. Madhukar in 2002 pointed out some of the negative influences of using the Internet as a medium of e-learning. He argued that introduction of the Internet as an e-learning tool reduces the student concentration on studies and is time consuming. He also argued that this makes student dependent on the Internet and in turn restricts a student to gain knowledge by research.

Another study conducted by Alexander & McKenzie in 1998 pointed out certain factors, which may result in the failure of e-learning systems. According to them, failure to prepare students for using e-learning and not obtaining the copyright clearance may result in the failure of e-learning. They argued that e-learning will fail if the outcome desired is not supplied with sufficient budget and time. They also argued that e-learning will fail if the system applied does not meet the requirements of the organization. The shortage of skilled IT workforce can as well be an important factor for the failure of an e-learning system. According to an estimate by Gordon in 2002, there will be more than one billion Internet users but there will be a shortage of skilled workforce to sustain this growth.

3. OBJECTIVES

The main objective of this study was to measure the success of e-learning programs in King Saud University from a technical point of view. This study was carried out with the help of engineers and technicians working towards the implementation of e-learning in King Saud University. Based on extensive literature review and consultation with the engineers and technicians, there were 11 factors that were identified as the success factors for e-learning implementation in King Saud University. These 11 factors were identified as:

- ✓ Sufficient Users Training
- ✓ Organization Commitment
- ✓ Management Support
- ✓ Technical Support

- ✓ Positive attitude of users
- ✓ Easy To Use tools
- ✓ Sufficient Training to Engineers
- ✓ Sufficient e-learning initiatives
- ✓ Sufficient Manpower
- ✓ Availability of Info on E-learning Website
- ✓ Support from other Departments

4. METHODOLOGY

A set of a questionnaire was created, which contained a total of 16 questions. The questionnaire was then distributed to the Engineer's and technical support staff of e-learning programs in different departments, deanships and Colleges of the King Saud University. The questionnaire was completely paper based and respondents were required to return the questionnaire before the given deadline. This ensured the completion of the questionnaire within a limited time frame. The questionnaire was sent out to nineteen engineers and technical support staff and the response was collected within the supposed time. All the questionnaires were complete and therefore, were useful in our study. Thus, a very high response rate was achieved.

Personal interviews were also carried out with the e-learning support staff in King Saud University. Interviews were carried out with the support staff of two main colleges of King Saud University: Collage of Computer Sciences and Collage of Pharmacy. With these interviews, we were able to conduct a meaningful discussion and generate a fruitful feedback. These interviews offered a clearer picture and deeper understanding of e-learning program implementation in King Saud University.

The data collected was subsequently analyzed on mean, percentages, frequencies and standard deviation using PASW Statistics 18 software. The analyzed data was afterwards synthesized and presented in the form of table. In the event of an invalid answer or an unanswered question, the question was deemed void and was not used in the analysis.

5. ANALYSIS AND DISCUSSION

Table given below shows the Mean and Standard deviation for each factor. The factors are arranged from the highest mean score to the lowest mean score. There were six factors that have a mean score in the range of 4 to 5. The rest had a mean score of less than 4.0. The six factors that have a mean score of greater than 4.0 are Sufficient Users Training, organization Commitment, Management Support, Technical Support, Positive attitude of users, Easy To Use tools. This implies that six factors were deemed most important by our respondents for the success of e-learning initiatives. There were four factors that have a mean score of more than 3.0 up to 4.0, which implies that all these factors are fairly important for the success of e-learning programs and play a vital role in successful e-learning implementation. These factors are Sufficient Training to Engineers, Sufficient e-learning initiatives, Sufficient Manpower, Availability of Info on E-learning Website. There was only one factor, Support from other Departments, which has a mean score of less than 3.0 implying that this factor was not considered important by our respondents.

Table: E-Learning Success Factors

Success factors	Mean	Std. Deviation
Sufficient Users Training	4.4211	.69248
Organization Commitment	4.3889	.77754
Management Support	4.2105	.91766
Technical Support	4.1579	.83421
Positive attitude of users	4.1579	1.11869
Easy To Use tools	4.1053	.87526
Sufficient Training to Engineers	3.7368	.65338
Sufficient e-learning initiatives	3.7368	1.04574
Sufficient Manpower	3.6316	.95513
Availability of Info on E-learning Website	3.2105	1.13426
Support from other Departments	2.0000	.94281

5.1 Sufficient User Training

A lot of respondents felt that sufficient user training is the most important factor for the success of e-learning programs. 52.6% of respondents felt that this factor is of topmost importance to the success of e-learning in King Saud University. This is the highest percentage of importance given to any factor in this survey. This factor was also considered very significant by 36.8% of the respondents and a minority of 10.5% of respondents considered this factor as just important. None of the respondents deemed this factor as less important or not important at all.

5.2 Organization Commitment

Organization commitment determines organization effort and seriousness towards the implementation of e-learning programs. Different Organization all over the world has distinct motivations and strategies for the implementation of e-learning programs. If the organization is not committed towards e-learning programs, the e-learning initiatives are bound to fail (Goi and Ng, 2009). Respondents in this survey considered organization commitment of topmost importance with 36.8% of respondents agreeing to this fact. A same percentage (36.8%) of respondents termed organization commitment to be a very important factor for the success of e-learning programs. This implies that more than 73% of respondents considered this factor as either topmost important or very important. The results strongly support the Henry's theory (2001) which stated E-learning requires the same management commitment as other mission-critical organization-wide initiatives.

5.3 Management Support

This is one of the most important factors for the success of any IT project including E-learning. The top management support and consistency is critical to implementation of any project (McPherson & Nunes, 2006 and Selim, 2007). The management can help an employee to learn and support the acceptance of the new system (Sela and Sivan, 2009).The importance of this factor can be attributed to the fact that 47.4% of the respondents termed this as a factor of topmost importance. 31.6% of respondents termed this factor to be very important while as 15.8% termed it as an important factor for the successful implementation of e-learning in King Saud University. A small percentage of 5.3% people considered this factor as less important.

5.4 Technical Support

The availability of technical support has a positive effect participation and willingness to use e-learning systems (Masie, 2001; McPherson & Nunes, 2006; Selim, 2007). It was found that 36% of the respondents deemed the technical support availability factor of topmost importance. Approximately, half of the respondents (47.4%) considered the availability of technical support to them as a very important factor. None of the respondents felt that they don't need any technical support.

5.5 Positive Attitude of Users

The use of e-learning systems by the users is determined by their attitude towards technology. According to technology acceptance model (TAM), the acceptance of new technology is determined by its perceived usefulness. The user will have positive attitude towards technology if they believe that the system will enhance their performance (Sela & Sivan, 2009; Venkatesh, Morris, Davis & Davis F, 2003). Majority of our respondents also believed that user attitude will determine the success of any e-learning initiative in King Saud University. 47.4% of the respondents gave top importance to the positive user attitude and 36.8% of the respondents rated positive user attitude as a very important factor for the success of e-learning programs.

5.6 Easy To Use tools

The success of any system depends on the degree the person believes that the system will be free of effort (Venkatesh, Morris, Davis & Davis F, 2003). The easy to use tools are extremely important for the success of any e-learning program. This fact was also considered important by all of the respondents. 42.1% of respondents felt that it's extremely important to have easy to use e-learning tools. 26.3% considered this factor as very important while as 31.6% deemed this factor important. None of the respondents gave this factor less or no importance.

5.7 Sufficient Training to Engineers

There were 68.4% of respondents who chose this factor as very important. 21.1% of respondents deemed this factor as important. This implies that the sufficient training to engineers and technicians is essential for the efficient management of e-learning programs in their respective Colleges and deanships. The reason for this could be that there are new e-learning technologies coming out every day and King Saud University is constantly implementing these technologies in various streams of the e-learning programs and initiatives. The working of e-learning systems and programs in various Colleges and deanships is largely dependent these respondents, so they want to be well versed in every system and program that is implemented in King Saud University.

5.8 Sufficient e-learning initiatives

There were 21.1% of the respondents who rated this factor as Topmost Importance. 52.6% of the respondents placed this factor as a very important criterion. None of the respondents deemed this factor as not important.

The results regarding this factor imply that majority of the respondents felt that the sufficiency of e-learning programs and initiatives are important for e-learning to succeed.

5.9 Sufficient Manpower

There were 47.4% of respondents who considered this factor as very important factor and 21.1% of respondents chose this factor as important. 15.8% of respondents rated this factor of topmost importance. Hence, it can be implied that majority of the respondents believed that sufficient manpower is extremely important to manage the e-learning programs in their respective Colleges and deanships.

5.10 Availability of Info on E-learning Website

The opinions of respondents regarding this factor were fairly divided. Only 10.5% of the respondents considered this factor of topmost importance whereas vast majority of respondents considered this factor very important. 21.1 % of the respondents considered this factor as somewhat important and 26.3% considered it as less important. Only 5.3% of the respondents deemed this factor as not important at all. The importance of this factor can be attributed to the fact that engineers and technicians want to know about the department they are working with and also would like information about the e-learning systems and programs they are going to work with or provide support.

5.11 Support from other departments

This factor had a lowest mean score of 2.0. This implies that this factor is of least importance for the success of e-learning programs in King Saud University. 31.6% of the respondents felt that this factor is not important at all and 47.4% of respondents considered this factor as less important for the success of e-learning programs. There were only 10.5% of respondents that considered this factor as very important and none of the respondents gave this factor a topmost importance.

6. CONCLUSIONS AND RECOMMENDATIONS

Out of the 11 factors 10 factors were considered important by the respondents and only 1 factor was considered less important. The responses and findings of this study can help King Saud University and other similar Organization in deciding higher priority and the lower priority factors. Six factors had a mean score of more than 4.0 (Sufficient Users Training, Organization Commitment. Management Support, Technical Support, Positive attitude of users, Easy To Use tools) while as the rest had a mean score of less than 4.0(Sufficient Training to Engineers, Sufficient e-learning initiatives, Sufficient Manpower, Availability of Info on E-learning Website, Support from other Departments). There was only one factor, Support from other Departments, which was deemed relatively less important or not important at all by a significant percentage of respondents (79.0%).

The focus of e-learning programs should be on the learners and users rather than the introduction of new technology. The results of this study are of critical importance because this study was carried out with the involvement of engineers and technicians who are actually responsible for the implementation on e-learning programs in King Saud University. We consider this study to be important not only to King Saud University but also to other Organization and universities which are in a process of implementing the e-learning systems and programs.

REFERENCES

A global strategic business report (2010). *Global Industry Analysts, Inc*. Online Available: http://www.strategyr.com/eLEARNING_Market_Report.asp

Abouzahra M M (2011). Building the E-learning System in King Saud University, A System Perspective. Proceedings of the World Congress on Engineering and Computer Science.

Ahmed. I. Albarrak (2007). Designing E-learning Systems in Medical Education: A Case Study. *Sixth International Internet Education Conference*. September 2-4, 2007

Alexander, S., & McKenzie, J. (1998). An evaluation of information technology projects in university learning. Canberra, Australia: *Australian Government Publishing Services*.

Allen. E, Seaman .J, (2011). Going the Distance Online Education in the United States, 2011. *Sloan consortium*. Online Available:http://sloanconsortium.org/publications/survey/going_distance_2011

Fry. K (2001). ELearning Markets and Providers: some issues and prospects. *Training and Education*. 233-239.

Goi C.L and Ng P.Y (2009). E-learning in Malaysia: Success Factors in Implementing E-learning Program. *International Journal of Teaching and Learning in Higher Education*. Volume 20, Number 2. 237-246

Gordon, G. (2002). E-learning is consistent and effective. *The Sunday Times Business Times*, p. 16.

Henry P (2001). E-learning technology, content and services. *Education + Training*. Vol. 43 Issue: 4/5. 249 - 255 King saud university Online Available: http://ksu.edu.sa

Le Blanc .A & Wands. M. (2001). Critical success factors: e-learning solutions cappuccino. *The Official E-*

Newsletter of the Change and Learning Practice. 2.
LIST OF 2010 UNPSA Winners and their Delegations (2010). Online Available: http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan039440.pdf
Madhukar. I. (2002). Internet based distance learning. *Authorpress Global Network*. . Delhi, India.
Masie, E. (2001). E-learning: If we build it, Will they come?. *The Masie Centre and ASTD Report, ASTD*. Alexandria, VA, United States.
McPherson M & Nunes M. B. (2006). Organizational issues for e-learning: Critical success factors as identified by The practitioners. *The International Journal of Educational Management*. 542-558.
Merisotis J. Harvey M. O'brien C. Quality On the Line: Benchmarks for Success in Internet-Based Distance Education. *The institute for higher education policy*. Online Available: http://www.ihep.org/assets/files/publications/m-r/QualityOnTheLine.pdf
Morrison D. (2003). E-Learning strategies: How to get implementation and delivery right first time. New York, USA: John Wiley & Sons.
Nagy, A. (2005). The Impact of E-Learning. E-Content: Technologies and Perspectives for the European Market. Berlin: Springer-Verlag. 79–96
Nycz,M and Cohen,E.(2007). The basics for understanding e-learning. Principles of effective online teaching. 1-17.
Papp R. (2000). Critical success factors for distance learning. *Americas Conference on Information Systems*, Long Beach, California, USA
QS World University Rankings Online Available: http://www.topuniversities.com/
Sela E, Sivan Y.Y. (2009) Enterprise E-Learning Success Factors: An Analysis of Practitioners Perspective (with a Downturn Addendum). *Interdisciplinary Journal of E-Learning and Learning Objects*. Volume 5.
Selim, H. M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers & Education*. 396-413
Shanghai ranking Online Available: http://www.shanghairanking.com
Urdan, T. A., & Weggen, C. C. (2000). Corporate e-learning: exploring a new frontier. *Wrhambrecht+Co*.
Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly. 425-478
Volery, T., & Lord, D. (2000). Critical success factors in online education. *The International Journal of Educational Management*. 216-223.
Wagner, N., Hassanein, K., & Head, M. (2008). Who is responsible for E-Learning Success in Higher Education? A Stakeholders' Analysis. *Educational Technology & Society*. 26-36.
Webometrics Rankings. Online Available: http://www.webometrics.info

SYNCHRONOUS TECHNOLOGICAL ADMINISTRATION OF DATA COLLECTION INSTRUMENTS: AN ERGONOMIC METHOD FOR GROUP ADMINISTRATION

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ABSTRACT
Questionnaires administered manually can cause surreptitious peer pressure on the candidate to finish when 'the others' have completed theirs, forcing students to rush or skip individual items or may hinder the ability of noticing participants who may be having in difficulty understanding certain items. These drawbacks can have serious consequences on the results of the study. With the use of the new S*ynchronous Technological Administration Method (STAM)*, each item with the possible response alternatives is presented on a PowerPoint slide to the group and the administrator waits until all the respondents mark their choice on the optic form. The Revised Two Factor Study Process Questionnaire was administered to 1145 undergraduate students using the STAM proved to be beneficial in many ways. The percentage of missing data decreased immensely dropping from 21.4% to 2–5%, and the reliability of the whole instrument significantly increased. In addition, paper wastage was diminished and the use of the optic form eliminated hours of tedious plugging in of data which eliminated errors that were likely to occur with manual plugging.
Keywords: group administration; synchronous administration; missing data; reliability; ergonomic method of group administration.

INTRODUCTION

Scholars, researchers, and educators pursuing a career in academia or administrators of academic institutes may need to conduct surveys in order to gather data. This may be done via a variety of methods. This spectrum of methods ranges from paper-and-pencil questionnaires to those that are web-based questionnaires. Some are manually distributed to individuals or groups of respondents and left for them to fill in at their own pace, some are sent out by post with a stamped and addressed envelope for easy return, and other questionnaires are completed over the phone. Computer based questionnaires (with or without the use of the Internet) are also commonly used where the respondent can click in their answers either in a laboratory setting as a group, again at their own pace or individually in their own time. It is, however, important to remember that the actual method used, can affect the quality of data collected (Bowling, 2005; Koponen, Maki-Opas, & Tolonen, 2013).

Collecting data in any of the above-mentioned methods has its advantages and disadvantages based on the cost, time taken for administration, number of willing participants, and response rates. Most important of all is the actual reliability of the answers. The respondents might fill in the questionnaire without totally grasping the meaning of the items, or leave out items that they have not completely understood, thereby jeopardizing the reliability of the instrument, and creating the subject of missing data (Denscombe, 2009; Koponen, Mäki-Opas & Tolonen, 2013) which is another issue that is greatly deliberated over. Missing data is a common problem for all survey researchers (Durrant, 2009) and "can cause bias or lead to inefficient analyses." (Horton & Kleinman, 2007, p.1). Researchers opting to delete the cases with missing data can find that this could lead to "a severe loss of statistical power" as it "often deletes a large fraction of the sample" (Allison, 2009, p.1) and in some circumstances the cases deleted may belong to a certain category. For example, it has been found that certain personality types can be more prone to leaving items unanswered (Jerant, Chapman, Buberstein, & Franks, 2009). Therefore, in order to get a true picture of the results, the replies of these respondents would also be especially important.

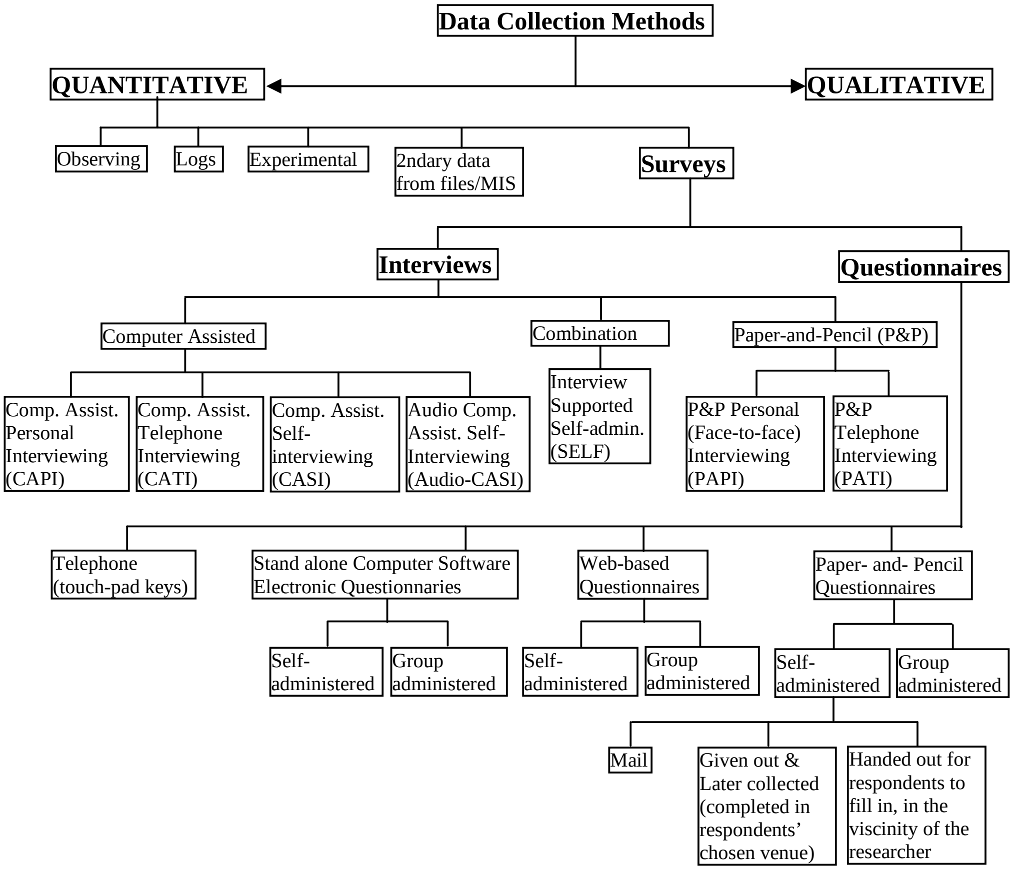

Figure 1. Data collection methods

Much research has been done on different methods of survey administration such as the advantages and disadvantages of internet based data collection methods (Benfield & Szlemko, 2006) comparisons of (a) World-Wide Web and paper-and-pencil questionnaires (Pettit, 2002; Denscombe, 2009), (b) mail questionnaires with telephone questionnaires (Denniston & Brener, 2010), (c) face-to-face interviews, with telephone interviews, and with mail questionnaires (Summerhill & Taylor, 1992), (d) different methods of interviewing methods and self-administered questionnaires (Lang, John, & Lüdtke, 2011), and (e) several types of modes of questionnaire administration (Bowling, 2005) and their effects (Dale, 2006). A diagram showing different methods of data collection has been created from the literature reviewed. This can be seen in Figure 1.

The main concern of this study is about methods of administration of questionnaires for collecting quantitative data and especially those methods that are based on group administration. These, at present, can be divided into two categories (1) the traditional paper-and-pencil questionnaires, and (2) the computer and/or web-based questionnaires. Some of the possible disadvantages suggested by researchers for both categories (group or individually administered) is that the researcher (even if present) may not be able to recognize all respondents who are having difficulties with items or statements and therefore could miss the opportunity to clarify these (Fraenkel & Wallen, 2006; Marshall, 2005). This could lead to respondents skipping or missing items or not taking the necessary care to understand the items or statements posed (Lang, John, Lüdtke, Schupp, & Wagner, 2011). As a result, this may lead to missing data and reliability issues (Koponen, et al., 2013). Further drawbacks pointed out by other researchers, is that questionnaires are not suitable for respondents who have poor literacy and poor comprehension skills (Benfield & Szlemko, 2006; Marshall, 2005) or poor vision (Marshall, 2005). The method that has been proposed in this article, which will be described extensively later in the paper, used PowerPoint slides whereby the administrator reads the questions to the whole group making it possible for the respondents to see and hear the items at the same time and move synchronously at the same pace.

Since the items are read by the administrator and are shown on a PowerPoint slide to the whole group synchronously, any queries that may arise can be answered immediately by the administrator. This benefits all respondents by increasing their understanding of the items as everyone is at the same stage in the questionnaire.

As everyone gets the same explanation, administration bias is also reduced. In this way many of the mentioned drawbacks can be eliminated, the number of missing data can be reduced and the reliability of the instrument can be increased.

The disadvantages of using paper and pencil questionnaires over the Internet or computer-based questionnaires are higher cost and longer data entry time spent for paper and pencil questionnaires (Owens, 2005; Benfield & Szlemko, 2006). Moreover, errors made when inputting data by using paper and pencil are greatly reduced when computer or internet-based questionnaires are used (Cohen, Manion, & Morrison, 2008). With the method proposed in this paper, students will be asked to indicate their answers on the allocated optic forms, after each question has been verbally read out and visually portrayed via a PowerPoint presentation by the administrator. This will almost eradicate excess data entry time and data inputting errors and the cost will be limited to the price of the optic forms.

This paper addresses all these problems and more by introducing a new method and sharing the experience of testing it on more than 1000 students in three different studies.

AN ERGONOMIC METHOD FOR GROUP ADMINISTRATION

Administrators of academic institutes, educators and researchers are all concerned with the issue of academic performance. There is a vast array of literature on this issue. One component of this issue is the approach to learning. A popular instrument used to measure the learning approaches of students is the revised two-factor Study Process Questionnaire (Biggs, Kember, & Leung, 2001) which measures the Deep Approach and Surface Approach. The Deep Approach is where the students' intention is to understand and learn the material and the Surface Approach is where the students' intention is to memorize the material to be able to pass the course. The aim of this questionnaire is to help teachers uncover what approaches their students use in leaning the material presented in their course (Biggs et al., 2001). Based on their findings the teachers will be able to implement certain teaching methods and evaluation methods to instil the Deep Approach as this is the preferred method of learning.

The revised two-factor Study Process Questionnaire was used as part of a large study to find out the students' approaches. Initially the paper and pencil survey method was employed but on facing implementation problems, a new method of collecting data using technology to overcome the existing problems has been developed.

In the 2008 – 2009 Summer session the Turkish version of the Revised Two Factor Study Process Questionnaire (R-SPQ-2F) (Biggs, Kember, & Leung, 2001) was administered to Turkish students from Turkey and Cyprus studying in the Eastern Mediterranean University (EMU) in North Cyprus. One hundred and three summer school students taking a variety of summer courses formed the first sample of the study. The classical method of 'group administration' whereby "the instrument is administered to all members of the group at the same time and usually in the same place" (Fraenkel & Wallen, 2006, p.399) was used for each class. After the administrator was introduced to the class and the aim of the research was explained, paper copies of the questionnaires were distributed and the students were asked to respond to the items at their own pace. The administrator invigilated the process while the participants filled in their questionnaires and answered any individual queries that arose. Those who completed filling in their questionnaires were allowed to leave the classroom with the aim of minimizing distraction to the others. This action, unfortunately, backfired as the non-completers were noticed to rush their answers ticking quickly without even reading the items or leaving some of the items unanswered so that they could join their peers outside. This was one of the many problems noticed by the administrator which was thought would lead to a reliability hindrance and missing data problem. Another such hindrance was the inability of the administrator to monitor every participant continuously through signs of body language which pointed to either difficulty in answering items or unwillingness to answer wholeheartedly although prior consent was obtained. This was mainly due to two reasons: (1) while helping students with a quiery, the administrator would not be able to notice what the others were experiencing and (2) any explanation to items given by the administrator would not be paid any attention to, due to the participants being at different stages in the completion of their questionnaires. Proof of this was found at the end of the session when the questionnaires were collected and the answer sections were checked. Some of the answer sections were ticked in a symmetrical pattern indicating that they may have been concentrating on creating an arty design rather than concentrating on the items. On further cross examination, where their answers were cross checked with items of the same nature, there were contradictory answers showing that those participants either did not comprehend the items fully or did not complete their answers willingly and carefully. Furthermore, many students left several items unanswered and as a result out of a sample of 103 students only 81 valid cases were found which caused 21.4% missing data.

An Exploratory Factor Analysis was conducted using SPSS on the data obtained from this first administration of the questionnaire and Varimax rotation was employed fixing the factors to two. All the items for Deep Approach and Surface Approach fitted snuggly into each factor except for a Surface Approach item 4, “I only study seriously what is given out in class”. Hence, this item was omitted from the reliability analysis.

As can be seen in Table 1, the Cronbach’s Alpha values found for the factors in this questionnaire were higher for one factor (Deep Approach, α = .77) but much lower for the second factor (Surface Approach, α = .69), yielding a difference of .08 between the two. This result is similar to the original study conducted by Biggs et al. (2001), where the Cronbach’s Alpha value for the Deep Approach was found to be .73, and .64 for the Surface Approach, yielding a .09 difference between the two. For both studies the reliability of the Deep Approach fell into the ‘acceptable’ category and ‘poor’ for the Surface Approach (George & Mallery, 2001).

The problems faced with this type of administration forced the authors to search for a new method. It was decided that a PowerPoint version of the questionnaire would be prepared. The first few slides would introduce the purpose of the study and the questionnaire. This would be followed by each item with the possible response alternatives portrayed on a slide. The whole process would be conducted using these slides. In addition to solving the abovementioned problems, this method would also eliminate the following expensive and time consuming factors: (1) Process of designing manual questionnaires to fit a minimum number of pages but at the same time be readable and understandable for the participants; (2) having to do a pilot study of the manual questionnaires for comprehension and ease of completion based on the design; 3) photocopying one questionnaire for each participant totalling to a number equal to the sample size, and 4) burden of carrying a heavy load of questionnaires to different venues for administration. For all these reasons the Synchronous Technological Administration Method (STAM) was created to be used when collecting data in group administration settings as it seems to be easier to administer and more economical, feasible and reliable**.**

EXPERIENCE IN USING THE STAM

The same questionnaire, Turkish version of the R-SPQ-2F (Biggs et al., 2001) was administered using the STAM to students taking the EGIT213 (Statistics – I) course in the Guidance & Psychological Counseling Program in the Department of Educational Sciences in the Eastern Mediterranean University. It was administered to four groups with a total number of 100 students during the 2009 – 2010 Fall Semester. After optic forms were distributed to the participants, the administrator began the PowerPoint presentation by explaining the aim of the research and questionnaire, followed by giving instructions for answering the items and then showing and reading each item with possible response alternatives on every slide. While waiting for all students to finish answering, the administrator checked the respondents’ body language for any problems such as confusion with the meaning of an item or unwillingness to wholeheartily participate, dealt with them where necessary and continued to the following slides in the same manner. In this way each slide took on the average between 22 - 24 seconds for completion. Each item taking the student between 5 – 10 seconds to fill in the circle on the optic form after having read and/or heard the item.

Out of a sample of 100 students 98 valid cases were found. This shows only 2% missing data. This is a great improvement from the previous study (missing data = 21.4%) that was conducted without the use of the STAM.

An Exploratory Factor Analysis was conducted using SPSS for the data obtained from this second administration of the questionnaire, and Varimax rotation was employed fixing the factors to two. Again, all the items for Deep Approach and Surface Approach fitted into each factor except for the Surface Approach item 4. This item was again omitted from the reliability analysis.

The reliability coefficient of the Surface Approach segment of the questionnaire improved rising from .69 (poor) to .74 (acceptable) and the difference between the reliability coefficients of the Deep and Surface Approaches were reduced to .01 as seen in Table 1. The reason for this rise in the alpha value could be due to the use of the STAM whereby students using the Surface Approach were compelled to spend enough time to concentrate on the items and/or portraying and reading out each item for them may have contributed to their better understanding of these items.

The sample sizes used for the initial two studies were limited to around 100 students. Aiming to increase the reliability of the Turkish version of the R-SPQ-2F (Biggs et al., 2001) questionnaire, it was administered by using the STAM in the 2010 summer semester to 184 students taking one of the six summer school courses, namely, LAW421 (Labour and Security Law), IENG355 (Ethics in Engineering), FINA302 (Money and Banking), FINA362 (Applied Financial Statistics), MATH373 (Numerical Analysis for Engineers), and FINA461 (Advanced Software Applications in Banking). One hundred and seventy-seven valid cases were found showing only 3.8% missing data. Once again a great improvement from the first study which had 21.4% missing data.

The Exploratory Factor Analysis was conducted using SPSS for the data obtained from this third administration of the questionnaire, and Varimax rotation was employed forcing the factors into two, yet again item 4 was found as an outlier and omitted from the reliability analysis. Thus, the reliability coefficients of the Deep and Surface Approach factors were found to both be equal to .71 (acceptable), reducing the difference between the two alpha values to zero.

A final study using the same questionnaire but with the omission of item 4, was conducted on 862 undergraduate students in 34 classes of the Faculty of Education in the Eastern Mediterranean University in the 2010 – 2011 Fall Semester. Again, Exploratory Factor Analysis was conducted using SPSS for the data obtained from this fourth administration of the questionnaire, and Varimax rotation was employed fixing the factors to two. All the Deep Approach and Surface Approach items fitted into their own factors.

Out of a sample of 862 students 819 valid cases were found. This shows only 5% missing data. Again, a great improvement from the initial study without the use of the STAM which had given rise to a 21.4% missing data.

The Cronbach's Alpha values for the Deep Approach and the Surface Approach both increased to .80 which is considered as a 'good' reliability, and became higher than the other Turkish versions with smaller sample sizes as can be seen in Table 1. Furthermore, the difference between the reliability coefficients of the two factors remained as zero.

Table 1: Cronbach's Alpha values and missing data for the studies with and without the use of the STAM

	English version Original study **without the STAM** N=495	Turkish version 1st study **without the STAM** N = 103	Turkish version 2nd study **using the STAM** N = 99	Turkish version 3rd study **using the STAM** N=184	Turkish version Final study **using the STAM** N = 862
Alpha value for Deep App.	0.73	0.77	0.75	0.71	0.80
Alpha value for Surface Approach	0.64	0.69	0.74	0.71	0.80
Difference between the two factors' alpha values	0.09	0.08	0.01	0.00	0.00
Missing data	…	22 (21.4%)	2 (2%)	7 (3.8%)	43 (5%)

As can be seen from the results, the original English version implemented by Biggs, Kember, and Leung (2001) was conducted without the use of the STAM on 495 undergraduate students and the Cronbach's Alpha value for the Deep Approach was found to be .73, and .64 for the Surface Approach. These reliability values are considered to be an 'acceptable' for the Deep Approach and 'poor' for the Surface Approach (George & Mallery, 2001). These values create a .09 difference between the Cronbach's Alpha values for the two factors. The first study conducted with the Turkish version of the questionnaire was also implemented without the use of the STAM and the Cronbach's Alpha values of .77 (acceptable) and .69 (poor) for the Deep Approach and Surface Approach factors respectively. These results were similar to those of the original study, creating almost an equal difference of .08 in the Cronbach's Alpha values for the two factors.

The second study conducted with the Turkish version, this time using the STAM, produced 'acceptable' reliability results for both factors; .75 for the Deep Approach and .74 for the Surface Approach. A difference of .01 between the two Cronbach's Alpha values for the two factors was computed which can be considered as negligible.

The third study yielded similar results. A Cronbach's Alpha value of .71 was found for both the Deep and Surface Approach factors diminishing the difference between the two to zero.
When the same questionnaire was implemented to 862 students in the actual study, the reliability results increased to .80 for both the Deep and Surface Approach factors, which is considered a 'good' reliability value (George & Mallery, 2001). Again the difference between the two Cronbach's Alpha values were zero. This result may show that students might have been having difficulty with the Surface Approach questions but with the use of the STAM this problem was reduced to a minimum. In addition to this, the use of the STAM seems to have brought both factors' reliabilities to 'acceptable' levels. Furthermore the increase of the sample size enabled the relability value to rise to a 'good' level.

Hence, it can be concluded that by changing the method of group administration of questionnaires to the Synchronous Technological Administration Method, the percentage of missing data can be reduced considerably, the reliability problems due to the misunderstanding of some items can be mostly eliminated, and the reliability level of the whole instrument can be significantly increased.

CONCLUSION AND BENEFITS OF USING THE STAM

Starting from 2009 – 2010 Fall Semester the STAM has been used to administer the Turkish version of the R-SPQ-2F (Biggs et al., 2001) to 1145 undergraduate students enrolled in the Eastern Mediterranean University in North Cyprus. This method was designed in order to remedy the problems faced when implementing the classical manual group administration method. It uses technology in two stages; one during the actual administration, and one for plugging in the data from optic forms via an optic reader to the statistics program. Thus relieving the researcher of the arduous ordeal of manually plugging in the data.

Reduction of Missing Data and Increasing Reliability

One of the most prominent benefits of using the STAM was found to be the decrease in the percentage of missing data dropping from 21.4% which was obtained from the regular group administration to between 2 – 5%. Another important benefit was found to be the significant increase of the reliability of the whole instrument.

Other Benefits of Using the STAM

Apart from the reduction of the percentage of missing data and significant improvement in the reliability of the instrument, many more benefits before, during and after administration can be noted with this method. First, there is no paper wastage since PowerPoint slides are used for the presentation of the items, thus aiding in the conservation of trees. Furthermore, money and time is saved from getting the manual questionnaires photocopied for hundreds if not thousands of participants. Second, the burden of carrying the weight of the manual questionnaires is removed – all that is necessary are optic forms and a laptop (or just a usb if a computer is already present in the room of administration). Third, during the administration the students took interest in the items and seemed to look forward to the 'next slide', some even asking for more items at the end of the administration, thus showing their enthusiasm towards the procedure. Fourth, during the administration the researcher was able to spot students who seemed to be filling in the questionnaires halfheartedly and not taking the administration seriously. These students were noted to be filling in the optic form before the items were shown or read out, or be in continuous conversation with their friends and therefore not listening to the items or looking at the slides. When this type of behavior was noted, the administrator was able to stop the administration to talk about the importance of everyone's sincere responses and to coax them into concentrating on filling in the optic form. As this interruption is done after the current item has been completed by everyone, it is believed that nobody is disturbed; whereas in the classical group administration, where participants are not working on the items synchronously as in the STAM but instead working at their own pace, it is not right to make this type of interruption as this will disturb respondents who are trying to concentrate on filling in the questionnaire. Fifth, by looking at the students' facial expressions after an item was read out and shown on the screen, the administrator could ascertain whether anyone had any problems with understanding the item and provide any necessary explanation. In this way other respondents will not be disturbed since they are all working on the same item. Sixth, the STAM catered for students with different learning styles. For example, the administrator noticed a student with his back to the screen where the items were being projected and asked if he would like to change his seat so that he could follow the PowerPoint slides. The student said that he preferred to 'just listen' to the items as he was able to concentrate better this way. This would not be possible in the classical administration method, as the respondents would have to read the items before responding to them. Seventh, students with visual or aural handicaps can still be included in the research since PowerPoint presentation caters for the needs of the hearing-impaired and the administrator's voice caters for the needs of the visually impaired. Eighth, the administrator was able to notice students who needed more time to respond to some of the items and told them that they could come up to the administrator at the end of the session to go over the items they needed more time on. A few students in each group did benefit from this opportunity. There were three to four students in most classes who fell into this category. In doing so this contributed immensely towards the reduction of the percentage of missing data within the sample. Ninth, although initially it was hypothesized that the implementation of the STAM may take more time to complete than the classical implementation method, this was not the case as students struggling with any item were immediately given clarifications and in this way the time lost pondering over items on their own was reduced. Tenth, the reading of the optic form done by the optic reader is done in minutes thus saving days or even weeks or months of tedious work involved in plugging in data to a statistics program. Furthermore, using the optic reader rather than plugging in the data manually is a health benefit as it is easier on the eyes and back of the researcher. Using the optic reader rather than plugging the data manually also reduces errors and the time needed to check and correct these errors.

The STAM of data collection is a group administration in the real sense, not just the distribution of questionnaires to a group of participants where they complete the instruments at their own pace, but group in the sense that they all go forward *synchronously* at the same pace. It uses technology in two stages – during and after administration, reducing the workload involved with data collection. It also makes use of the benefits of a combination of both face-to-face individual and group administration where every person is monitored after each item is read out, and any arising problems are solved thus reducing missing data enabling higher reliability.

REFERENCES

Allison, P. D. (2009). Missing Data, *Chapter 4, Statistical Horizons*. Retrieved February 20, 2012 from http://www.statisticalhorizons.com/downloads/Milsap-Allison-pdf

Benfield, J. A., Szlemko, W. J. (2006). Internet-based data collection: Promises and realities. *Journal of Research Practice, 2.* Retrieved June 27, 2011 from http://jrp.icaap.org/index.php/jrp/article/viewArticle/30/51

Biggs, J. B., Kember, D., & Leung, D. Y. P., (2001). The revised two-factor study process questionnaire: R-SPQ-2F. *British Journal of Educational Psychology, 71*, 133-149.

Bowling, A. (2005). Mode of questionnaire administration can have serious effects on data quality. *Journal of Public Health. 27*, 281-291. Retrieved June 29, 2011 from http://jpubhealth.oxfordjournals.org/content/27/3/281.full.pdf+html

Cohen, L., Manion, L., & Morrison, K. (2008). *Research Methods in Education. 6th ed.* Routledge, Taylor & Francis, London and New York.

Dale, A. (2006). Quality issues with survey research, *International Journal of Social Research Methodology,* 9(2), 143-158. Retrieved February 20, 2012 from http://dx.doi.org/10.1080/13645570600595330

Denniston, M. & Brener, N. (2010). A comparison of mail and telephone administration of district-level questionnaires for the School Health Policies and Programs Study (SHPPS) 2006: Effects on estimates and data quality, *Journal of School Health, 80.* Retrieved June 29, 2011 from http://www.med.upenn.edu/beat/docs/DennistonandBrener2010.pdf

Denscombe, M. (2009). Item non-response rates: a comparison of online and paper questionnaires, *International Journal of Social Research Methodology,* 12(4), 281-291. Retrieved February 20, 2012 from http://dx.doi.org/10.1080/13645570802054706

Durrant, G. B. (2009). Imputation methods for handling item-nonresponse in practice: methodological issues and recent debates, International Journal of Social Research Methodology, 12(4), 293-304. Retrieved February 20, 2012 from http://dx.doi.org/10.1080/13645570802394003

Fraenkel, J. R., & Wallen, N. E. (2006). *How to design and evaluate research in education* (6th ed., International Edition). McGraw Hill Higher Education, NY.

George, D. & Mallery, (2001). SPSS for Windows A simple guide and reference, 3rd edition. A Pearson Education Co., Needham Heights, MA 02494 USA.

Horton, N. J., & Kleinman, K. P. (2007). Much ado about nothing: A comparison of missing data methods and software to fit incomplete data regression models. *The American Statistician, 61*(1) 79-90. Retrieved October 18, 2011 from http://www.math.smith.edu/~nhorton/muchado.pdf

Jerant, A., Chapman, B. P., Duberstein, P., & Franks, P. (2009). Is personality a key predictor of missing study data? An analysis from a randomized controlled trial. *Annals of Family Medicine,* 7(2). Retrieved October 18, 2011 from http://www.ncbi.nlm.n.h.gov/pmc/articles/PMC2653957/pfd/0060148.pdf

Koponen, P., Mäki-Opas, J., & Tolonen, (2013). H. Questionnaire design and administration. *EHES Manual, Part A.* Retrieved February 12, 2013 from http://www.ehes.info/manuals/EHES_manual/EHES_manual.htm

Lang, F. R., John, D., Lüdtke, O., Schupp, J., & Wagner, G. G. (2011). Short assessment of the Big Five: robust across survey methods except telephone interviewing. *Behavioral Research 43,* 548-567. Retrieved June 29, 2011 from http://springerlink.com/content/y7426hw21vp1q41/fulltext.pdf

Marshall, G. (2005). The purpose, design and administration of a questionnaire for data collection. *adiography*, *11*, 131-136. Retrieved July 22, 2011 from http://www.sciencedirect.com/science/article/pii/S1078817404001208

Owens, L. K. (2005) Introduction to survey research design. *SLR Spring 2005 Seminar series.* Retrieved July 19, 2011 from http://222.srl.uic.edu/semiars/surveydesign.DOC

Pettit, F. A. (2002). A comparison of World-Wide Web and paper-and-pencil personality questionnaires, *Behavior Research Methods, Instruments & Computers, 34,* 50-54. Retrieved June 29, 2011 from http://www.springerlink.com/content/b115760536046200/fulltext.pdf

Summerhill, W. R., & Taylor, C. L. (November, 1992). Selecting a data collection technique. *Florida Cooperative Extension Service (University of Florida), Circular PE-21.* Retrieved June 29, 2011 from http://edis.ifas.ufl.edu/pdffiles/PD/PDO1600.pdf

THE DIGITAL DIVIDE AMONG UNIVERSITY FRESHMEN

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ABSTRACT
Use of new technologies in university training is an ongoing reality today. However, the inequalities that exist among university students are the source of an important problem. Such inequalities need to be detected and analyzed and therefore a study of college freshmen can be very valuable. This qualitative study intends to analyze the digital divide of such freshmen by using techno-autobiographies, i.e.; the students' account of their situation. A total of 91 such students from the University of Vigo, Spain, participated in this research. Results obtained show the presence of asymmetries in the use of ICTs and indicate the presence of a digital divide. Such inequalities with respect to technology imply fewer ICT resources for some of these newcomers and difficulties to access the Internet. Worth highlighting is the fact that not all university freshmen use digital technology in a standardized manner for academic purposes but they nevertheless use such technology more frequently for private purposes.

INTRODUCTION
Within the Spanish university context, the teaching methodology needed to adapt to the European Higher Education Area (EHEA) requires the integration of Information and Communications Technologies (ICTs) into the training process. Salmon and Jones (2004) sustain that the inclusion of ICT in syllabi acts as a driving force for learning and brings about educative innovation. Research into ICTs is found at the different educational levels, is derived from innovative experiences and highlights the relevance of ICTs for collection and dissemination of information, communications within the educational community, online collaboration, etc. Cavusa and Kanbulb (2010) indicated some of the advantages of using e-learning platforms such as for sending and receiving work/ exercises, providing immediate feedback in tests, communicating with teachers and other colleagues, accessing training information and carrying out collaborative work. Other authors pointed to the importance of ICTs to follow-up learning, develop communications and plan the teaching process (Cavus, 2010; Lonn and Teasley, 2009).

An analysis of the available ICT resources, their usefulness and the training needs of students can provide important information to teachers, the scientific community, institutions and politicians. Of special interest to the development of the training process, is the adaptation of methodological strategies to incorporate ICTs, in order to respond to the expectations and demands of contemporary society.

This study researches the digital divide of university freshmen with respect to obstacles experienced by them for using ICTs. The central objectives of this study are as follows:

- Identification of ICT resources available to students for training and personal use.
- Identification of nature of ICT use by students; whether academic or personal.

What is already known about this topic:

- ICTs have a transformation potential that can contribute to reducing social, cultural and economic inequalities.
- Insight into student's literacy with ICT can be a starting point to gauge their level of digital competences and to explore or learn about the influence of such competences both at academic and personal levels.

What this paper adds:

- A digital divide has been found among university freshmen within the context that has been analyzed.
- The inequalities faced by university students towards technology are evident when we look at the scarce ICT resources available to some of them and what they are used for.

Implications for practice and/or policy:

- In order to be able to define teaching strategies and integrate ICTs within an academic setting, one must first detect and analyze the presence of such digital divide among students.
- University institutions should reinforce their available ICT resources and dynamics in order to minimize the handicap that arises from such digital divide.

RELEVANT LITERATURE

Digital divide is known to be linked with digital literacy and the limitations experienced by people in the use of ICTs. For the UNESCO (2008), digital competence comprises mastery of the several capacities of students to search, select, analyze and evaluate information rather than just technical operation of technological equipment. This means that they must be creative and efficient at using digital tools, communicate and collaborate with other people, and produce and publish materials and information. They must also be able to solve problems, make decisions through technology, be responsible and contribute to enriching the knowledge society.

The Organization for Economic Co-Operation and Development (OECD, 2001) defines the concept of "Digital Divide" as the inequality of access to ICTs among geographic areas and people from different socio-economic levels. A double dimension is therefore accepted, i.e., socio-economic and territorial. Zhang, Wang and Kolodinsky (2010) widen the scope of this expression to the skills needed for effective and real use of ICTs. Archibugi and Coco (2004; 2005) suggest the creation of digital divide indicators by analyzing: creation of technology, existing digital structures and development of abilities for using the same, at the local scale. Cantwell and Iammarino (2003) considered regions as important study areas for the digital proficiency of people.

Digital divide is a problem that affects students from all over the world to a greater or lesser extent. Therefore, scientists have tried to analyze this phenomenon at different stages of a student's life in an attempt to discover the underlying problems and seek explanations and possible solutions. For example, Waycott, Bennett, Kennedy, Dalgarno and Gray (2010) identified differences in the use of technology in higher education and in the daily lives of teachers and students in Australia. They justified such differences based on individual motivations and social norms that promote the use of ICTs. The study revealed that teachers are the ones who most resist use of ICTs as against students who are receptive and enthusiastic. The study also showed that teachers mostly focused on using ICTs for institutional matters and pedagogic application while students used the same to organize their social life.

For Edmunds, Thorpe and Conole (2012), researching into students' experience with ICTs is a valid method to explore the influence and the attitudes related to their use in academic, social and leisure contexts. They also state that an analysis of the use of ICTs by students and their interactions can contribute to the future use of ICTs in apprenticeships. This study also provides an insight into the student's previous knowledge and can be a starting point to channel the development of innovative methodological strategies.

Even though Goode (2010) affirms that ICTs are part and parcel of the daily life of university students in the USA, their findings however indicated the presence of differences associated with technological skills. The study pointed to the need for incorporating teaching and policy dynamics in order to permit higher education students receive training through the integration of ICTs. It furthermore indicates that institutions should be the ones responsible for providing such ICT support.

THE STUDY

This research followed a qualitative methodology wherein information was collected as techno-autobiographies of students from two degree programs and also through a virtual forum that lasted one month. Students from other degree programs were also interviewed. Based on the ideas of Watulak Lohnes (2012), the discourses and social constructs of experience were considered to be useful for knowing and understanding the different perceptions, through the particularities that make up the life of human groups in specific contexts.

Due to space constraints, the work presented herein focused on students from two classrooms, as sub-cases (Stake, 1995). It was framed within the perspective of *narrative inquiry* through techno-autobiographies. This narrative technique permits students to describe their previous experiences on a specific subject or problem, which is the purpose of the study. In this sense, Swindells (1995) states that such narration permits the creation of space for the protagonists themselves in which their voices can be heard, however, the researcher should take on an important role in the analysis of the information and the interpretation of results. The strategic methodology used places emphasis mainly on the descriptive and interpretative facets in order to provide a comprehensive vision of the reality through the eyes of the protagonists.

Research context and participants

The study was part of a research project undertaken by the University of Vigo, located in the NW of the Iberian Peninsula. This institution was created in 1990 and is regionally organized into three university campuses, located in the cities of Ourense, Pontevedra and Vigo (Spain). It has modern facilities and infrastructures are still being expanded and consolidated. The University has state-of-the art technological devices and offers the university community Internet connection through cable and wifi on campus premises. Even though such equipment can generally still be improved, it is nevertheless quite appropriate for carrying out teaching and research activities.

Ninety-one first year students registered in the University of Vigo (academic year 2012-2013) participated in the recording of the techno-autobiographies. In September 2012, students from two degree programs from the Faculty of Education Sciences also joined the study. These were students of *Technological Resources in Social Education* and *New Technologies Applied to Pre-School Education* (from the *Social Education* and *Pre-School Education* degrees respectively). There were 79 females and 12 males aged between 18 and 46 years (Table 1), whose average age was 21 years. The number of female participants was by far higher than male participants. This is because education studies in Spain are mostly chosen by female students.

Table 1. Age and gender distribution of the participants

Age	18		19		20		21		22		23		24		25		38		46		
Sex	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	Total
Frequency	23	2	14	2	11	1	12	1	7	4	7	0	2	0	0	1	2	1	1	0	
Total	25		16		12		13		11		7		2		1		3		1		91
Per cent	27,5		17,6		13,2		14,3		12,1		7,7		2,2		1,1		3,3		1,1		100%

Legend: M = Male; F = Female

Data collection and analysis

One of the researchers of the project, who is also a teacher in the said disciplines, promoted the development of reflexive narrations from students through techno-biographies, in which students talked about their individual experiences with the use of ICTs and the problems experienced within their academic and personal fields. This was done with a two-fold objective (students were informed of the same), namely; to obtain insight into the initial level of use of ICTs and ascertain the presence of digital divide. Students prepared their narration privately and away from classrooms. The techno-autobiographies were first written using a word processor and then submitted by the students via the e-learning platform.

A qualitative analysis was performed based on definition of the different categories of the research objectives. Content analysis facilitated the determination of the different sub-categories derived from both the objectives and the set of information obtained. Such analysis was carried out systematically and in detail following the procedure described in Bardin (2007). The text version of the software *Analysis of Qualitative Data* (6.0) was used for such analysis. This program furthermore permits the generation of summary tables which, upon using a spreadsheet, permit the production of figures to show the results obtained. These figures show a preponderance of the obtained sub-categories frequency (f) and percentage (%). The purpose of representing these quantities is illustrative and is aimed at revealing the sub-category trend. It does not intend to emphasize the numerical component because this is a qualitative study.

In order to facilitate comprehension of the data provided, the results section also contains some extracts that exemplify the narrations (R) generated by the student's techno-biographies, and indicates the number attributed to them for analysis purposes, together with the gender and age of each participant (Example: R1, female, 18 years).

RESULTS

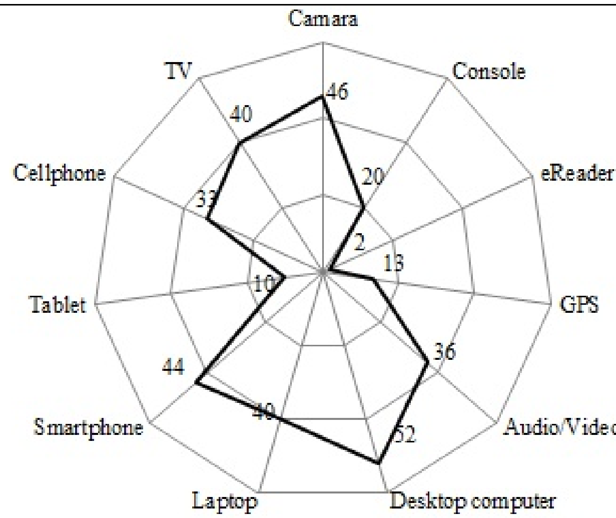
Results are shown for the following general categories based on the above mentioned objectives:

- ICT resources available to students.
- What students use ICTs for.

ICT resources available to the student

University students can avail of a variety of ICT resources for their training and personal use. They normally use a desktop computer, a laptop, cell phone, digital camera, audio/ video player and TV (Figure 1).

A small group of students was found to be well versed with technological updates evident from the amount and variety of resources that they had at their disposal for personal use. Some of the participants used more than five new technological devices on a daily basis, which is large within a Spanish context. Besides the above, some of them also had access to smart phones, tablets, e-readers, GPS's and videogames consoles.



Legend : f=frequency

Equipment	Camara	Console	eReader	GPS	Audio/Video	Desktop computer	Laptop	Smartphone	Tablet	Cellphone	TV
%	51	22	2	14	40	57	44	48	11	36	44

Figure 1. ICT devices that students have

The narration of some students is reproduced hereunder:

"I currently have a computer, a cell phone, a videogames console and I furthermore share 2 TVs at home with my family. The device I use most is my computer because I can use it for many things such as searching information on the Internet, doing academic work, accessing my social networks and playing games." [R_{35}, male, 18 years]

"Later on I began using a laptop for class and academic work, and my e-reader to look at study books and articles. There are 3 TVs at home which we share among family members, and a desktop computer, two laptops, two cameras (one digital and another analog), one e-reader and my Smartphone." [R_1, female, 18 years]

Some students feel that the knowledge demands of the ICT resources are proportional to the possibilities they offer in return. Students associate state-of-the art equipments with high economic cost. In fact, most students state that ICTs are beyond their reach. They also mention their shortfalls in mastering certain technical skills needed to operate some devices and their economic limitations to access the Internet. These aspects point to digital divide indicators which are substantial obstacles for university students. The following extract shows a student explaining her problem:

"I usually use the computer, social networks and the cell phone. I use the wifi connection available on campus because we cannot afford Internet connection at home. This creates problems academically because when I need to do some academic work through the Internet, I have to do so in the library or in areas with free wifi access." [R_{41}, female, 20 years]

Generally speaking, only middle to upper class families can afford to purchase the latest technology in Spain. It is quite uncommon for students to have access to the latest devices both at institutional and personal levels since they are beyond their economic reach. This in turn negatively affects the level of digital skills acquired. These aspects also point to the presence of digital divide in higher education students.

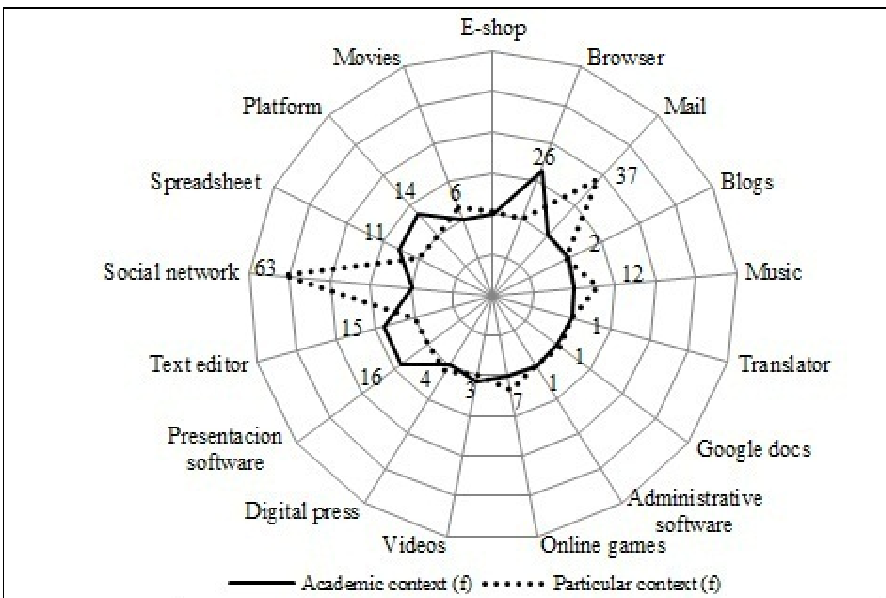
Use of ICTs by students

The results obtained generally show that university freshmen have a good technical command for handling the different ICT equipment. They normally use a variety of digital applications, different softwares and diverse virtual scenarios. In as far as software and digital applications are concerned, they present different intensities and experiences insofar as the students' academic and private lives are concerned (Figure 2). An extract taken from the techno-autobiography of one of the students is reproduced below as an illustrative example:

"My experience with new technologies in the academic field is basically related to preparing work for university such as the creation of videos, power point presentations, blogs, web pages, etc. For example, in one subject, students created a blog for the class in which we pasted links to news, images, films, etc. At other times, we presented our class assignments using power point, and did activities with Photoshop, Word, Excel…" [R_4, female, 18 years]

Worth highlighting is that one group of participants only had limited experience in the use of ICTs. The main reasons were the few activities they did using ICTs at school and problems to access the Internet. In fact, inequality among students becomes evident with respect to type and amount of ICT resources used and the heterogeneity expressed in the use of the same.

Students revealed that the activities they carried out in the university context were related to performing several tasks, which at times required Internet connection. They linked such tasks with information search, publication of content, translations, work performed on the e-learning platform, consulting their exam results and administrative tasks such as registration and formalization of their university enrolment. The applications for which they did not require Internet connection were text edition, creation of videos, presentation of assignments in the classroom and spreadsheets (Figure 2).



Context	Type of use	eShop	Browser	Mail	Blogs	Music	Translator	Google docs	Administrative software	Online games	Videos	Digital press	Presentacion software	Text editor	Social network	Spreadsheet	Platform	Movies
Academic	%	0	29	0	2	0	1	0	1	0	3	0	20	16	0	12	20	0
Particular		1	0	41	0	13	0	1	0	8	0	4	0	0	69	0	0	7

Figure 2. ICT devices that students have

At a personal level, students associated ICTs mainly with leisure activities and connection to the Internet. They highlighted use of the Internet for communicating with family and friends (through email and social networks), downloading and listening to music, watching films and playing games online and for reading newspapers (Figure 2). The results show that students prefer to use some digital applications for communications but not for academic use. These facts point to asymmetries in the use of ICTs on the personal and academic fronts. And therefore, digital divide becomes more pronounced in the academic use of ICTs.

CONCLUSIONS AND DISCUSSION

Within a Spanish context, the results presented in this paper point to the presence of digital divide indicators among students that have just joined university. Several inequalities between students were observed insofar as the amount and diversity of ICTs used by them. This consequently affected the type of activities they performed with such ICTs. There is therefore a need to introduce palliative measures to boost a generalized use of such technology with a view to avoiding negative effects in academic training. Brown and Czerniewicz (2010) state that the so-called "digital natives" are an elite lot because of their familiarity and experience in the use of ICTs rather than because of their age. Lohnes Watulak (2012), on the other hand, feels that we will be able to increase the number of ICT users by reducing the tension experienced when they have problems using ICTs.

Most students own several digital devices and use them with great ease both for academic and private purposes. However, the study reveals that a small group of people have economic limitations for acquiring such devices while another group lacks digital competence. Goode (2010) alerts about the high costs of technologies and states that students who do not have enough resources and experience would probably lose out on training opportunities. Such conclusion can be extended to university freshmen from our study since they do not have a standardized use of ICTs. Therefore teachers must provide strategies to students in order to orient training via supporting tools that will help them to train in both academic and digital contexts (Hwang, Chu, Lin and Tsai, 2011). In like manner, university institutions should in great measure provide initiatives to ameliorate inequalities between students by providing provisional loans of digital mobile devices, increasing class times, increasing quality and bandwidth of the Internet signal, etc. Students should also be given supplementary digital lessons in order to reduce currently existing asymmetries.

The study revealed that college freshmen use some digital applications (social networks and email) for personal purposes but do not use them for academic purposes. To that end, Terras and Ramsay (2012) state that the use of ICTs can stimulate both formal and informal learning. This study has generally revealed asymmetries in the use of social networks: presence within personal contexts but absence within academic contexts. The same trend was also observed in a study carried out on university students in Russia and Germany (Porshnev and Giest, 2012).

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REFERENCES

Archibugi, D. & Coco, A. (2004). *New Indicator of Technological Capabilities for Developed and Developing Countries (ArCo). CEIS Working Paper 44* [WWW document]. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=487344

Archibugi, D. & Coco, A. (2005). Measuring technological capabilities at the country level: A survey and a menu for choice. *Research Policy*, *34*(2), 75–194.

Bardin, L. (1977 1st edn, 2007 1st edn quadrige). *L'analyse du contenu*. Paris: PUF.

Brown, C. & Czerniewicz, L. (2010). Debunking the "Digital Native": Beyond digital apartheid, towards digital democracy. *Journal of Computer Assisted Learning*, *26*(5), 357-369.

Brown, G. & Yule, G. (1998). *Discourse analysis*. Cambridge: University Press.

Cantwell, J. & Iammarino, S. (2003). *Multinational corporations and European Regional systems of innovation*. London: Routledge.

Cavus, N. (2010). The evaluation of learning management systems using an artificial intelligence fuzzy logic algorithm. *Advances in Engineering Software*, *41*(2), 248-254.

Cavusa, N. & Kanbulb, S. (2010). Designation of Web 2.0 tools expected by the students on technology-based learning environment. *Procedia Social and Behavioral Sciences*, *2*, 5824-5829.

Edmunds, R., Thorpe, M. & Conole, G. (2012). Student attitudes towards and use of ICT in course study, work and social activity: A technology acceptance model approach. *British Journal of Educational Technology*, *43*(1), 71-84.

Goode, J. (2010). Mind the gap: The digital dimension of college access. *The Journal of Higher Education*, 81, 5, 583-618.
Henwood, F., Kennedy, H. & Miller, N. (2001). *Cyborg lives? women's technobiographies.* York: Raw Nerve Books.
Hwang, G., Chu, H., Lin, Y. & Tsai, C. (2011). A knowledge acquisition approach to developing mindtools for organizing and sharing differentiating knowledge in a ubiquitous learning environment. *Computers and Education*, *57*(1), 1368-1377.
Lohnes Watulak, S. (2012). I'm not a computer person: Negotiating participation in academic discourses. *British Journal of Educational Technology*, *43*(1), 109-118.
Lonn, S. & Teasley, S. D. (2009). Saving time or innovating practice: Investigating perceptions and uses of learning management systems. *Computers & Education, 53*(3), 686-694.
OECD (2001). Understanding the digital divide. Paris: Organisation for Economic Co-operation and Development.
Porshnev, A. & Geist, H. (2012). University students' use of information and communication technologies in Russia: A focus on learning and everyday life. Seminar.net, *8*(1), 27-53. Retrieved from http://seminar.net/index.php/component/content/article/75-current-issue/184-university-students-use-of-information-and-communication-technologies-ict-in-russia-a-focus-on-learning-and-everyday-life-
Salmon, D. & Jones, M. (2004). Higher education staff experiences of using web-based learning technologies. *Educational Technology and Society, 7*(1), 107-114.
Stake, R. E. (1995). *The art of case study research*. Thousand Oaks: Sage Publications.
Swindells, J. (1995). *Introduction*. *The uses of autobiography*. London: Taylor and Francis.
Terras, M. M. & Ramsay, J. (2012). The five central psychological challenges facing effective mobile learning. *British Journal of Educational Technology*, *43*(5), 820-832.
UNESCO (2008). *ICT competency standards for teachers*. Retrieved from http://unesdoc.unesco.org/images/0015/001562/156210e.pdf
Watulak Lohnes, S. (2012). I'm not a computer person': Negotiating participation in academic discourses. *British Journal of Educational Technolog, 43*(1), 109-118.
Waycott, J., Bennett, S., Kennedy, G., Dalgarno, B. & Gray, K. (2010). Digital divides? student and staff perceptions of information and communication technologies. *Computers & Education*, *54*(4), 1202-1211.
Zhang, G., Wang, Q. & Kolodinsky, J. (2010). The digital divide in Internet information searching: A double-hurdle model analysis of household data from Vermont. *First Monday*, 15, 11. Retrieved from http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/3118/2649

THE EFFECT OF BANKING PERSONNEL'S ACCESS TO E-LEARNING OPPORTUNITIES ON THEIR PROFESSIONAL ACHIEVEMENT

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ABSTRACT
Developments in information and communication technology create the spread of education and economic opportunities. E-learning is one of them. For companies in the banking sector, web-based training is a new opportunity to create a harmonious labor force with new technology and to increase the efficiency of business productivity. E-learning with practice of these new technologies, offers bank employees individual learning, regardless of time and space.

Nowadays, because e-learning provides opportunities for learning without interfering with the flow of work for the staff working at the appropriate time and space, an economic advantage is provided to both the bank as company and its employees. Therefore, spending on education decreases. However, the level of benefit that bank staff gains from educational opportunities changes on the basis of certain demographic characteristics. This situation is an important variable with regard to the effect of e-learning which is seen in the efficiency of the business.

This study on foreign-owned banks was carried out on employees in İzmir. Foreign-owned banks in Turkey are entering the market and have achieved a lot of success and innovation. Today, nearly 350 branches, 7,000 employees and serve more than 3 million customers and in the last 22 years they have achieved sustainable growth and innovation. In addition, this study investigates the role of e-learning in vocational success and the levels of web-based education that bank staff enjoy. Web-based training is effective in increasing the bank employees' professional achievements, but was reported to vary according to individual differences.
Keywords: E-learning, Bank, Career Success

INTRODUCTION

Today, as all sectors have experienced, a transformation in education and training is also very important. This conversion is economically demanding; information and communication technology infrastructure is moving on. Institutions and businesses in computing in common countries have become dependent on information technology.

Nowadays, as competition is increasing all over the world, and with the aim of increasing yield, Turkey is putting forward strategies. Access to useful information as soon as possible for competitive national and international markets has become an important condition for adapting to changing conditions. Information and communication technologies, however, due to the economic and social effects all over the world are seen as a critical area of investment (Düşükcan & Kaya, 2003). In addition, one of the most important aspects of competition is qualified personnel. Therefore, investments that are made for the training of personnel will be appropriate for the demands of a changing world. At the beginning of these investments are training which affect business performance and their own progress.

Through the use of information and communication technologies in ensuring continuous and effective training of the personnel, skilled labor is acquired. However, the criteria of economic institutions must be considered when planning training. In times of crisis, one of the first budget items that may be waived is also apparent in resources devoted to education such as 'development activities expenditures'. Created by constant technological changes in the demand for change in job performance, continuing education has become inevitable. Distance learning, especially web-based learning, is one of the important solution areas to minimize education spending. Because transportation, food and hotel accommodation will not be reguired during such training, costs are eliminated. E-learning projects in education provide important advantages in sustainable training as a rational solution.

Today, many banks include distance education applications. Continuing training is required to uses new technologies and software and to raise the quality of banking services. However, one of the educational opportunities created by new technologies, e-learning packages, produces an economical solution through distance education. Banks are able to transmit the new developments in their staff training costs by adapting to the decline in distance education programs, and banking services are attuned to the global innovation.

E-learning materials, where course content is distributed in electronic form by the development of technology, indicate the privilege of education. The most important of these privileges is that the course is communication and interaction technology-based (Swan, 2003).

Sustainable training of the personnel is carried out in branch or home environments before and after closing time. During the course of study, the staff is able to back up any learning and self-test through e-examinations. In addition, assessment exam questions are delivered to the various branches of the bank's employees through the Internet, enabling personnel to receive their results instantly even though they are in different places at the same time. Time, money and labor savings are also achieved. Thus, increasing the intellectual capital of the bank via e-learning seems to be quite functional. Because human capital is an important component of intellectual capital, human resources, policies, and coordinated e-learning contribute to improving the performance of the bank's business and services.

To inform personnel that the new system is implemented or launched, a campaign is tranmitted immediately and it can be quickly put into practice. As e-learning will be saving training, senior management and staff interaction with each other is through this medium. Interaction is one of the most important features of web-based education. Communication and interaction between staff and training staff is the most important factor in improving the efficiency of the training.

E-LEARNING AND INTERACTION

With learning in a virtual environment, as the e-learning package is a user-centered design crafted packet, user requests are taken into account and so the establishment of interaction through the program is simplified. For this reason, there is an interaction between the users and program.

E-learning uses electronic multi-media technologies to reach a wider audience the world and distribute knowledge by using Internet, intranet, and other technology-based systems (Vaughan, 2004). E-learning is very effective for prior knowledge capture, use and interaction between staff and the online material. Thus, while learning time enables continuity, flexibility and accessibility, learning materials are distributed free of charge and fast to a wider audience (Welsh et al., 2003). It is important that there is the provision of high quality E-learning materials.

In order to share educational content, e-learning uses synchronous (real-time) and asynchronous (asynchronous) communication technologies. E-learning is also preferred effectively in the banking financial sector as in every sector for the provision of fast and effective feedback. Many banks use e-learning training support in cases where it is impossible to have face-to-face training. Because it can provide training anytime, anywhere, e-learning allows individuals to receive training without disrupting work hours. In addition, it enables the institution to save costs such as transportation, meals and hotel costs.

During learning, learners with each other or the other with the course the authorities of their interactions facilitate the exchange of information and feedback. For example, when using asynchronous communication tools, previously sent messages are sent comments. Through this interaction, learners' learning process without being isolated enables more spacious and great information. The use of synchronous communication tools such as chat instantly evaluates each other's comments and questions.

Content compatible interactions should be designed in e-learning design. Students interacting with each other contributes to the formation of the social process of education. The learners can see not only material, but also their own circles through the interaction and there is increased sharing of information (Johnson et al., 2008). In addition, because there is an increased interaction of the individual, the learning environment is perceived to be more positive. Immediate interaction and feedback between instructors provides learners with the necessary information more quickly.

E-LEARNING IN THE BANK SECTOR

Due to the progression of the rapid development of information technology, banks do not have enough time for training on how to use it and how to be productive with this technology. Therefore, e-learning has important functions in terms of capturing developments in the personnel sector.

Information and communication technologies have led to revolutionary changes in both in-company and inter-company communications in today's increasingly global competitive environment. An important part of business is visibly increasing investments in information technology day by day. Using IT systems in enterprises enables the task project teams of managers of functional units to be interconnected via networks regardless of geographic location (Tekin et al., 2005).

IT in a competitive structure is one of the important competitive tools the banks have used. Since Internet has radically changed the concept of business, banks use have also shown a change in this process. At the beginning of the use of the Internet on the web, banks began their products to promote internet banking to customers via Internet banking (İleri& İleri, 2011).Though there is no limitation of time and space, they perform training services through the web in order to work with more qualified personnel. Thus, using speed tracking technology banks have made a profit in terms of time and cost.

Therefore, since investments have paved the way to develop e-learning in the field of education, numerous companies are carrying out their training in the virtual environment. In order to carry out economic training in the workplace, it should be maximize the the ratio between income and investment. Business investment includes financial contribution for training software, learning management systems, training hours, for the workplace to the costs allocated to the workers (Moon et al., 2005). Companies provide from technology, sales, marketing for the staff to personal skills training training opportunities in every field of e-learning.

While e-learning is workplace learning, job performance is a development tool (Bershin, 2002). By increasing human resources, knowledge is increased and contributes to employees' career development. Due to the frequent use of the virtual environment in employees' work routines, e-learning and the ability to repeat the information presented, individuals' enhanced performance forms due to the ease of access to information which can be taken from what you find as soon as the possibility of applying.

Individuals who need information when they need to work and co-operation by establishing an e-learning method allows them to interact anytime and anywhere able to meet these requirements (Sambata, 2000, Zhang & Nunamaker, 2003). Learning technology in workplace learning is focused on technical matters, not required learning points to design an effective e-learning of adult (Williams, 2002). Distance learning opportunities are important not only for fixing the shortcomings of personal information but also in the process of the elimination of the obstacles encountered and in the service and support of banks.

Learning in the workplace-related studies have spread as a comprehensive and interdisciplinary field since the early 1990s. Increasing these trends in the workplace is an important change in business life. The rapid development of information and communication technologies has increased and changed the growth of the place of production of the knowledge economy, the structure of the work and the content. In this case, companies have developed new ways of work organizations at the change level of their opponents (Tynjala, 2008).

Recent studies related to education show the differences between the information obtained through formal education and the necessary knowledge in the workplace. Development of vocational and professional expertise requires the interaction of different types of information. Learning is important to ensure continuous competence development for employers as a learning environment in the workplace Companies strive especially for collaborative training. Individual and group learning in the workplace requires high social activity like interaction, dialogue, reflecting on past experiences and future planning activities (Tynjala, 2008). Individuals can interact with e-learning, share goals, have access to more information. All employees can participate.

Staff in institutions can be directed in e-learning through motivation and reward. If a person is not well organized, that person is self-isolated from the e-learning process. In addition, employers should be directed to e-learning by informing them about the development opportunities of e-learning, the support to management, boundaries, how to overcome these constraints and the method of assessment of future relationships. In 2004, a study was conducted in England, among 80 randomly selected employers. According to this study, 76% of the employers required e-learning in the life-long learning process and found it to be effective for access anywhere. 74% of employers never used e-learning. 47% of employers used it for easy accessed from anywhere. 29% of employersthought that e-learning courses affected their future careers. 24% of employers found the program easy to use. When the distribution of the employer's relationship with the staff is considered, 16% of employers used e-mail, 16% of employers used chat, 40% of employers used telephone and 28% of employers communicated face to face. Looking at the relationship between staff training methods, e-learning effects 95% test, 40% interview, 26% discussion with the administrator, 64% appreciation, 57% observation, 52% the efficiency (Vaughan & MacVicar, 2004).

According to 2003 dated research on the e-learning system applied in Greek Bank, of all the personnel 72% want no missing parts in contents, 93% emphasize visual design, 62% care about interaction, 82% want easy surfing on the system, 68% demand easy access and 58% want control. Also 65% of personnel the reported their contentment with the system while 35% asked the performance of further researches on this subject (Borotis & Poulymenakou, 2009).

Another research is the one conducted during Clinton administration in the US. As manifested by this research, via e-learning, a person can learn 20% more, spend 40% less time and 30% less money. In the mids of 1999, the research findings released by New York- centered Think Tank Establishment Masie Center demonstrate that 92% of major US companies have received some form of online education. According to Forrester's e-learning research covering 40 global companies 67% of participants agreed that e-learning is low-cost, 36% liked its easy use from anywhere anytime, 28% favored its simultaneous learning, 21% liked easy access to the instructor, 18% emphasized its ease of use, 13% liked the rapid distribution, 13% selected its individual-based learning rate and 10% favored its adjustable contents. Originally designed as an educational model for information technology sector, e-learning is now a widely-used type of education provided to elevate the performance of all fields of personnel and used in kind of trainings that give product information (Sinç, 2006). There are many barriers that affect individuals' learning such as lack of motivation, employer support, unsuitable time, courses falling short and geographical boundaries. Therefore, these factors are minimized to learn in the workplace between individuals (Harun, 2002).

Today, banks are in a global competition. Education supports this process. Because in the past only people having received professional education were offered jobs and this education was considered to be adequate but now even if a personnel receives professional training before, the newly hired personnel is still offered in-company trainings to enable better adaptation of the personnel to work. Not only in terms of knowledge, the skills and behaviour of the staff also will raise their productivity by enabling their training. However, this investment plan for training should be made with care. Banks on the one hand support staff training and education, on the other hand, they adopt e-learning applications to prevent the loss of labor and in order to minimize costs during the training (Dinc, 2006).

Material and spiritual achievements increase via training in banks. Tangible benefits are to minimize travel costs, accommodation costs, training, space rent, instructor costs, money spent on stationery and a reduction in the loss of labor due to on the job training. Therefore, e-learning is an investment for the institution. Non-pecuniary benefits are the creation of a digital library of the institution (reference sources), repeatability, deciding for oneself how much time to spend on education, training time is determined by the employees, regardless of different locations and usability not only for employees but also for customers, suppliers and retailers (Sinç, 2006).

In the banking sector, the importance given to education will depend on the banks. International private banks put more relative emphasis on education. For example, ABN AMRO has a training unit for educational purposes in the field of academia. Similar studies have been carried on ING Bank as well as other international banks. For this purpose, a training center in the Business School field was established. In terms of the purpose of the Center, it is hoped to train future administrators of the group (Yardibi, 2008). However, when it comes to the knowledge of the bank's e-learning, it may not be enough. According to a study conducted in the bank sector during 2004-2006 in Poland, Slovakia, Germany and the United Kingdom in the bank sector, 60% of personnel working at the bank stated that `'I should be the implementation of e-learning in the bank", 28% of personnel stated "they might be able to participate in e-learning",6% of personnel stated that it was not possible and 6% of personnel did not seem to have any information about it (Zimkova, 2006).

In 1999, one of the developments in the world banking sector was the e-learning began by Spanish Bank. In the study carried out in order to understand and analyze training program given by Spanish Bank in 2005; factors which have effect in training program, adaptation to technology-based training programs, effect of these programs on success, factors which have effect on the staff were discussed. For many European and American companies like Cisco, IBM, EDS and Deutsche Bank, the new educational technologies made a good fit. Spanish Bank has successfully completed the training program in new technologies (Andreu & Jaurequi, 2005).
In 1997 in Norway, NEMLIG prepared a research project about Norway. The aim of this project was to support education and training for the future in the web-based learning arena. This arena has been established with a focus on employees in the workplace (Lahn, 2004).

As another example, Banking academy was established by the Association of German Banks to provide educational services to the staff of the bank in 1957 in West Germany. One of the most important applications of Banking academy is computer-based training applications. Banking academy executes training activities in the banking sector, simulated by software, banking for beginners, banking for bankers, banking for professionals under the headings of banking. ABN AMRO, Citibank, Wachovia, Bank of America, Barclays, and others use training software which have education, desktop applications, and information technology. 75% of world banks use existing software, 25% use specially designed software (Yardibi, 2008).

AIM AND METHOD

This study was conducted on Aegean region employees of a foreign-ownedbank. Quota sampling was carried out on 100 people. Equality was ensured between the sexes studied. However, some subjects did not take part. Therefore, the study was carried out on 54 males and 46 females. Survey data were collected electronically. Bank staff gender, department, occupational position (title) will affect the participation of features such as e-learning, assuming that these features are to be included in the sample studied.

The aim of this study is to determine whether the effects of e-learning increase the performance of professional and career development bank employees. The research was carried out on the basis of an e-learning system used by the bank staff. The staff can log in to the system with a user name and password. Personnel can follow past and future activities as well as applications such as e-courses and e-exams in the system. In addition, there is a virtual library which has a variety of reading documents.

Independent variables are determined as gender, age, education, department and title, dependent variables are the bank staff's approach to e-learning and the conditions required to benefit from the program. In addition, this study will reveal whether e-learning environments increase the performance of the staff or whether increasing occupational achievements is effective.

The numerical data obtained were tested using the SPSS statistical package. Dependent variables were analyzed using frequency distributions. At the same time, relationships between the e-learning perspectives of bank personnel and factors influencing their success were evaluated by statistical analysis technique λ^2 with independent variables.

RESEARCH HYPOTHESES

H_0: Bank staff does not change their attitudes towards the use of an e-learning program according to gender.
H_1: Bank staff change their attitudes towards the use of an e-learning program according to gender.

H_0:Bank staff do not change the frequency of use of an e-learning program according to section
H_2: Bank staff change the frequency of use of an e-learning program according to section

H_0: According to the title of the Bank's personnel in the use of e-learning does not change affects the success of the staff to interact with the instructors.
H_3: According to the title of the Bank's personnel in the use of e-learning change affects the success of the staff to interact with the instructors.

RESULTS

Demographic Characteristics of Staff

The study was applied to staff of each age group, in each section, each title in the Aegean region. Use of e-learning opportunities of staff were investigated according to gender, department, and were based on the occupational location.

Gender: This study is applied to 54% males, 46% females.

Age: Age distribution of the personnel participating in research reveals that the ones between ages 26-30 is in the first order with 50%, 31-35 age interval in the second order with 22%, 36-40 age interval in the third order with 15%, age 41 and above in the fourth order with 8% and 20-25 age interval in the fifth order with 5%. Accordingly it is noticed that the personnel between 26-30 age interval constitute the half of entire list which indicates that personnel between this age group tend to use technology more.

Educational Background: Of all the participants of research, 79% personnel are university graduates, 10% are college graduates, 6% are high-school graduates and 5% are post graduates.

Department: Personnel from different departments of the bank have been included in survey. Of all the participants of survey 46% work in the department of checking accounts, 44% in private marketing department, 8% are from other departments and 1% from trade marketing and operation departments.

Professional Status (Position): Of all the participants of research 33% are bank clerks, 25% are assistant directors and directors, 11% are vice managers, 6% are managers.

Seniority: Of all the participants of research 52% have 0-5 years of seniority, 22% have 6-10 years of seniority, 17% have 11-15 years of seniority, 7% have 16-20 years of seniority and 2% have more than 21 years of seniority.

ATTITUDES OF THE BANK PERSONNEL TOWARDS E-LEARNING

86% of the personnel stated to be acquainted with e-learning system used in the bank while 14% stated to have no acquaintance with the site. 78% of the employees reported their contentment with e-learning program while 10% stated opposing views and considered it unnecessary. 12% of the personnel remained neutral on this issue. 65% of the personnel contented with e-learning program state that the first reason underlying their contentment with the program is that it provides a learning setting that is independent of time and place. As the secondary reason, 21% indicated its usability during work hours too, 21% pointed out its time saving, 20% underlined the comfort it provides thanks to its repeatability. 69% of the personnel stated to use e-learning program freely any time of the day. 13% claimed to spare approximately one hour in a day and 58% stated to use the program occasionally.

As the usage frequency of the program is analyzed these figures are obtained: 26% of the personnel use it very rarely and only when needed, 20% once a month, 20% never, 11% once a week follow their past activities from this program. 26% of the personnel check their upcoming activities from this program once a month, 23% once a week, 13% never, 11% few times in a week. At certain intervals the personnel participate in e-lesson and e-exam programs from the work environment of the bank. 28% of the personnel follow e-lessons once a month, 17% once a week, 16% less frequently, 10% once a week and 10% personnel never. E-exams appropriate for the bank personnel are given on the program out-of-working hours. That is because e-exam has to be completed within a certain length of time by the bank personnel. However as the data reveal, 30% of the personnel take e-exams once a month, 15% once a week, 14% less frequently, 8% a few times in a week, 6% every day while 12% personnel never take e-exams. As seen, the e-learning participation and usage tendencies of the personnel seem to be high.

In the e-learning program used by personnel there is another section which can be used to take notes; however 39% of users do not take notes in this section. The remaining 21% personnel use it less frequently, 12% once a month, 8% once a week, 4% few times in a week and 2% everyday.
In e-learning system there is also an e-library that contains several documents for the self –training of the personnel. 41% of the personnel never use this library. 24% use it less frequently, 10% once a month and 5% once a week.

Via this system surveys on a range of topics are distributed to the personnel. 26% of the personnel never participate in these surveys, 23% less frequently, 22% once a month, 7% a few times a week, 5% once a month and 3% everyday check this section and make survey evaluations.
Information sharing is an important issue in e-learning sites therefore the personnel is required to provide information when demanded. 81% of the personnel stated to have provided no information while 5% provided information.

The personnel stated to be contented with e-learning program they have received. Thus 45% of the e-learning trainers can use the e-courses they take in their work life. 75% of the personnel stated that e-courses they take leave substantial effect on their career development.

Since information and communication technologies are necessary anytime, anywhere 86% of the personnel stated that they believe in the necessity of technology and 83% stated that they believe it increased their work performance. 73% of the personnel believe that e-courses are useful for the employees. 66% of the personnel feel the necessity to use forum and chat rooms to interact with the others sharing e-learning program. Additionally 77% of the personnel believe that interacting with their colleagues and trainers while using e-learning program can be effective in raising their success because 75% of the personnel believe that through interaction they enlarged their social learning environments. 74% of the personnel believe that once their social learning environment is expanded their e-learning performance shall also be heightened. Interaction matters greatly in e-learning. Therefore 77% of the personnel believe that if they can instantly interact with their instructors during an e-lesson they can be more successful. To enable active usage of e-learning program by the personnel, the user should have a program that gives no boredom and provides instant responses. 44% of the personnel believe that content is important to use the program actively, 39% emphasize interaction and 21%

underline visuality. As demonstrated, the personnel believe that the interaction they set amidst themselves and their instructors is vital. The personnel would like to interact with his/her instructor whenever needed.

THE ATTITUDES OF EMPLOYEES AS REGARDS THE CONTRIBUTION OF E-LEARNING ENVIRONMENTS ON THEIR PROFESSIONAL SUCCESS

Personnel working consists of four main sections in e-learning environments factors affecting the success in creating such as a special use of computer applications, to understand the benefit, satisfaction, including e-learning unit(Johnson et al., 2008).

Table: Distribution of E-Learning Environments affecting the Attitudes of individuals Accomplishments

	Strongly Agree (%)	Agree(%)	Neither Agree nor Disagree(%)	Disagree (%)	Strongly Disagree(%)
A1:Application-specific computer self-efficacy					
1)I believe I have the ability to respond to comments posted in an online discussion	14	40	15	8	6
2)I believe I have the ability to post comments in an online discussion	7	44	20	9	13
3)I believe I have the ability to locate information on the class website.	3	24	29	11	15
4)I believe I have the ability to use all e-learning features	10	38	9	17	8
5)I believe I have the ability to access and complete the end of module assessments (quizzes).	16	37	6	13	10
A2:Perceived usefulness					
1) Using e-learning improves my performance in this class	31	38	6	6	1
2)Using e-learning in this class improves my productivity.	29	44	6	2	2
3)Using e-learning enhances my effectiveness in this class.	29	45	5	2	2
4)I find e-learning to be useful	30	41	7	3	2
A3: Satisfaction					
1)I am satisfied with the clarity with which the class assignments were communicated.	23	41	10	3	6
2)I am satisfied with the degree to which the types of instructional techniques that were used to teach the class helped me gain a better understanding of the class material.	20	48	9	5	1
3)I am satisfied with the extent to which the instructor made the students feel that they were part of the class and ‘‘belonged’’.	24	49	6	3	1
4) I am satisfied with the instructor’s communication skills	14	50	14	3	2
5)I am satisfied with the accessibility of the instructor outside of class.	13	42	21	4	3
6)I am satisfied with the present means of material exchange between you and the course instructor.	16	38	21	4	4
A4:Course instrumentality					
1)I feel more confident in expressing ideas related to Information Technology.	20	46	11	4	2
2)I improved my ability to critically think about Information Technology.	17	45	15	4	2
3)I improved my ability to integrate facts and develop generalizations from the course material.	17	46	14	4	2
4) I increased my ability to critically analyze issues.	16	49	13	4	1
5)I learned to interrelate the important issues in the course material.	17	46	15	4	1
6)I learned to value other points of view.	15	47	15	5	1

On the basis of Usage and Satisfaction Approach (McQuail,2004) which is one of the Communication Theories as regards the effects of e-learning programs on people’s success: a. Using special computer applications b. Grasping its benefits c. Contentment d. Educational unit question groups have been measured and reliability coefficient has been detected as Cronbach α=0,972. The scale employed in factor analysis has 3 dimensions. 1st factor measures 73.7%, 2nd factor measures 5.3%, 3rd factor measures 4.82%. Research survey consisting of 3 factors and 21 questions has measured 83.91% of the attitudes towards the effects of e-learning programs on people’s success.

As the distribution of the attitudes of e-learning environments on the effects on individuals' success are analyzed in Table 1, the state of using computer applications (A1) shows that 40% of the personnel agree that they are able to respond to the comments sent from online discussions, 44% of the personnel agree that they are able to send comments to online discussions and 29% of the personnel state that they have no idea on providing information to e-learning system. 38% mostly agree that they make use of all the parts of e-learning system they use and also 37% mostly believe that they reach to the end of exam module then complete the module. As the section on grasping the benefit of used system is analyzed (A2), 38% of the personnel agree that e-learning system is effective in enhancing their work performance, 44% of the personnel agree that e-learning applications in education support their productivity, 45% of the personnel believe that it enhances their working performance and 41% of the personnel respond that they believe in the benefits of using e-learning system. As their contentment with education system is analyzed (A3), 41% of the personnel are contented with clarity in in-training communication, 48% of the personnel state that in-training teaching techniques assist them in grasping teaching materials better, 50% of the personnel stated their contentment with the communication skills of instructor and 42% of the personnel stated their contentment with access to the instructor even outside e-learning environment. Also 38% of the personnel stated that they agree with the contentment about material exchanges between instructor and learner. Educational unit (A4) section demonstrates what is gained from education unit. Accordingly 46% of the personnel stated that they felt much secure in expressing ideas related to information technologies, 45% of the personnel stated that their critical thinking skills on information technologies improved, generalizations from teaching materials and truth-combining faculties have been elevated, 49% of the personnel stated that their ability to criticize analytic subjects has improved, 46% of the personnel stated that they learnt about the interrelated subjects in course materials, 47% of the personnel stated that they have learnt the remaining significant points of display.

WITH RESPECT TO GENDER, E-LEARNING PROGRAM USAGE FREQUENCY OF THE PERSONNEL

There is a meaningful correlation between gender and e-learning program satisfaction of the personnel (p=0.03). Of all the female personnel 27.8% prefer the program thanks to its time-saving quality, 25.9% due its repeatability and 11.1% by virtue of its usability during working hours. Male personnel on the other hand (by a ratio of 32.5%) state their contentment with the usability of program during working hours. Of all the male personnel the ratio of the ones selecting the program thanks to its time saving quality and repeatability is the same for both and this ratio is 13%. Additionally 39.1% of males and 31.5% of females are discontented with the e-learning program they use.

The ratio of e-lesson followup differs with respect to gender (p=0.03). Male personnel use e-learning program more frequently than female personnel which might be connected to higher interest towards computers and internet amidst men.

There is a meaningful correlation between gender and usage of virtual library (p=0.003). Compared to female personnel, male personnel make use of the library more often which might be attributed to the fact that men have greater inclination towards technology. 10.9% of the male personnel make use of virtual library once a week while female personnel (3.7%) make use of this service once a month.

Through e-learning system, surveys covering a variety of topics are administered to the personnel. There is a differentiation between genders in terms of participation to surveys (p=0.02). 28.3% of the male personnel take part in survey evaluations once a month whereas the ratio is 16.7% amidst female personnel who never or rarely complete the surveys.

Active usage of e-learning program and surfing on program contents without getting bored also change with respect to gender (p=0.005). Both males and females pay attention to visuality in e-learning. However for female personnel communication matters more while for male personnel content is much more important. That may be related to the fact that women have wider social circles and enter social networking sites more frequently than men.

WITH RESPECT TO EDUCATIONAL BACKGROUND, E-LEARNING PROGRAM USAGE FREQUENCY OF THE PERSONNEL

There is a meaningful correlation between educational background of the personnel and their followup of e-lessons (p=0.02). High school graduates follow the e-lessons daily which implies that this program is functional in filling the educational lacks of the ones with lower level of education. The followup of e-lessons is sporadic amidst university graduates while high school, college and post graduates follow the courses more frequently. It can thus be argued that there is an asymmetric relationship between educational background and program usage frequency.

The belief amidst the personnel that while using e-learning program their interaction with their colleagues and instructors is effective on their success is subject to change with respect to educational level of the personnel (p=0.03). High school, College and University graduates believe that interaction is effective on their success while only 20% of post graduates support this argument.

WITH RESPECT TO DEPARTMENT, E-LEARNING PROGRAM USAGE FREQUENCY OF THE PERSONNEL

There is a meaningful correlation between the departments survey participants are employed in and following the activities of e-learning program (p=0.04). Checking accounts department personnel are, compared to private marketing personnel, more active in following the activities that shall come from e-learning program. 21% of the personnel from checking accounts department follow upcoming activities few times a week from the particular website. However since personnel from private marketing department are required to perform client visits during working hours, 31% of the personnel in private marketing department use e-learning program to follow upcoming activities once a month, 25% once a week and 11.4% less frequently.

There is a meaningful correlation between the frequency of following up e-lessons and the departments personnel are employed in (p=0.01). Personnel employed in checking accounts department have the opportunity to follow e-lessons every day or few times a week whereas this may not be possible for the personnel in private marketing department. It is a privilege for e-learning program users that e-lessons can be taken during working hours as well as out of working hours. Independence of e-learning from time limits allows the personnel to follow e-lessons out of working hours too.

The frequency of survey participating bank personnel to follow e-exams varies with respect to department (p=0.02). Since e-exams are given during working hours, personnel from checking accounts department can spare more time than the ones in private marketing department since private marketing personnel are required to make client visits during the day. 31.8% of the personnel from private marketing can take e-exams once a month while 20.5% take exams less frequently and 15.9% of private marketing personnel take no e-exams at all. To ensure that private marketing personnel can also take e-exams those exams should be given out of working hours too.

WITH RESPECT TO PROFESSIONAL STATUS, INCLINATION OF THE PERSONNEL TOWARDS E-LEARNING PROGRAM

There is a meaningful correlation between the professional status (position) of employees and their belief that communicating with their colleagues and instructors during e-learning is effective on their success (p=0.03). Parallel to the climb in professional hierarchy, the belief amidst personnel that interaction affects success topples. This might be echoed in the restriction of professional levels and professional knowledge accumulation of employees to execute their daily routine activities. Only the top level personnel (manager) hold the belief that communication that can be reestablished with the program is essential to guarantee success. That is because as a requisite of this position, spread of competition to the branches not only strengthens the tendency for personal professional success but also success of the branches. However in e-learning, interaction is essential for any position. That is related to the reason that any personnel gearing towards career development should, while interacting with both colleagues and instructors, continue to establish interaction with his/her subordinates to transfer their knowledge and seniors to receive their support.

There is a differentiation between professional status and belief amidst personnel that through interaction their social learning circle widens (p=0.05) Since social learning is the way of learning through following other people, their social learning circles also expand via interaction they set in any e-learning environment. Just as it happens in interaction it is true that as the position is elevated, the number of personnel who believe their social learning circles are expanded through interaction is decreased. It becomes evident that junior personnel interact with each other more frequently.

Expanding social learning circles and its effect on e-learning performance of individuals vary with respect to professional status of people (p=0.03). The belief that social learning circle widens via interaction and e-learning performance is affected changes with respect to position. The personnel employed as bank clerks (%90.9) hold the belief that social learning circle that is expanded via interaction is effective on their e-learning performance.

CONCLUSION

Organizations that employ information and communication technologies can outpace other enterprises only through expanding their production, planning and marketing capacities and uplifting their training services. Just as it is valid for all sectors, in finance and banking sector too, through the intense application of information and communication technologies the integration of web-based products with daily life makes it a necessity to use relevant technologies. Particularly speaking, rampant competition that rises parallel to developing technology is a factor triggering this necessity. To elevate productivity it is expected from the banks to actively use information and communication technologies. In the enhancement of labor productivity the qualities of trained laborforce should also be heightened.

Parallel to the spread of information systems web-based education is now used more frequently in banks since currently in all domains of life, life-long learning is the acknowledged principle by all. Today, effective use of information technologies is considered to be an economical solution in the betterment of bank personnel's productivity and following the new developments. However there are certain differences in making the most benefit from e-learning programs. To put differently, with respect to the elevation of personnel productivity and job satisfaction, perceived values of e-learning vary thus tendency towards e-learning changes direction.
The employees tend to select the kind of jobs that allow continuous self improvement, keep up with the necessities of modern age and assist them in rising to higher positions and reach job satisfaction through reconciling personal objectives with organizational goals. Those who believe in the benefits of program spend longer time for e-learning both during and out of work hours.

In this research it has been manifested that since information and communication technologies are essential anywhere and anytime, a majority of bank personnel support the view that this program is an inseparable part of technology and a driving factor of work performance. More than half of the personnel make use of e-learning system utilized within the bank. The remaining personnel who constitute only a small group explain that the reason they do not enter e-learning site is they are unaware of this program. This might be an indicator of the fact that bank employees have no sufficient interest towards information technologies. The personnel however have worded their contentment with the existence of an e-learning program. The primary reason for the high selection of this program is connected to its usability anytime and anywhere.

At certain intervals, the bank personnel attend e-lesson and e-exam programs from their work environment. Since in this research some of the participants fail to follow e-learning, the participation ratio to e-exams is also inadequate. Generally speaking it is feasible to argue that program participation and usage ratio of the personnel is below expectations. This might be attributed to the low computer-literacy level and lack of interest towards new technologies due to age factor of the personnel. On the other hand more than half of the personnel report that e-lessons they took have played remarkable role in their career development and drew their attention by virtue of providing "a new learning setting on the internet".

Interaction in e-learning is pretty functional in the communication of employees with both their instructors and colleagues. Correspondingly, the personnel cultivated a belief that their interaction with instructors and colleagues would leave positive effects on their success. Since the program allows interaction with other users while in-progress, it also expands the learning circle.

There is a meaningful correlation between gender and satisfaction received from the employed e-learning program. The male personnel pointed that the usability of program during working hours as the primary motive for satisfaction while female personnel indicated its time-saving quality and repeatability. The followup of e-courses amidst the personnel varies with respect to gender. Since computer literacy amongst men is higher, they use e-learning program more frequently than women.

With respect to gender, active usage of e-learning program and surfing on program contents without boredom also vary. It has been witnessed that both genders place importance to visuality in e-learning program. In addition to visuality, the women are more open to web-based communication while men care more about program contents. Besides, women enlarge their social circles mostly by using social networking sites.

There is a meaningful correlation between educational background of employees and their followup level of e-lessons. High-school graduate personnel follow e-lessons daily which might be an indicator of the functionality of system in compensating for educational lacks. University graduates follow e-lessons at certain intervals while high school, college and post graduates enter the program less frequently which might be related to the perceived educational inadequacies and desire to pursue new goals. Accordingly it can be stated that till bachelor's degree level, there is an asymmetrical relationship between educational background and usage ratio of the program.

There is a meaningful correlation between the department of survey-participant personnel and following upcoming activities on the e-learning program. Compared to the personnel from private marketing department those employed in checking accounts department are more active in terms of following upcoming activities on the e-learning program. Since their work routine is intertwined with risk conditions, those working in checking accounts department are required to adapt to frequent changes in processes. There is a meaningful correlation between followup of e-lessons amidst the personnel and the department they work in. Personnel employed in checking accounts department have the opportunity to follow the lessons daily or few times a week while this is not the case for the personnel from private marketing department. One of the privileges e-learning program provides to its users is that e-lessons can be taken not only during but also out of working hours as well. Independence of e-learning from time enables the personnel to follow e-lessons out of working hours too.

The followup of e-exams on the e-learning program differs with respect to the department of personnel. Since e-exams are held during working hours, those employed in checking accounts department can spare more time to exams than the ones in private marketing department because employees in private marketing department are required to conduct client visits as specified under their job definitions.

There is a meaningful correlation between the position of bank personnel and their belief that interacting with instructors and colleagues during e-learning is effective on their success attainment. Parallel to the climb in professional status, the belief on the effect of interaction is pulled down. This might be related to the restrictions of professional status and professional knowledge accumulation that allows the personnel to execute their daily routines. Only the top level personnel (manager) hold the belief that communication that can be reestablished with the program is essential to guarantee success. That is because as a requisite of this position, spread of competition to the branches not only strengthens the tendency for personal professional success but also success of the branches. However in e-learning, interaction is essential for any position. That is related to the reason that any personnel gearing towards career development should, while interacting with both colleagues and instructors, continue to establish interaction with his/her subordinates to transfer their knowledge and seniors to receive their support.

There is a differentiation between professional position and belief amidst the personnel that through establishing interaction, their social learning circle can be expanded. That is because since social learning also necessitates interactive communication, they can share their knowledge through interacting with one another in e-learning environment. Parallel to the rise in professional status, the belief amidst the personnel that their social learning circle expands is pulled down. Hence, it surfaces that junior level personnel interact with one another more intensely.

To conclude, just as is true for any other sector, in banking and finance industry where technology is effectively used, e-learning is becoming increasingly widespread. Employed personnel internalize and use e-learning system commonly. Based on research findings it can be asserted that the personnel should use the system more actively. To enable an active use, the personnel should be informed about the processes that can be completed on e-learning system. By following a gender-blind policy which also makes no discrimination on the basis of department and educational background, every single personnel should be motivated to use the system in the best effective way. Since it is widely acknowledged that communication amidst personnel is effective in the improvement of work performance and career development, interaction on the system should be promoted.

REFERENCES

Andreu R. & Jaurequi K. (2005), Key Factors of e-Learning: A Case Study at a Spanish Bank, Journal of Information Technology Education (4)

Bersin J. (2000), "Just in time learning", http://www.linezine.com/7.2/articles/jbsmyelpn.htm.

Borotis S.& Poulymenakou A. (2009), E-Learning Acceptance in Workplace Training: The Case Of A Greek Bank, 17th European Conference on Information Systems.

Düşükcan M.& Kaya Ü(2003), İşletmelerde Bilgi Teknolojilerinin Kullanılma Yerleri, Doğu Anadolu Bölgesi Araştırmaları, 3,33-37.

Dinç, İ.D,(2006), İşletmelerde eğitimin Önemi, http://www.enocta.com/web2/ ContentShowOne.asp?CType=2&ContentID=284&T=5

Güngör N.D.(1997), Education and economic growth in Turkey 1980-1990: A panel study. Odtü Gelişme Dergisi, 24(2), 185-214.

Harun M.H. (2002), Integrating e-Learning into the workplace, Internet and Higher Education 4 (2002), 301–310
İleri Y.& İleri H.(2011), İnternet Bankacılığı ve E-Ticaretin Türkiye Ekonomisi Üzeirndeki Etkileri, Selçuk Üniversitesi, sosyal Bilimler Meslek Yüksek Okulu Dergisi,14(1-2), 109-127.
Johnson R.D. & Hornik S.& Salas E. (2008), An empirical examination of factors contributing to the creation of successful e-learning environments, Int. J. Human-Computer Studies 66, 356–369
Lahn L. C. (2004), Dilemmas in the development of e-learning at work , The Journal of Workplace Learning 16(8), 466-478.
McQuail D.(2004), "With more Hindsight: Conceptual Problems and Some Ways Forward for Media Use Research", Action Theory and Communication Research; Recent Development in Europe, (Edit) Renckstorf K., Walter de Gruyter, Gumb H&Co.KG. 10785 Berlin.
Moon S. & Birchall D. &Williams S. & Vrasidas C. (2005), Developing design principles for an e-learning programme for SME managers to support accelerated learning at the workplace, The Journal of Workplace Learning, 17(5/6), 370-384.
Tekin M., Zerenler M.&Bilge A.(2005), Bilişim Teknolojileri Kullanımının İşletme Performansına Etkileri: Lojistik Sektöründe Bir Uygulama, İstanbul Ticaret Üniversitesi Fn Bilimleri Dergisi, 4(8), 115-119.
Tynjala P., (2008), Perspectives İnto Learning At The Workplace, Educational Research Review 3, 130–154.
Sambataro M., (2000), Just-in-Time Learning, http://www.itari.in/categories/justintime learning/ DefinitonJust-in-TimeLearning.pdf.
Seow C.& Hughes J. (2005), E-learning in the Workplace, Emerald Group Publishing Limited.
Sinç B., (2006), İş Dünyası ve E-öğrenme, Capital Aylık İş ve Ekonomi Dergisi, http://www.enocta.com/web2/ContentShowOne.asp?CType=2&ContentID=284&T=5
Swan, K., (2003), Learning effectiveness: what the research tells us. In: Bourne, J., Moore, J. (Eds.), Elements of Quality Online Education 4, 12–45.
Vaughan K. & MacVicar A.(2004), Employees' pre-implementation attitudes and perceptions to e-learning A banking case study analysis, Journal of European Industrial Training, 28(5), 400-413.
Welsh E.T., Wanberg C.R., Brown K.G., Simmering M. J., (2003), E-learning: emerging uses, empirical results and future directions, International Journal of Training and Development 7(4), 245-258. http://onlinelibrary.wiley.com/doi/10.1046/j.1360-3736.2003. 00184.x/pdf
Williams S. (2002), "Instructional design factors and the effectiveness of web-based training /instruction", The Cyril O. Houle Scholars in Adults and Continuing Education Program Global research Perpectives II, http://www.design4instruction.com/articles/pdf/ instructional 20Design%20Factors%20on%20Web-Based%20Training.pdf
Yardibi N. (2008), E-learning in Development (Case of a Turkish Bank), American-Eurasian journal of Scientific Research 3(2), 117-122.
Zhang D., Nunamaker J., (2003), Powering E-Learning In the New Millennium: An Overview of E-Learning and Enabling Technology, Information Systems Frontiers 5:2, 207–218.http://www.springerlink.com/content/x2jv277358503x28/fulltext.pdf
Zimkova E., (2006), E-Learning In The Banking Sector, Biatec, Xıv(2),20-21. http://www .nbs.sk/img/Documents/BIATEC/BIA02_06/20_21.pdf.

THE EFFECTIVENESS OF MANAGING SPLIT ATTENTION AMONG AUTISTIC CHILDREN USING COMPUTER BASED INTERVENTION

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ABSTRACT
One of the most common problems in autistic children is split attention. Split attention prevents autism children from being able to focus attention on their learning, and tasks. As a result, it is important to identify how to make autistic individuals focus attention on learning. Considering autistic individuals have higher visual abilities in comparing with ordinary people, visual supports are used to enable learning. With the requirement of visual information displays for autistic children, computer based interventions are used. Previous researches indicated that autistic children could be supported effectively by providing a structured and controlled environment using computer based intervention. In order to overcome autism children's split attention problems, design issues should be customized for them. Moving forward towards the research, it is concluded that in addition to the design issues to be considered for the autistic children, teaching issues are also required to be incorporated. This research aimed at providing a computer based application, considering the identified design issues incorporated with the teaching issues based on Fakih method for the autistic children to manage their split attention. The considered design issues incorporated with teaching issues are evaluated to identify whether they are effective in enhancing autistic children's split attention and learning.
Keywords: Autistic Children, Computer Based Intervention, Split Attention.

INTRODUCTION

Autism is one of the most common pervasive developmental disorders that contain criteria of defects in communication, social interaction, and creative or imaginative play. Nowadays autism is affecting 1.5 million American children and with the growing rate of 10 to 17 percent (Kientz, Hayes, Westeyn, Starner, and Abowd, 2007). Autism is diagnosed between the ages of two and six, and it is four times more likely to occur in boys in comparison with girls. As stated by the National Autism Society of Malaysia (NASOM), the number of autistic people diagnosed has increased 30 percent in three years.

Defined as a complex developmental disability, autism is the result of a neurological disorder that affects the normal brain functioning and influences the development of social interaction and communication skills (American Psychiatric Association, 2000). Because of autistic children disabilities, they encounter various challenges in life. They are unable to understand social cues and their personal safety might be at risk (Myles, Trautman, & Schelvan, 2004). Therefore, autistic children have to be taught special skills to help them cope with their problems.

In order to assist autistic children, visual supports which are cognitive tools are used to enable learning (Hayes et al., 2010). Considering autistic children have higher visual abilities than ordinary people (Ameli, Courchesne, Lincoln, Kaufman, & Grillon, 1988), using visual supports can improve their communication process (Hodges et al., 2006). Responding to autism needs of communications, they must be taught to learn their language effectively and could be able to focus attention on their learning. Supporting autism children in communications and understanding of social situations will help encourage growing awareness of their difficulties (Hanbury, 2005).

One of the most important difficulties of autistic children is learning. Due to autism spectrum disorders, these children cannot focus attention on their learning process. The split attention effect is required to see how the user can learn to use the system by splitting their attention to different source of information (Sweller, Ayres, & Kalyuga, 2011). In this research, we will focus on how to manage autism individuals' split attention while using the computer in their learning. In addition, we will point out how to integrate different sources of information that must be considered (Sweller et al., 2011), so that children's learning occur. Furthermore, the design issues, and teaching issues that are required to be considered for the autistic children are identified in this study.

BASIC CONCEPTS, DEFINITIONS, AND LITERATURE REVIEW

This section offers the basic concepts, and definitions of the study. It provides a review of the literature and related works on the use of computer based interventions in learning and understanding for the children in autism spectrum disorders (ASD), managing split attention among autistic children, and the effectiveness of managing split attention between autistic children using computer based intervention.

Autistic Children

Kientz et al. (2007) label autism as one of the most common pervasive developmental disorders that contain criteria of defects in communication, social interaction, and creative or imaginative play. Wetherby and Prizant (2000) describe the main characteristics of the autistic children's disorders as impairment communication which is the earliest symptom shown as the word (Eigsti, Bennetto, & Dadlani, 2007), delay in language development, using language idiosyncratically and repetitively and not being able to begin or maintain a conversation (Wetherby & Prizant, 2000).

Due to autism children disabilities, they face numerous challenges in life. One of the most important difficulties of autistic children is learning. Many researches had been done to investigate a method for teaching and helping the autistic children most effectively and efficiently (Ramdoss, Lang, Mulloy, et al., 2011; Hetzroni & Tannous, 2004; Ramdoss, Mulloy, et al., 2011; Whalen, Massaro, & Franke, 2009; Simpson, Langone, & Ayres, 2004). Alcantara (1994) proved that providing practice and training in controlled environments for the autistic children is effective. For this purpose, multimedia computer based strategies could be used to present simulated environments containing a structured and controlled setting (Hetzroni & Tannous, 2004). Therefore, in order to facilitate the autism individuals practice and training various skills, computer based intervention is used (Hetzroni & Tannous, 2004).

Computer Based Intervention

Barron, Harmes, and Kemker (2006) note that with the development of computer technology, and decreasing their expenses, computers are used in children's schools and homes commonly. Computers are used as instructional tools in children with or without learning disabilities today (Inan, Lowther, Ross, & Strahl, 2010). As stated by (Ramdoss, Lang, Fragale, et al., 2011), in computer based intervention, the computer provides instructions via offering audio and visual stimuli associated with the target skill. (Mechling, Gast, & Stefane'Barthold, 2003) pointed out that computer based intervention allows learners to interact with the program using external hardware devices such as touch screens, scanners, keyboards and switches (Herskowitz, 2009).

Using Computer Based Intervention among Autistic Children

Computers have been found successful as a teaching instrument for the autistic children (Chen & Bernard-Opitz, 1993; Colby, 1973; Higgins & Boone, 1996; Panyan, 1984). According to several studies, supporting autistic children with computers in a structured and controlled environment, using multilevel interactive functions was found effective in a variety of computer based interventions (Bernard-Opitz, Ross, & Tuttas, 1990; Chen & Bernard-Opitz, 1993; Panyan, 1984; Yamamoto & Miya, 1999).

There are several reasons for selecting computer based intervention as a feasible approach in teaching literacy skills to autistic children (Powell, 1996). First of all, research has indicated that autistic children are visual learners and computer based intervention offers visual information displays that are customizable (Bondy & Frost, 1994; Whalen et al., 2010).

Secondly, computer based intervention minimizes the social defects impact on the autistic children and benefits literacy instruction by reducing the children's complexity in the interaction with the teacher (Ramdoss, Mulloy, et al., 2011). Thirdly, research by Lahm (1996) shows that autistic children are highly responsive while using computers that could make academic demands. As a final point, computer based intervention could be used for a particular student's ability level by selecting the appropriate setting in order to utilize individualized instruction (Ramdoss, Mulloy, et al., 2011).

Higgins and Boone (1996) and Panyan (1984) mention that computers are used effectively in teaching different instructional skills to the autistic children. Blischak and Schlosser (2003) found computer based intervention using word processing software as a great way of enhancing the children with autism spelling and frequent word spontaneous. In order to teach vocabulary and grammar to the autistic children Bosseler and Massaro (2003) successfully used computer animated tutor including receptive and expressive language activities.

(Ramdoss, Lang, Mulloy, et al., 2011) used computer based intervention systematically in teaching literacy skills such as reading, and sentence construction with the intention of improving vocal and non-vocal communications of autistic children. Reading and writing skills were enhanced for the autistic children interacting with computers as stated in the study of (Heimann, Nelson, Tjus, & Gillberg, 1995). Fitzgerald, Koury, and Mitchem (2008) reported advances in using computer based intervention in the study field of reading, mathematics, writing, social studies, and science among children with minor or severe disabilities.

Higgins and Boone (1996) emphasize that using computer based intervention among autistic children in classrooms with high numbers of students reduces distractions, establish clear routines, and provides immediate reinforcement, better performance, and faster response collecting. They also indicated that using computer based intervention for children with autism allows performing programs that deliver many necessary functions and instructions (Higgins & Boone, 1996). Research by Chen and Bernard-Opitz (1993) indicated that autistic children had presented more correct answers, and improved behavior skills after using computer based intervention rather than using traditional instruction.

Herskowitz (2009) utilized computer based intervention on the autism spectrum and her study indicated that using computer based intervention for autistic children is more effective in comparison with the traditional skill training methods. This speech pathologist realized that using computer based intervention improves acquisition of many skills such as language and speech, reading, math, auditory processing and life skills (Herskowitz, 2009). Yamamoto and Miya (1999) point out that only a few studies have been done to explore the effectiveness of using computers among autistic children to improve their language skills. Therefore, it is still required to study whether the autistic children could learn specific language skills using computer based intervention in a controlled and structured environment (Hetzroni & Tannous, 2004).

Split Attention Definition

Split attention takes place when learners are required to divide their attention between at least two sources of information (Sweller et al., 2011). For maximum learning and understanding to occur, all disparate sources of information must be integrated as far as possible. The split attention is applied whenever it is more effective for the learner to integrate different sources of essential and non redundant information in a learning strategy (Sweller et al., 2011). Depending on the information source, the reference should be synchronized with the relevant text, or visual presentation, and without such integrated configuration, learning does not happen fast.

The split attention has been used for many diverse categories of learners and in a wide variety of situations using many different types depending on their requirement (Sweller, et al., 2011). If isolated multiple information sources are unlearnable and unintelligible, split attention effect must be facilitated among learners (Sweller et al., 2011). For example, having a circumstance in which a diagram provides all the required information for the learner, and adding text would not be beneficial, then the text should be eliminated. There are many various forms of split attention effect, but the best effective condition of information display must be chosen for learners.

Reviewing what other researchers have done demonstrates that integrating essential sources of information has a great advantage on learner understanding (Sweller & Cooper, 1985; Tarmizi & Sweller, 1988; Mayer & Moreno, 1998; Pociask & Morrison, 2008; Rose & Wolfe, 2000; Cooper & Sweller, 1987; Sweller & Chandler, 1994). Presenting information in split source form requires learners to search for connection with the information sources if they could not understand them in isolation (Sweller et al., 2011). By integrating disparate sources of information, searching process that need heavy memory functioning could be eliminated largely. Integrating split sources might be done within two sources of information, or more than two information sources (Sweller et al., 2011).

Split Attention While Learning to Use a Computer

One of the most common usages of split attention effect is giving instructions to the learners to use a computer either from a computer screen or computer manual (Sweller, et al., 2011). Sweller et al. (2011) mentioned that learners must read the information and learn how to manipulate different parts of the computer, such as the mouse, or typing a specific text to run the particular application. (Sweller & Chandler, 1994) tested the learners who wanted to learn about a Computer Aided Design (CAD) or Computer Aided Manufacturing (CAM) in two forms of integrated and split source. In the integrated strategy only a modified manual is used which consists of physically integrating text and diagrams, but learners were not allowed to access the computer since all commands relating to the computer screen and keyboard were represented in the manual. On the other hand, in the split source circumstances learners could try out different procedures on the computer as reading the manual. Later on, the evaluation result confirmed that in the integrated group students were showing greater competence in using the computer to solve the primary tasks than students practicing with the equipment physically.

Recent research done by Sweller et al. (2011) indicates that students could effectively learn how to use computer programs by giving all the instructions in an integrated or single module. Cerpa, Chandler, and Sweller (1996) expressed that there is no difference between the presentation of instructions whether it is paper based or on the screen manual. Learners are required to generate some simple mathematical formulae inside the cells in using spreadsheets learning format. In the integrated strategy, all instructions were inserted into the spreadsheets at the most spatially relevant points, within the cells themselves (Cerpa et al., 1996). The physically integrated strategy was found superior in comparison with the split source formatting where the screen based instructions were not integrated.

According to Sweller and Chandler (1994) and Cerpa et al. (1996), the split attention effect takes place using high element interactively materials. As mentioned by Sweller et al. (2011) because of having lots of tasks to be done in spreadsheet learning form such as creating a complex numerical formula, locating the cell, finding the relevant symbol on the keyboard and typing the value, they could be managed to fewer interacting elements. Sweller et al. (2011) also noted that presenting information within the instructions and machinery requires learners' hard memory working, and students feel they ought to divide attention between the machine and instructions. Therefore, the instructions must be presented in an appropriate manner, more intelligible than the split attention format instructions, and without referencing to machinery.

Methods to Overcome Split Attention

Research done by (Sweller, et al., 2011) indicates that problems with the presentation of split information source is facilitated with integration strategy so far. Nevertheless other alternative methods are used to overcome the split attention problem. Directing attention to the proper source of information has been worked out by (Kalyuga, Chandler, & Sweller, 1999) to help learners efficiently in the domain of learning electrical circuits. In order to connect the related diagram with the text, color coding system was used to reduce the visual amount of the required search. In addition, Tabbers, Martens, and Van Merriënboer (2000) found that using visual cueing is an effective strategy to reduce the visual search by isolating the text with colors.

Florax and Ploetzner (2010) grouped text into segments and each segment was labeled with a number corresponding to the relevant diagram, and found out that there is no difference between fully integration strategy and segment-number format in the learning process. As mentioned by Sweller and Chandler (1994), in the fully integration form the text segments were written next to the relevant part of the diagram. Further research showed that both methods were found superior to facilitate the split attention effect, but segment-number strategy had a stronger effect on the learner rather than the fully integration form. As noted by Sweller et al. (2011), the reason of segment-number format effectiveness is having smaller information chunks which are easier for the memory to hold.

Bétrancourt and Bisseret (1998) stated that by placing pictures and text close to each other in their integration, the picture could be over crowded with the inserted text. As an alternative method, the pop-up method is used to avoid the cluttered picture if there are large amounts of text included. In order to solve this problem Bétrancourt and Bisseret suggested inserting the text at the relevant position in the diagram but in hidden form unless the learner clicks on the mouse and the information is displayed. Both methods were found superior outcomes on learning in comparison with the split source format, but in the pop-up display learners made fewer errors and the solution time was quicker and there was more user control.

To support the effectiveness of the pop-up method, Barron et al. (2006) compared the pop-up method with the separated and integrated format. The study demonstrated that the pop-up model and the integrated strategy were superior to the separated method, but by measuring the tasks the pop-up method was found superior to the integrated format. Crooks, White, Srinivasan, and Wang (2008) used the pop-up method in the domain of geography maps and proved that it is also effective to place the text away from the map. The text could appear on a separate screen immediately since the learners click on the specific part of the map, and still could facilitate more learning.

Managing Split Attention

In managing split attention there should be a control over the conditions of applicability from the required information sources. As stated by Sweller et al. (2011), integrating different information sources is done under condition that it is more effective for the learner instead of split format that contains separated materials. The applicability of integrating information sources is when the information is essential and non redundant. Considering that learners could learn only by using one information source, then the physical integration strategy is not required in this situation.

Sweller et al. (2011) point out that the split attention effect is used in various learning domains containing different combination of text, diagrams, pictures and machines such as computers. In managing split attention, intending highest learning and understanding takes place for learners, all different information sources must be integrated as far as possible (Sweller et al., 2011). Sweller et al. (2011) stated that the split attention effect provides the significant instructional design principles to help the designers know how to include the information that must be considered simultaneously.

Therefore, in managing split attention within the information sources the most effective format must be chosen. Whenever the information integration takes place, the structure should contain a clear relation among the information sources, and it should eliminate or reduce any search for the references (Sweller et al., 2011). In addition, learners' working memory should be reduced and they should not search to find a relation within the information sources (Sweller et al., 2011). In brief, in split attention management, there should be a great control through the presented information to avoid split attention and redundancy (Pociask & Morrison, 2008).

Managing Split Attention among Autism Children

According to Wetherby and Prizant (2000), one of the most important difficulties of autistic children in learning is not being able to focus and pay attention to the relevant information and cues. This defect prevents the autistic children from paying attention to the appropriate information source, and focuses the child's attention only on a restricted area in which they might miss the important notes. Resistance to change as the autistic children characteristics causes the problem of shifting attention within one source to another source (Wetherby & Prizant, 2000). In addition autism children might show a short attention span. Consequently, autism child difficulties have a significant effect on their learning and language development.

As stated by Wetherby and Prizant (2000), because of autistic children disabilities, instructional activities and the information provided for teaching them must be structured in a clear format that makes them focus their attention, and emphasizes the most relevant information. For this objective, using visual supports as a teaching approach for autistic children is suggested by Wetherby and Prizant (2000). Visual aids have been widely successful for autistic children and help them cope with their difficulties in learning, thinking, understanding and communications. As mentioned by Wetherby and Prizant (2000), using visual aids enables autism children to focus attention on the messages. Another advantage is that autistic children could use visual supports as long as they are required to process the information comparing with the oral information presentation especially for children with difficulty in language processing who need extra time to focus.

Visual aids are used in a variety of ways according to the student's level of comprehension. They could be presented from simple form to complex and concrete to abstract. Visual supports include graphic symbols, pictures, photographs, drawing and written language. As stated by Wetherby and Prizant (2000), visual supports were found useful in organizing the children's activity, providing instructions for the children, assisting their understanding, supporting appropriate behavior, teaching social skills and self-control. On the other hand, the main question asked here is how to present the information to the autism children by using visual aids so that it improves their understanding, abilities and responses.

In addition to visual supports, other instructional approaches exist to draw the autistic children attention in learning as noted by Wetherby and Prizant (2000). Giving the autistic children precise information and positive praise about what they did right in their learning could be motivating. Providing opportunities for choosing which practice they prefer might be helpful in autism children learning, and does not frustrate them. In giving oral instruction to the students with autism, it is better to break down the instructions into small steps due to their split attention problems. The fact that autistic children require more time to respond should be taken into account.

In designing and preparing instructional materials for autistic children's learning it is important to consider the child's age, provide reinforcements and rewards, and plan tasks at an appropriate level of difficulty. Using specific examples could give abstract ideas and conceptual thinking to the autistic children while learning. Another method is to use task analysis among children with autism to break complex tasks down into subtasks and reinforce in sequence and small increments. Incorporating colors for the children with autism might be helpful in representing the emotional context.

The Effectiveness of Managing Split Attention among Autism Children using Computer Based Intervention

With the objective of evaluating the effectiveness of managing split attention between autism children, computer based intervention is used to achieve improved learning, task performance for the individuals. A review of the literature on autistic child's defects by Wetherby and Prizant (2000) shows that these children have difficulties in paying attention, language development and handling complex information. Therefore, the main question in this research is how to give instructions to the autistic children in learning to make them focus attention, and avoid splitting attention using computer based intervention.

Wetherby and Prizant (2000) highlighted that in designing instructions the problematic behavior of the children with autism should be considered in order to gain the children's attention. Instruction prepared for the autistic children should be given in a manner to emphasize paying attention, comprehending, and using language in play mode. Incorporating visual material in teaching autistic children is suggested by Wetherby and Prizant (2000) since they are visual learners (Layton, 1988), and visual oriented.

According to Kalyuga et al. (1999) using the color coding technique might be helpful to manage split attention in computer based intervention, because of giving the permission to use a manageable amount of colors. Using manageable amount of colors eliminates the positive effect of color coding technique and avoids significant load on working memory. Consequently, computer based intervention should be designed considering the required design issues and the autistic children's problems and concerns to have more influence and be more effective. Measurement metrics are used to identify whether the system is effective or not (Nielsen, 1994).

Introducing Fakih Method

Fakih method is a method to teach Quran to the deaf individuals. According to (Daud, 2012), this method aims at addressing the lacking issues of learning aids, and teaching materials in the field of Islamic knowledge for deaf children having problem in learning. In this method numbering and coloring techniques are applied to represent each Arabic alphabet, and each Arabic sign in the holy Quran. Numbers and colors are used to avoid confusion and assist the deaf individuals easily learn the Quran. The method shows the pronunciation steps of the each Arabic alphabet, and each Arabic sign by using numbers. Due to the fact that this method of teaching has not been used to teach autistic children, and not implemented either, the intention of this study is to use the same module as Fakih for the autistic, using the computer based application.

Literature Review Discussion and Findings

All in all, it is important to identify how to make autistic individuals focus attention on learning. Considering the autism spectrum disorders, how can we manage their split attention in learning while interacting with the system, and how to integrate different sources of information that must be considered, so that children learning occurs, and how can we reduce their difficulties, and improve their learning and communication skills. Another significant point is to identify how to prepare the design and teaching instructions for the autistic children to make them focus attention on learning their lessons.

From the review study on other researchers work, it is concluded that autistic individuals require providing specific teaching instructions. Besides, each study points at using a particular issue in order to draw these individual attention on learning. Using techniques such as color coding, and segment number strategy, illustrating the essential materials, and avoiding redundancy are proved by different researchers in facilitating the learners split attention. In addition, others insist on preparing instructional materials using visual supports, breaking the tasks (step by step), and providing rewards for motivation in order to improve the understanding abilities and responses of autistic children.

Although there are many diverse studies on how to manage autism children split attention problems in learning, there is still a lack of a computer application in which uses, and incorporates all the pointed reviewed materials simultaneously. The intention of this research is to provide a computer based application based on Fakih method that incorporates all the methods at the same time. Therefore, the main objectives of this research are as follows:

- To identify the design issues, incorporating with the teaching issues that are required to be considered to manage split attention among the autistic children.
- To develop a computer based application based on Fakih method in which it considers the identified design issues, and teaching issues.
- To evaluate the effectiveness of the system on the autistic children's split Attention.

RESEARCH METHODOLOGY

Two main studies were performed in this research; Baseline Study, and Intervention Study. After performing the Baseline Study, the next step is the system Design and Implementation. Since the system is prepared, the Intervention Study starts to evaluate the application.

Baseline Study

The objective of the Baseline stage is to identify needs, establish requirements, obtain knowledge, and be familiarized with the autism spectrum disorders. As a result of this section, the user interface requirements are presented in final.

Identifying Needs

To identify the needs of the research, Interviews, Observations, and Preliminary Study had been performed. Interviews with the autistic children's parents had been done in order to identify their children's needs, and get familiar with the challenges in their life. Observations on the autistic children had been done in three sessions with the objective of identifying their learning requirements, familiarizing with the autistic children's behavior in class, knowing how the teacher teaches the autistic children in class, and how the autistic children interact with the computer.

After the interviews and observations were prepared, a short preliminary study was conducted in Malaysia in October 2011 as a part of the Baseline study. In this preliminary study refer to the interviews had been done with the aim of getting familiar with the autism children's characteristics and knowledge level, and identifying the learning skills required for them. Accordingly to this study, a few teaching issues that are pointed by autistic children parents are identified to be considered in designing, and preparing instructions for such children as follows:

- Using Phonics, Syllables, Numbers, and Visual Supports
- Teaching One-to-one, and in Sequence.

Establish Requirements

After identifying the needs, in order to produce a set of stable requirements, and to move forward to the design, establishing requirements is needed. In order to establish the requirements PACT (People, Activities, Contexts, and Technologies) Analysis is carried out in which it specifies the People, Activities, Contexts, and Technologies in the research (Benyon, Turner, & Turner, 2005). For this purpose, User Analysis, Task Analysis, Context Analysis, Technology Analysis, and Usability Specifications are done as the steps of PACT Analysis.

After performing the PACT Analysis steps, Usability Specification is done to specify the user requirements from the usability aspect. Moreover, Literature Review, and Preliminary Study are performed to specify the user interface requirements. The Literature Review and the Preliminary Study aim to recognize the required design issues incorporating with the teaching issues to manage autism children's split attention. Finally, the user interface requirements are offered as a result of the applied methods.

User Analysis

User Analysis contains detecting the user profile that shows the user characteristics (Benyon et al., 2005) which is illustrated from the Baseline Study.

Table 1: User profile

User Profiles	Description
Age	Will range in age from about 5 and maximum 18
Gender	Both male and female which is 12 male, and 1 female in the class.
Physical Limitation	Some students might require help during learning because of having weak hands.
Computer/iPad /Hand-phone Use	Most students used computers, and hand-phones for playing, and some used iPad before.
Motivation	Make the students feel they are in playing condition.
Attitude	This application aims at assisting autistic children in learning Quran. Attitude to use is to make them feel they are enjoying learning, and the application motivates them to focus attention on learning.
Educational Background	The students were elementary school students. Students could speak and understand Malay, and English language. Most of the students know how to use the computer and mouse.

Task Analysis

Task Analysis classifies the tasks required to be carried out in the learning process (Kurniawan, 2001). In this study, Task analysis includes how autistic children will carry out the tasks, which tasks they were able to perform, and whether they were able to achieve the goal. The goal is to be able to focus attention, and finish learning a level, and achieve to another level. The reason for task analysis is to identify where to give instructions to the autistic children, and where they could take turns in learning. In this research task analysis is done in both Baseline study, and Intervention study to identify whether using the application has effect on autistic children's focusing attention. In this research the tasks are broken into the following steps in the paper based, and computer based:

Paper Based Tasks Analysis:

- Students sit on the chair
- Students look at the papers
- Students hold the pencil
- From Level 1 to 8:
- Students listen to Instructions (the researcher holds student's hand, and show directions in learning)
- Repeating Instructions if required
- Students take Turn
- Student finish learning, and leave (this is when students become tired and refuse to learn)

Computer Based Tasks Analysis:

- Students sit on the chair
- Students look at the monitor
- Students hold the mouse
- From Level 1 to 8:
- Students listen to Instructions (the researcher holds student's hand, and shows directions in learning)
- Repeating Instructions if required
- Students take Turn
- Student finish learning, and leave (this is when students become tired and refuse to learn)

Context Analysis

Since this application is prepared to draw autistic children's attention, therefore, this analysis is basically emphasized on the physical environment rather than the social and organizational environment (Benyon et al., 2005). The physical environment for teaching must be a quiet class, so that autistic children could focus attention, and listen to the lessons, and there is nothing to make them fear, because autistic children are resistant to change.

Technology Analysis

Four important elements are specified in the Technology Analysis as follows (Benyon et al., 2005):

- **Input:** The autistic students must be able to choose whether they prefer to use the Apple computer or the iPad. The system should contain a touch screen feature to assist the autistic children with weak hands, or a mouse is provided for the ones who prefer using the Apple laptop.
- **Output:** The options should be specified. The system needs to say when the task is completed. A sound must be provided as the system response to the correct answers.
- **Communication:** The communications between the system and the autistic children must be simple and easy.
- **Content:** The system must help autistic children with learning Fakih method (Daud, 2012).

Usability Specifications

Usability Specifications involves the required specifications, from the usability aspect, for the autistic children. Usability specifications divide into two categories of performance measures and preference measure (Bevan & Macleod, 1994). Performance measures are obtained throughout observing how the autistic children complete their task while interacting with the application and preference measures are user's opinion about the system (Seffah, Donyaee, Kline, & Padda, 2006). Since autistic children could not express their opinion about the system, their response towards the system, or their teacher's opinion could be noted.

For the performance measures the following must be considered (Seffah et al., 2006): Learnability which is the system should be easy for the autistic children to learn, Efficiency which is autistic children must be able to complete their task from one level to another level to reach their goal, and effectiveness which is the system should be simple and clear, and provide easily access for the autistic children. For the preference measures the following must be considered (Seffah et al., 2006); Memorability which is the system should be easy for the autistic children to learn and remember the structure, and Helpful which is the system should be found helpful in teaching Quran to autistic children.

User Interface Requirements

To identify the user interface requirements, the researchers needed to go through the literature review. Reference to the literature review is done to identify how to manage split attention among autistic children using Computer Based Intervention. It could be concluded from the literature review that in order to manage split attention among autistic children, there should be design issues considered for them in designing the application. In addition to the design issues, teaching issues should be incorporated while the teaching process takes place. In the following section, the selected points chosen from the literature review to be considered in managing autistic children split attention in learning are demonstrated in two sections of Teaching Issues, and Design Issues:

Design Issues

The selected design issues summarized from reviewing other researchers' studies are noted as follows:

- **Structuring Information in a Clear Format:** the information should be structured clearly to make the autistic children focus attention, and emphasize on the most relevant information, since autistic children are resistant to change (Wetherby & Prizant, 2000). Moreover, Sweller et al. (2011) mentioned that there should be a clear relation among the information sources provided for the learners. Pociask and Morrison (2008) stated that there should be a great control through the presented information to avoid split attention and redundancy.

- **Using Color Coding Technique:** Kalyuga et al. (1999) declared using colors to direct learners' attention, and reduce the visual amount of search required. They insisted although this technique is helpful to manage split attention in computer based intervention, but manageable amount of colors must be used. Also, Wetherby and Prizant (2000) mentioned to incorporate colors to emphasize on autistic children paying attention.

- **Using Segment-Number Strategy:** Chandler and Sweller (1991) noted that using segment-number strategy presents stronger effect on the learner. Sweller et al. (2011) identified the reason as having smaller information chunks; it is easier for the memory to hold. They also insisted on managing numbers in design in order to avoid complexity.

- **Using Visual Supports:** Wetherby and Prizant (2000) pointed on using visual aids for autistic children in relation to the student's level of comprehension. Visual supports could be presented from simple form to complex and concrete to abstract, such as graphic symbols, pictures, photographs, drawing and written language. Tabbers et al. (2000) noted that using visual cues is an effective strategy to reduce the visual search for learners. Besides, Wetherby and Prizant (2000) declared that incorporating visual materials emphasizes paying attention, comprehending, and using language in play mode.

- **Providing Reinforcements and Rewards:** Wetherby and Prizant (2000) mentioned that reinforcements and rewards must be provided in order to motivate the autistic children.

- **Breaking down the Tasks:** Wetherby and Prizant (2000) insisted on breaking down the instructions into small steps, and teaching in sequence, due to autistic children's split

attention problems. Designers should also consider the child's age, and plan tasks at an appropriate level of difficulty. In addition, the fact that autistic children require more time to respond should be taken into account.
Therefore, it could be concluded that the information provided for autistic children must be clear, and structured properly to make them focus attention, and emphasize the most relevant information. Besides, manageable amount of colors could be used to direct autistic children's attention, and reduce the visual amount of search required. Since autistic children need to be taught in sequence, and step by step, incorporating numbers could have a strong effect on them. Furthermore, autistic children require rewards and reinforcements to motivate them. The tasks designed for autistic children must consider their age, and level of difficulty. Visual materials emphasize autistic children paying attention, comprehending, and using language in play mode.

Teaching Issues
The selected teaching issues summarized from reviewing other researchers' studies are as follows:

- **Giving Instructions to Learners:** Sweller et al. (2011) mention that instructions should be given to the learners while using the computer in order to learn manipulating different parts of the computer. This method was found effective to draw the learners' attention, thus, it is chosen as a teaching method to make autistic children more focused on learning.

- **Giving Precise Information on the Tasks:** Wetherby and Prizant (2000) insisted on giving the autistic children precise information, and positive praise about what they did right in their learning. This motivates the children to proceed if they know they are doing right while interacting with the application.

- **Providing Choices to Choose:** Wetherby and Prizant (2000) noted that providing opportunities for choosing which practice the autistic children prefer is helpful in their learning, and does not frustrate them.

- **Breaking down the Tasks:** It was insisted by Wetherby and Prizant (2000) to break down the instructions into small steps, and teach in sequence, due to autistic children's split attention problems. In addition, the fact that autistic children require more time to respond should be taken into account.

- **Providing Examples:** Wetherby and Prizant (2000) pointed out that using specific examples could give abstract ideas, and encourage conceptual thinking of the autistic children while learning.

Therefore, it could be concluded that autistic children required to be given instructions in teaching, and the instructions must be told step by step, and in sequence. Giving the autistic child's precise information and positive praise about what they did right in their learning motivates them. As a part of giving instructions, examples would be provided for the autistic children to teach them how to use the application.

Additional User Interface Requirements
Besides the design issues, and teaching issues, other important elements are required to be considered in the user interface design for the autistic children, according to their identified characteristics in the User Analysis, that are as below:

- The interface should provide aesthetically pleasing presentation to attract the autistic students, and draw their attention.
- The font size needs to be in big or medium size, and not too small, so that autistic children are attracted, and could see the words properly.
- The tasks which an autistic child is required to undertake in the system should be simple and easy to perform, and does not make them feel tired and sleepy.
- This system should be easy to learn for the autistic students, and they should be able to understand how to use the system.

Design and Implementation

After presenting the user interface requirements, the next step is the system design and implementation. The system design is divided into three parts of conceptual design, low fidelity design, and high fidelity design.

Intervention Study

In the Intervention study, the researchers intervened, and evaluated the application with the autistic children. The objective of the Intervention study was to teach autistic children Fakih method using the computer, and measure the effect of using the application on autistic children's split attention. More to the point, the objectives of the evaluation are specified as follows:

- To assess the effectiveness of using the considered design elements in the application to manage split attention among autistic children.
- To assess the effectiveness of incorporating teaching elements with the considered design elements in the application to manage split attention among autistic children.

Evaluation Participants

Thirteen autistic children from the Autistic Research Lab at the National University of Malaysia (Universiti Kebangsaan Malaysia, UKM) participated in this study. The participating students were from 5 to 18 years old, including Asperger, Mild, Hyper, and Severe autistic kids. One of the thirteen participants was a girl, and the others were boys. Hayes et al. (2010) mentioned that autism is likely to be diagnosed five times more in boys than girls. Thus, it could be understood that autism is likely to occur more in boys in comparison to girls, and the percentage is more in boys. In this study 8% of the participants were girls, and 92% were boys. Figure 1 shows each student's age. The horizontal axis shows the student's age according to the sequence of participating in the test. The average age of students participating in the test is nearly 9 years old:

$$\frac{\sum \text{Student's Age}}{13} = 9.15$$

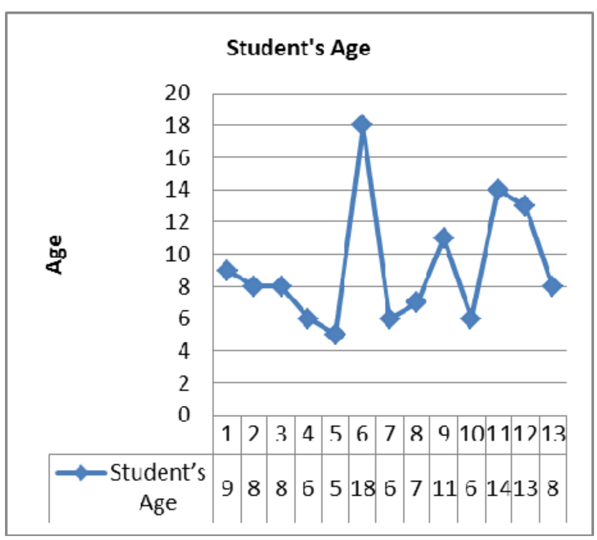

Figure1. Student's age

The students participating in the evaluation were elementary school students, and could speak and understand Malay, and English language. Besides, most of them know how to use the computer.

Evaluation Method

In order to evaluate the application, experimental method is used. The main purpose of conducting experimental evaluation is assessing the effectiveness of using the considered design elements, incorporated with the teaching elements in the application, to manage split attention among autistic children. For this purpose, two phases of the study are performed in this evaluation; one using paper-based method, and another is computer based, using the application among the autistic children. A comparison is performed on the gathered data to identify whether the application has effect on autistic children's attention, since the same autistic children participated in both paper-based, and computer method.

Evaluation Materials

In this section, a brief literature review on how to measure the effectiveness of a system is done. Many methods and strategies have been used in Human Computer Interaction (HCI) to evaluate the system effectiveness. Frøkjær, Hertzum, and Hornbæk (2000) define effectiveness as the completeness and accuracy of achieving certain goals by users. Error rates and quality of solution are considered as indicators of effectiveness. Coltekin, Heil, Garlandini, and Fabrikant (2009) mention that effectiveness relates to identifying whether or not the user could successfully complete a task. Kurniawan (2001) emphasized the importance of measuring task completion time which relates to the impact if the information achieved later than it should. Zhu and Meyers-Levy (2007) indicated evaluating the effectiveness of the intended users and task goal is based on the task goal achieving and task completion time which comes under the principles of efficiency. For this reason, according to Kurniawan (2001) task analysis is done to break down the necessary steps required to reach the end target.

User satisfaction is another metric to identify the system's ease of use which falls under the aspect of effectiveness (Kurniawan, 2001). National Institute of Standards and Technology (Fenves, Standards, & Technology, 2001) define satisfaction as the positive attitudes towards using the product and freedom from discomfort. In addition, attitude rating scales could be used to measure user satisfaction level (Frøkjær et al., 2000). Hence, Frøkjær, et al. (2000) declared user satisfaction level as an important aspect of usability. Therefore, reviewing what other researchers said, it could be concluded that in order to evaluate the effectiveness of a system in HCI, the following measurements materials should be included:

- **User Task Completion:** Being able to complete the tasks is an important factor to be considered for the autistic children. Completing a level to another level could be measured for the autistic students to identify whether students could achieve an acceptable level using the application in comparison with the paper based teaching method. Being able to complete the tasks indicates that autistic children could be able to focus their attention on learning and finish one level to another.

- **User Task Completion Time:** Considering this application was developed to draw the autistic children's attention, and make them focus on learning the Fakih method, thus, it could not be denied that task completion time is measured for them, because the application aims at teaching with high quality, and teaching speed is not much important. Additionally, since autistic children have different speed of learning, and also some students are fast in interacting with computers and some are slow, and their task completion time could not be compared with each other. For that reason, task completion time could not be chosen as a suitable measurement metric to evaluate the effectiveness of the system on the autistic children.

- **User Error Rates and Quality of Solution:** Because the autistic children had different background of using computers or iPad, and the students might be experienced, or inexperienced, the number of errors, or quality of the solutions which is the right and wrong answers would be counted, and compared for them. One of the objectives of this application is to help autistic children learn, and focus attention, not to count their correct and wrong answers in the test.

- **User Task Analysis and Achieving Certain Goals:** Task analysis is done to break down the necessary steps required to reach the end target, and to identify whether the user could achieve certain goals. Using task analysis is helpful for the autistic children, since they require being told what to do in sequence, and finally identifying whether they could achieve certain goals. In this research, with the objective of teaching Fakih method, task analysis could be applied to identify whether the autistic children were able to be given instructions, if yes until which level they could learn, or to identify whether the autistic children were able to take turns, if yes until which level they could take turns. All the results of the computer based, and paper based test must be documented, and compared. In addition, this study aimed at identifying how many times (frequency) autistic children required help in learning which is how many times (frequency) they needed to be taught the instructions.

- **User Satisfaction Level:** User satisfaction is defined as the positive attitudes towards using the system, in which attitude rating scales could be used to measure the user's satisfaction level. Since the autistic children are unable to fill a questionnaire to indicate their satisfaction, the children satisfaction rate is measured by their positive attitude and response towards using the system. The positive attitude is considered as the response to the reward sound saying excellent, and providing cup cake for them. Showing a positive attitude toward the application indicates that autistic children could be able to focus their attention on learning.

According to the National Institute of Standards and Technology (Fenves et al., 2001), from the information given to the user, being able to finish the tasks accurately, in a timely manner is considered as the main importance of effectiveness. Hence, it could be mentioned that in order to identify system effectiveness, time is a significant metric required for inclusion. Because this application was developed with the objective of drawing autistic children's attention, and avoiding split attention, their focus time is measured to identify whether this application was effective on their attention or not. To sum up, the chosen measurement metrics are as follows:

- **User Total Time and Focus Time** which considers the total time and first sight focus time of autistic students.

- **User Task Completion** which considers the autistic student's level of achievement.

- **User Task Analysis** which identifies how many times (frequency) instructions were given to each autistic student. In addition, how many times (frequency) autistic students took Turn in learning is identified.

- **User Satisfaction Level** which is considered as the autistic student's response towards rewards.

Analysis and Result

Comparing the data gathered from the children's interaction with the application, and without the application using traditional teaching methods reveals the following results:

Result 1

The gathered data shows that all of the autistic children were able to focus on learning the instructions in Baseline (with the ratio of 13:13), and Intervention test (with the ratio of 13:13). This means that all autistic children were able to focus their attention on giving Instructions to them. But, the results in students taking turn were different. Figure 2 illustrates and compares students who took turns, and who did not take turns in the Baseline, and Intervention study. To chart number 1, the blue color refers to students who took turns in the Baseline test, and the red color relates to the students who did not take turns in the Baseline test. To chart number 2, the blue color refers to students who took turns in the Intervention taste, and the red color relates to the students who did not take turns in the Intervention test.

In the Baseline study, a ratio of three to thirteen of the students (3:13) were able to take turns. In the Interventions study, a ratio of six to thirteen of them (6:13) had the ability to take turns. Theis improvement in the ratio is considerable to point out that the more autistic students were able to take turns, and to interact with their own, and without any guides. Thus, in the computer Intervention Study more students were able to focus their attention on learning. (See Figure 2)

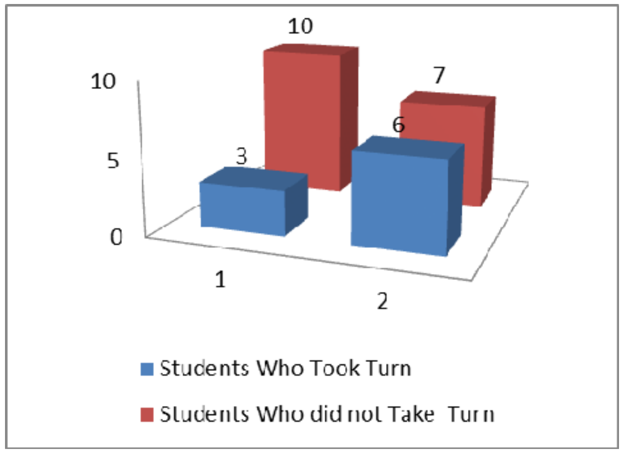

Figure 2. Student's taking turn

Result 2

From the data gathered it could be concluded that all of the participants were able to be given instructions (with the ratio of 13:13). Comparing the times (frequency) instruction were given to students in the Baseline, and Intervention study indicates that most autistic students were able to sit, focus their attention, and listen to instructions more in the Intervention test in comparison to the Baseline test. Figure 3 shows that this improvement had been seen in eleven out of thirteen students (with the ratio of 11:13). The two others who were given instructions once; one had motor skills problems, and the other felt sleepy in teaching him the instructions to learn the practice, and he wanted to do it on his own. Therefore, he took turns, and was able to focus attention, and interact with the application.

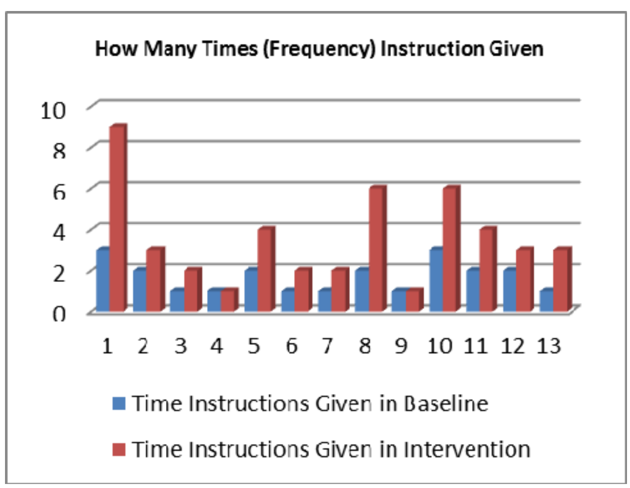

Figure 3. The times (frequency) instruction given

Result 3

Figure 4 shows the student's level in giving instructions, for both Baseline, and Intervention study. Analyzing the student's level from Figure 4, it could be concluded that the majority of the students (with the ratio of 8:13) achieved an acceptable level in the Intervention test which is higher than level 2 in the learning process, or even if they were at level 1, according to Figure 4, they were able to learn more than once, and the teaching process could be continued for them (5:13). Comparing the student's level in Baseline, and Intervention study, most of the students improved their level of learning while interacting with the application. This shows that they were able to spend more time, and focus their attention on learning.

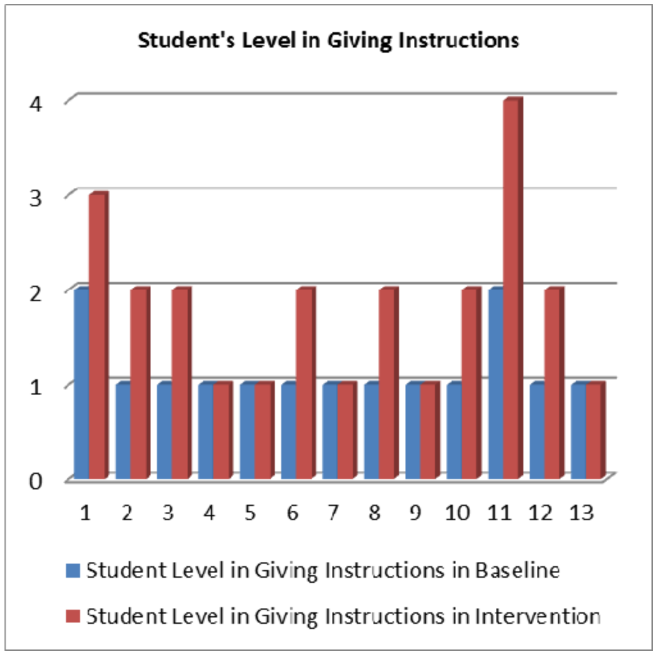

Figure4. Student's level in giving instructions

Result 4

Figure 2 showed that three students took turns in Baseline test, and six students took turns in the Intervention test. The three students participating in both Baseline and Intervention study are compared. Figure 5 illustrates the compares of student's Turn. This figure indicates that there was an improvement in the times (frequency) students took turns while interacting with the application. This illustrates that more students were able to focus their attention on the Intervention study.

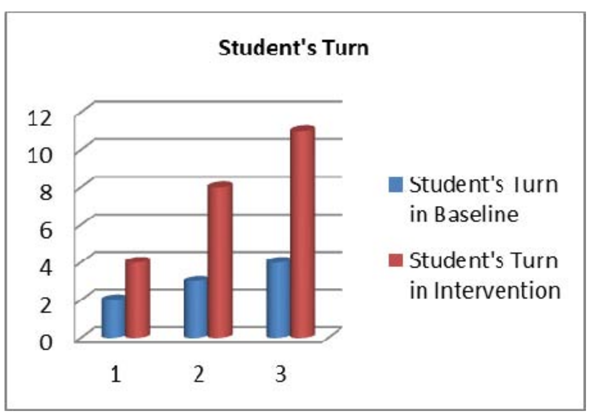

Figure 5. Comparison of student's turn

Result 5

Figure 6 compares the student's Total Time in the Baseline, and Intervention study. Analyzing the results indicates that there is a great improvement on all student's Total Time in the Intervention stage, in comparison with the Baseline stage (with the ratio of 13:13). This reveals that students could more focus attention, and spend more time on interacting with the computer rather than learning by paper.

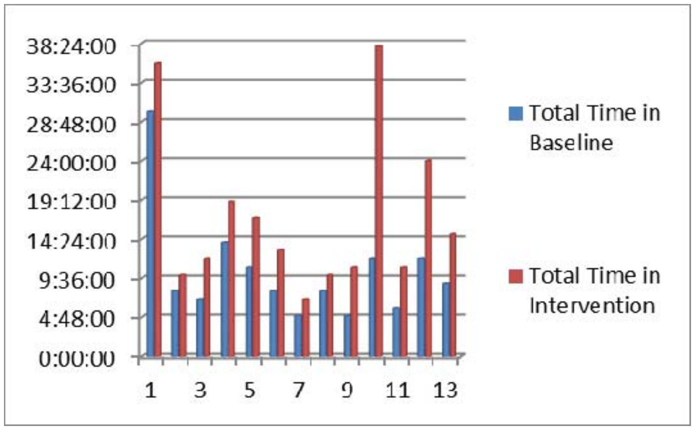

Figure 6. Total time

Result 6
Figure 7 shows and compares the student's first sight focus in the Baseline, and Intervention study. The first sight focus starts from the time children start learning, by the time they refuse to learn, or they are attracted by their friends, or something else. Comparing the results of Baseline, and Intervention test indicates that the majority of students improved their first sight focus in their learning process, and could put more focused attention on learning (with the ratio of 11:13). The two others who could not focus much on learning were student number 9, and 12. The problem with student number 9 was that she had motor skill problems, shaking problems, and she did not have the power to hold the mouse. Student number 12 was very sensitive towards the sounds, and the sounds made him scared. This fear did not permit him focus, though, he was responsive to the rewards, and start clapping when receiving them.

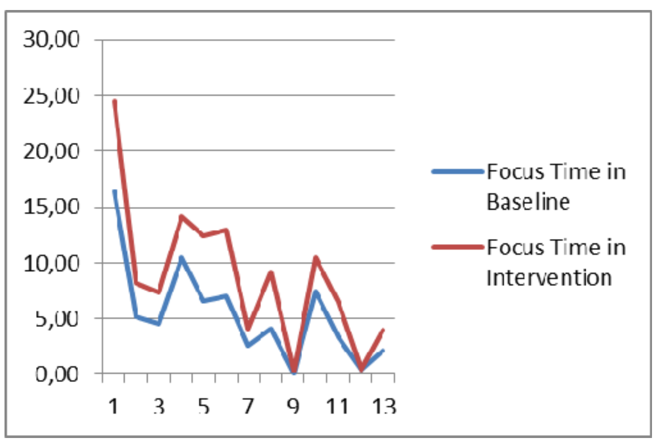

Figure7. Focus time

Result 7
Results show that a ratio of eight to thirteen students (8:13) were responsive to the rewards, and rewards motivated them. This ratio indicates that most students responded when hearing the excellent sound. Although student number 12 could not talk at all, and used sign language, the reward sound saying excellent made him clap for himself. Other students start laughing, looked happy, or started clapping and showing emotion upon hearing the reward sound.

DISCUSSIONS ON THE RESULTS OF THE EFFECTIVENESS TEST

The arisen results of the effectiveness test are discussed in the following sections:

Discussions on the Arisen Result of the Student's Total Time, and Focus Time

Comparing the evaluation results indicates that there is a great improvement in all student's Total Time in the Intervention stage, in comparison with the Baseline stage (see Figure 6).

This means students could sit longer, and focus their attention, and listen in the learning class while interacting with the application. Thus, it reveals that students spend more time on interacting with the computer rather than learning by paper. In addition, comparing the results of Baseline and Intervention test indicates that most students improved their first sight focus on their learning process (see Figure 7). Therefore it could be concluded that using the application will have a significant effect on the Student's Total Time, and Focus Time, and makes autistic children focus their attention more on learning.

Discussions on the Results Arising from the Student's Task Completion

Student's task completion time for the autistic children is considered as completing a level to another level in order to identify whether students could achieve an acceptable level using the application in comparison with the paper based teaching method. According to the results to the student's level, it could be concluded that most of the students achieved an acceptable level in the Intervention test which is higher than level 2 in the learning process, or even if they were at level 1, they were able to learn more than once, and the teaching process could be continued for them (see Figure 4). Thus, it could be concluded that most of the students improved their level of learning while interacting with the application in comparison with using paper. Additionally, it could be concluded that using the application makes autistic children focus more attention on learning, and this focusing attention allows them to improve their learning level and be able to finish one level to another.

Discussions on the Result Arising from the Student's Task Analysis

Task analysis was done to identify whether the autistic children were able to be given instructions, if yes until which level they could learn, or to identify whether the autistic children were able to take turns, if yes until which level they could take turns. Wetherby and Prizant (2000) insisted on breaking down the instructions into small steps, and teaching in sequence, due to autistic children's split attention problems. Comparing the times (frequency) instruction given to students in the Baseline, and Intervention study indicates that most students were able to sit, focus attention, and listen to instructions more, and improvements had been reported while interacting with the application (see Figure 3).

In the Baseline study, only a ratio of three to thirteen students (3:13) were able to take turns, and in the Interventions study, 6:13 of them had the ability to take turns (see Figure 2). Comparing the ratio of the results of Baseline and Intervention study shows an improvement in students taking Turn in the test which is a considerable ratio to point that more autistic students were able to focus attention, take Turn, and to interact with their own, without any guide, while using the computer. Comparing the results of the three students who took turns in the Baseline and Intervention study showed there was an improvement in the times (frequency) students took turns while interacting with the application.

Discussions on the Results Arising from the Student's Satisfaction Level

The autistic children satisfaction rate is measured by their positive attitude and response towards using the system which is the children's response to the reward sound saying excellent, and providing cup cake for them. Wetherby and Prizant (2000) emphasized providing reinforcements and rewards in order to motivate the autistic children. Results indicate that 8:13 of the students were responsive to the rewards, and rewards motivated them. This ratio is considerable to specify more than half of the students responded when hearing the excellent sound. Other students, start laughing, appeared happy, or started clapping, and showed emotion upon hearing the reward sound.

CONCLUSIONS AND FUTURE ENHANCEMENTS

The study performed by (Bernard-Opitz, et al., 1990; Chen & Bernard-Opitz, 1993; Panyan, 1984; Yamamoto & Miya, 1999) showed that supporting autistic children with computers in a structured and controlled environment, using multilevel interactive functions were found effective on a variety of computer based interventions. More to the point, the results of this research indicate that using computers in a customized design environment were more effective on autistic children rather than papers. The positive effect of using computers among autistic children allows split attention to be reduced. The reason of decreasing autistic children split attention is because of reducing the children's complexity in the interaction with the teacher (Ramdoss, Mulloy, et al., 2011). Another reason is using computers offers visual information displays which help autistic children, since they are visual learners (Bondy & Frost, 1994; Whalen et al., 2010).

From the results arising, it could be concluded that using the application improves the autistic children's total time of learning, and also improves the student's first sight focus. This indicates that this application was able to draw autistic children's attention in learning, and make them focus attention which was one of the objectives of this study. While interacting with the application, autistic students improved their level of learning in comparison with using paper. As pointed out by Sweller et al. (2011), giving instructions is effective to make learner focus attention. In this research, the times (frequency) Instruction was given to students improved which indicates that most students were able to sit, focus attention, and listen to instructions more when using computers. Besides, results prove that providing examples aimed autistic children to focus attention on learning which was noted by Wetherby and Prizant (2000) since it offers abstract ideas and conceptual thinking to the autistic children while learning.

Improvements in students taking turn show that they were able to focus attention, and interact on their own, without any guide, while using the computer. More than half of the students responded towards the rewards which show their satisfaction with using the application. Autistic children being able to focus attention while interacting with the application reveals that the considered design issues incorporated with the teaching issues helped, and reduced autistic children's split attention, which means using the application could manage autistic children split attention, and makes them focus attention on learning Fakih method.

Although this application assists the autistic children with the objective of facilitating their split attention, there are still some future enhancements required to be considered in order to improve the application, and have more influence on the autistic children. As the first suggestion, providing Arrows for the application which includes specifying what exact vowel sound to be used. The second suggestion is to provide sound for the application that pronounces the Arabic word. Third, highlight the word that has been numbered. Fourth suggestion is to place numbers on the buttons was hard for children to put it in the exact circle. The final suggestion is that in order to make it easier for the autistic children to differentiate the word and sound by specifying each alphabet word, sound and/or syllables.

References

Alcantara, P. R. (1994). Effects of videotape instructional packaging on purchasing skills of children with autism. *Exceptional Children, 61*.

Ameli, R., Courchesne, E., Lincoln, A., Kaufman, A. S., & Grillon, C. (1988). Visual memory processes in high-functioning individuals with autism. *Journal of Autism and Developmental Disorders, 18*(4), 601-615.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR.* Washington, DC: Author.

Barron, A. E., Harmes, J. C., & Kemker, K. J. (2006). Technology as a classroom tool: Learning with laptop computers. *Handbook of research on literacy in technology at the K-12 level* (pp. 271-286).

Benyon, D., Turner, P., & Turner, S. (2005). *Designing interactive systems: People, activities, contexts, technologies.* Addison-Wesley Longman.

Bernard-Opitz, V., Ross, K., & Tuttas, M. (1990). Computer assisted instruction for autistic children. *Annals of the Academy of Medicine, Singapore, 19*(5), 611.

Bétrancourt, M., & Bisseret, A. (1998). Integrating textual and pictorial information via pop-up windows: an experimental study. *Behaviour & information technology, 17*(5), 263-273.

Bevan, N., & Macleod, M. (1994). Usability measurement in context. *Behaviour & information technology, 13*(1-2), 132-145.

Blischak, D. M., & Schlosser, R. W. (2003). Use of technology to support independent spelling by students with autism. *Topics in Language Disorders, 23*(4), 293.

Bondy, A. S., & Frost, L. A. (1994). The picture exchange communication system. *Focus on Autism and Other Developmental Disabilities, 9*(3), 1-19.

Bosseler, A., & Massaro, D. W. (2003). Development and evaluation of a computer-animated tutor for vocabulary and language learning in children with autism. *Journal of Autism and Developmental Disorders, 33*(6), 653-672.
Cerpa, N., Chandler, P., & Sweller, J. (1996). Some conditions under which integrated computer-based training software can facilitate learning. *Journal of Educational Computing Research, 15*(4), 345-367.
Chandler, P., & Sweller, J. (1991). Cognitive load theory and the format of instruction. *Cognition and Instruction, 8*(4), 293-332.
Chen, S. H. A., & Bernard-Opitz, V. (1993). Comparison of personal and computer-assisted instruction for children with autism. *Mental Retardation*.
Colby, K. M. (1973). The rationale for computer-based treatment of language difficulties in nonspeaking autistic children. *Journal of Autism and Developmental Disorders, 3*(3), 254-260.
Coltekin, A., Heil, B., Garlandini, S., & Fabrikant, S. I. (2009). Evaluating the effectiveness of interactive map interface designs: a case study integrating usability metrics with eye-movement analysis. *Cartography and Geographic Information Science, 36*(1), 5-17.
Cooper, G., & Sweller, J. (1987). Effects of schema acquisition and rule automation on mathematical problem-solving transfer. *Journal of Educational Psychology, 79*(4), 347.
Crooks, S., White, D., Srinivasan, S., & Wang, Q. (2008). Temporal, but not spatial, contiguity effects while studying an interactive geographic map. *Journal of Educational Multimedia and Hypermedia, 17*(2), 145-169.
Daud, N. J., N., & Zubi, N. (2012). FAKIH: A Method to Teach Deaf People 'Reading' Quran.
Eigsti, I. M., Bennetto, L., & Dadlani, M. B. (2007). Beyond pragmatics: Morphosyntactic development in autism. *Journal of Autism and Developmental Disorders, 37*(6), 1007-1023.
Fenves, S. J., Standards, N. I. o., & Technology. (2001). *Core Product Model for Representing Design Information.* US Department of Commerce, Technology Administration, National Institute of Standards and Technology.
Fitzgerald, G., Koury, K., & Mitchem, K. (2008). Research on computer-mediated instruction for students with high incidence disabilities. *Journal of Educational Computing Research, 38*(2), 201-233.
Florax, M., & Ploetzner, R. (2010). What contributes to the split-attention effect? The role of text segmentation, picture labelling, and spatial proximity. *Learning and Instruction, 20*(3), 216-224.
Frøkjær, E., Hertzum, M., & Hornbæk, K. (2000). *Measuring usability: Are effectiveness, efficiency, and satisfaction really correlated?*
Hanbury, M. (2005). *Educating pupils with autistic spectrum disorders: A practical guide*: Sage Publications Ltd.
Hayes, G. R., Hirano, S., Marcu, G., Monibi, M., Nguyen, D. H., & Yeganyan, M. (2010). Interactive visual supports for children with autism. *Personal and ubiquitous computing, 14*(7), 663-680.
Heimann, M., Nelson, K. E., Tjus, T., & Gillberg, C. (1995). Increasing reading and communication skills in children with autism through an interactive multimedia computer program. *Journal of Autism and Developmental Disorders, 25*(5), 459-480.
Herskowitz, V. (2009). *Autism and computers: Maximizing independence through Technology.* AuthorHouse.
Hetzroni, O. E., & Tannous, J. (2004). Effects of a computer-based intervention program on the communicative functions of children with autism. *Journal of Autism and Developmental Disorders, 34*(2), 95-113.
Higgins, K., & Boone, R. (1996). Creating individualized computer-assisted instruction for students with autism using multimedia authoring software. *Focus on Autism and Other Developmental Disabilities, 11*(2), 69-78.
Hodges, S., Williams, L., Berry, E., Izadi, S., Srinivasan, J., Butler, A., & Wood, K. (2006). SenseCam: A retrospective memory aid. *UbiComp 2006: Ubiquitous Computing* (pp. 177-193).

Inan, F. A., Lowther, D. L., Ross, S. M., & Strahl, D. (2010). Pattern of classroom activities during students' use of computers: Relations between instructional strategies and computer applications. *Teaching and Teacher Education, 26*(3), 540-546.
Kalyuga, S., Chandler, P., & Sweller, J. (1999). Managing split-attention and redundancy in multimedia instruction. *Applied Cognitive Psychology, 13*(4), 351-371.
Kientz, J. A., Hayes, G. R., Westeyn, T. L., Starner, T., & Abowd, G. D. (2007). Pervasive computing and autism: Assisting caregivers of children with special needs. *IEEE Pervasive Computing*, 28-35.
Kurniawan, S. H. (2001). *Using GOMS to predict older adults' search time of health information in a hierarchical structure*.
Lahm, E. A. (1996). Software that engages young children with disabilities. *Focus on Autism and Other Developmental Disabilities, 11*(2), 115-124.
Layton, T. L. (1988). Language training with autistic children using four different modes of presentation. *Journal of Communication Disorders, 21*(4), 333-350.
Mayer, R. E., & Moreno, R. (1998). A split-attention effect in multimedia learning: Evidence for dual processing systems in working memory. *Journal of Educational Psychology, 90*(2), 312.
Mechling, L. C., Gast, D. L., & Stefane' Barthold. (2003). Multimedia computer-based instruction to teach students with moderate intellectual disabilities to use a debit card to make purchases. *Exceptionality, 11*(4), 239-254.
Myles, B. S., Trautman, M. L., & Schelvan, R. L. (2004). *The hidden curriculum: Practical solutions for understanding unstated rules in social situations*. Autism Asperger Pub Co.
Nielsen, J. (1994). *Usability engineering*. Morgan Kaufmann.
Panyan, M. V. (1984). Computer technology for autistic students. *Journal of Autism and Developmental Disorders, 14*(4), 375-382.
Pociask, F. D., & Morrison, G. R. (2008). Controlling split attention and redundancy in physical therapy instruction. *Educational Technology Research and Development, 56*(4), 379-399.
Powell, S. (1996). The use of computers in teaching people with autism. In *Autism on the agenda: Papers from a National Autistic Society Conference, London.*
Ramdoss, S., Lang, R., Fragale, C., Britt, C., O'Reilly, M., Sigafoos, J., . . . Lancioni, G. E. (2011). Use of computer-based interventions to promote daily living skills in individuals with intellectual disabilities: A systematic review. *Journal of Developmental and Physical Disabilities*, 1-19.
Ramdoss, S., Lang, R., Mulloy, A., Franco, J., O'Reilly, M., Didden, R., & Lancioni, G. (2011). Use of computer-based interventions to teach communication skills to children with autism spectrum disorders: A systematic review. *Journal of Behavioral Education, 20*(1), 55-76.
Ramdoss, S., Mulloy, A., Lang, R., O'Reilly, M., Sigafoos, J., Lancioni, G., . . . El Zein, F. (2011). Use of computer-based interventions to improve literacy skills in students with autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders*.
Rose, J. M., & Wolfe, C. J. (2000). The effects of system design alternatives on the acquisition of tax knowledge from a computerized tax decision aid. *Accounting, Organizations and Society, 25*(3), 285-306.
Seffah, A., Donyaee, M., Kline, R. B., & Padda, H. K. (2006). Usability measurement and metrics: A consolidated model. *Software Quality Journal, 14*(2), 159-178.
Simpson, A., Langone, J., & Ayres, K. M. (2004). Embedded video and computer based instruction to improve social skills for students with autism. *Education and Training in Developmental Disabilities, 39*(3), 240-252.
Sweller, J., Ayres, P., & Kalyuga, S. (2011). *Cognitive load theory* (Vol. 1). New York, NY: Springer.
Sweller, J., & Chandler, P. (1994). Why some material is difficult to learn. *Cognition and Instruction, 12*(3), 185-233.
Sweller, J., & Cooper, G. A. (1985). The use of worked examples as a substitute for problem solving in learning algebra. *Cognition and Instruction, 2*(1), 59-89.
Tabbers, H., Martens, R., & Van Merriënboer, J. (2000). *Multimedia instructions and Cognitive Load Theory: Split-attention and modality effects*.

Tarmizi, R. A., & Sweller, J. (1988). Guidance during mathematical problem solving. *Journal of Educational Psychology, 80*(4), 424.

Wetherby, A. M., & Prizant, B. M. (2000). *Autism spectrum disorders: A transactional developmental perspective* (Vol. 9). Baltimore, MD: Paul H Brookes.

Whalen, C., Massaro, D., & Franke, L. (2009). Generalization in Computer-Assisted Intervention for Children with Autism Spectrum Disorders. *Real life, real progress for children with autism spectrum disorders: Strategies for successful generalization in natural environments* (pp. 105-148).

Whalen, C., Moss, D., Ilan, A. B., Vaupel, M., Fielding, P., Macdonald, K., . . . Symon, J. (2010). Efficacy of TeachTown: Basics computer-assisted intervention for the intensive comprehensive autism program in Los Angeles unified school district. *Autism, 14*(3), 179-197.

Yamamoto, J., & Miya, T. (1999). Acquisition and transfer of sentence construction in autistic students: Analysis by computer-based teaching. *Research in Developmental Disabilities, 20*(5), 355-377.

Zhu, R., & Meyers-Levy, J. (2007). Exploring the cognitive mechanism that underlies regulatory focus effects. *Journal of Consumer Research, 34*(1), 89-96.

THE EFFECTS OF EXTENSIVE READING VIA E-BOOKS ON TERTIARY LEVEL EFL STUDENTS' READING ATTITUDE, READING COMPREHENSION AND VOCABULARY

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ABSTRACT
This study investigates the effects of extensive reading of e-books on tertiary level EFL students' English reading attitude, reading comprehension and vocabulary. Eighty-nine participants were assigned in two groups, with 46 students in the experimental group and the other 43 students in the control group. In addition to a traditional curriculum for both groups, a ten-week e-book extensive reading program was conducted for the experimental group by encouraging students to read the materials freely from three e-book library collections categorized on the basis of level of difficulty. In contrast, the control group did not engage in any extensive reading program. Stokmans's Reading Attitude questionnaire and TOEFL reading comprehension and vocabulary test were employed to collect the data. The findings of the study showed that the experimental group exhibited significantly better reading attitude, reading comprehension and vocabulary than the control group. Therefore, integrating e-books extensive reading program into EFL teaching program helps improve tertiary level EFL students' reading attitude, reading comprehension and vocabulary learning.
Keywords: Extensive reading, e-books, reading attitude, reading comprehension, vocabulary,

INTRODUCTION

Extensive reading, sometimes for pleasure reading (Day & Bamford, 1997; Dungworth, Grimshaw, McKnight, & Morris, 2004), sustained silent reading (Garan, & DeVoogd, 2008; Kelley, & Clausen-Grace, 2006; Reutzel, Fawson, & Smith, 2008), or free reading (Krashen, 1996; 2004), has been drawing increasing attention from ESL and EFL researchers and educators as an effective reading instruction in teaching English as a second/foreign language (Grabe, 2009, 2010; Lems, 2005; Mason, 2003; Nation, 2009; Yamashita, 2004). Extensive reading is relaxing, informal, and allows students to choose materials based on their English proficiency level and their interests. Also, it involves reading large quantities of text for general understanding of content with the purpose of having pleasure, and includes individualized and independent reading, which gives students the chance to select the materials based on their own interest without the discussion of texts in class (Bamford & Day, 2004; Brown, 2009; Chun, Choi, & Kim, 2012; Green, 2005; Hashimoto, & Okazaki, 2012; Kirin, Poolsap, & Plongthong, 2012; Lituanas, Jacobs, & Renandya, 2001; Safaeia, & Bulca, 2013; Susser & Robb, 1990; Takase, 2007;Yamashita, 2008).

Theoretical support for extensive reading in the field of L2 research comes from the input hypothesis (Krashen, 1982) arguing for comprehensible input as the sufficient condition for L2 acquisition and/or the reading hypothesis (Krashen, 1993). This trend in line with the recent popularity of computer assisted language learning (CALL) had led educators and researchers to believe that the interactive and lively nature of reading on Web and e-books, which may contain multimedia elements and animated content impossible to be shown on printed papers, can evoke better reading comprehension and vocabulary acquisition than traditional printed medium (Grimshaw, 2007; Groot, 2000; Korat, 2010; Korat & Shamir, 2012; Lai, Tsai & Yu, 2009; Liu, Chen, & Chang, 2010; Liu, Moore, Graham, & Lee, 2003; Marzban, 2011; Maynard, 2005; Moody, 2010; Rhodes & Milby, 2007; Rusanganwa, 2013; Smeets & Bus, 2012; Stakhnevich, 2002).

Thus, introducing e-books into extensive reading program proved to be useful for supporting young children's literacy and language development (De Jong & Bus, 2003; Lefever-Davis & Pearman, 2005). The facilitative effect of e-book extensive reading (ER) for both first and second language learners on various abilities/skills such as vocabulary development and writing skill has also been reported (Adamson, 1995; Day & Bamford, 1997; Elley, 2000; Krashen, 1993). For instance, Huang and Liou (2007) selected sixteen articles from the computer corpus of a local English magazine and used them to construct an online English extensive reading program. The reading program was conducted with 38 college students over twelve weeks, based upon vocabulary gains from a pretest to a posttest. The results showed that learners improved their vocabulary scores after participating in the reading program. Also, Hou (2006) investigated the impacts of using alternative learning strategy on improving students' reading and writing skills in an extensive reading program. Participants were forty college students of an EFL class in southern Taiwan, and were expected to implement extensive reading from both traditional print and web-based reading materials. It was found that this activity did improve their writing skills. In particular, half of the students who had failed in the General English Proficiency Test (GEPT) finally passed the test after the extensive reading program training required for writing class.

Studies on learners' reading attitude in e-books extensive reading

The section reviews relevant previous literature on learners' reading attitude as a result of the implementation of extensive reading via e-books extensive reading program. A number of studies have reported that in addition to skills or literacy improvement on ESL/EFL learners, extensive reading program can also help enhance learners' English reading attitude in affective domain. For instance, Safaeia and Bulca (2013) reported that after participating in the extensive reading program, students could read as they like, and had stronger self-confidence to internalize what they had read. Also, their creativity in second language skills was highly improved.

Similarly, Matthew (1996) proposed that "reading and interaction with a book on a computer screen has the potential to be a powerful motivating force for even the most reluctant readers" (p. 380). Chu (1995) invited three first graders to read five stories in electric versions and documented their performance in their hands-on interactions, spontaneous/kinesthetic responses, and group discussions. The results showed that participants demonstrated high interest in reading e- books. She concluded that "reading computer books was exciting, meaningful, and most of all, enjoyable" (p. 361).

Traditionally, the implementation of extensive reading studies were reported by using print (Asraf & Ahmad, 2003; Bell, 2001; Hayashi, 1999; Hitosugi & Day, 2004; Horst, 2005; Mason & Krashen, 1997; Powell, 2005; Robb & Susser, 1989; Rodrigo, Greenberg, Burke, Hall, Berry, Brinck, Joseph, & Oby, 2007; Sheu, 2004; Taguchi, Takayasu-Maass, & Gorsuch, 2004), on-line (Arnold, 2009; Pino-Silva, 2006; Sun, 2003), or the combination of both (Rankin, 2005). When compared with traditional print text medium, integrating online text material into extensive reading program is less represented.

Among the three programs using electronic texts as reading material (Arnold, 2009; Pino-Silva, 2006; Sun, 2003), Sun (2003), for instance, conducted the study to investigate 59 university students' attitude toward Extensive Reading Online (ERO). Data were collected, including 1,770 reflection entries, 2,852 annotated words in one semester, and 44-item 5-Point-Likert Scale questionnaire was embedded with the constructs of system interface design, language learning benefits, perceived progress and learner attitude. The results showed that the participants had a positive attitude toward the extensive reading program and the system in enhancing their language skills. Also, students' Internet reading ability was improved and they became more capable of finding reading materials. These were all important for establishing learners' independence and autonomy in L2 reading.

Also, Arnold (2009) conducted an online extensive reading program on learners in learning German as a foreign language. Participants were seven undergraduates (including two freshmen) and one graduate student, including three male and five female students. All of them were English native speakers aged from 18 to 23, and had formally studied German for two to seven years. These students had mixed proficiency levels and were instructed to read German reading material according to their own interest. Data were collected from learners' self-report data including a reading questionnaire at the beginning of the semester, reading reports for each extensive reading session, two student reflections about the reading sequence and their progress, and end-of-semester questionnaire about the program. Overall, this modified extensive reading program did increase students' reading motivation, attitude, confidence in L2 reading, reading ability, and reading pleasure outside class.

Extensive reading as a support for reading comprehension and vocabulary

In addition to the influence on learners' reading attitudes, extensive reading has been recognized as one of the most effective ways to enhance reading rate, comprehension and vocabulary due to large amount of repeated exposure to interesting and meaningful L1/L2 reading materials (Asraf & Ahmad, 2003; Davis, 1995; Ellis, 1995; Elley, 2000; Elley & Mangubhai, 1983; Hitosugi & Day, 2004; Kirin, Poolsap, & Plongthong, 2012; Mason & Krashen, 1997; Yamashita, 2008). For instance, Lefever-Davis and Pearman (2005) stated that "e-books can indeed be a powerful tool and an asset to the teaching of reading". (p. 453). It has also been indicated that the e-books can facilitate students' learning by reading more actively with simultaneous audio and visual input (McFall, 2005). Hayashi (1999) also confirmed the benefits of ER (i. e., extensive reading) by examining 100 Japanese sophomores' reading methods and the relationship between reading ability and the reading quantity. In a word, extensive reading effectively helped improve reading comprehension and vocabulary ability. It corresponded with Krashen's (1985) "Input Hypothesis" the lower Affective Barrier set, the more Comprehensive Input got, and the more language acquisition developed, learners' vocabulary could be improved by extensive reading, which is emphasized in reading for pleasure without pressure.

Cho and Krashen (1994) investigated four Koreans immigrated into the U.S ranging from five months to seven years, and they had little or no pleasure reading in English before the study. After finishing 8 through 23 books, the subjects showed an increase in their vocabulary development and general improvement in their second language proficiency. Similarily, Yamashita (2008) explored the effects of extensive reading on different aspects of foreign language ability, including the general reading ability and lower-level linguistic ability. Thirty-one Japanese university freshmen participated in the extensive reading study. Though learners' linguistic ability like spelling and morphosyntax did not exhibit significant improvement, learners had great improvement for reading ability. In a two- year "Book Flood" experiment (Elley & Mangubhai, 1983), eight rural Fijian elementary schools were invited to join the program. Fourth- and fifth- graders were assigned to three groups, including the traditional audio-lingual method group, free reading group, and the shared reading group. The latter two were the "book flood" groups. Results showed that the Book Flood groups did better in reading comprehension, vocabulary recognition, and listening competence.

A review of related literature has shown that there is still conflicting evidence or inadequacy in previous research. For instance, previous extensive reading studies mostly placed emphasis on how much students could read instead of emphasizing the extent to which students could read voluntarily (Yamashita, 2004). Furthermore, using online material or e-books is less representative in extensive reading program literature. Also, the research design in previous extensive reading studies was often criticized for the drawback of lacking a control group (Lin, 2010). Without a control group, it is hard to rule out those factors that might confound the result of the experiment.

In order to fill the gap, this study attempts to investigate the effect of English e-book extensive reading on the attitude and reading comprehension of tertiary level EFL students, a less represented population. This is because in previous studies, the participants participating in extensive reading programs were mostly either 5-year junior college students (Sun, 2003; Yang, 2001) or high school students (Lin, 2010; Krashen, 2008); so far, limited studies were conducted to investigate tertiary level EFL students with technology-related majors. Evidence from the literature suggests that the underlying cognitive processing in different culture, disciplines, or age, by implication, may be tapped differentially due to socio-cultural, environmental and processing factors, which, in turn, may affect the learning style language learners prefer to use in discovering the meaning in language use (Dunn & Griggs, 1995). Technological university students represent a population who may possess specific learning style in language use. In view of cultural, disciplinary and age specificity, the findings from English speaking L1 children may not be generalized to tertiary level EFL students. Hence, the present study which intends to investigate whether extensive reading via e-books will help enhance tertiary level EFL students' reading attitude, reading comprehension, and vocabulary is valuable and significant.

The research questions of this study were: (1) Does the e-books extensive reading program used in this study affect tertiary level EFL students' English reading attitude, including utility, development, enjoyment, and escape construct? (2) Does the e-books extensive reading program used in this study affect tertiary level EFL students' English reading comprehension (3) Does the e-books extensive reading program used in this study affect tertiary level EFL students' English vocabulary? The hypothesis is that extensive reading of e-books will help enhance tertiary level EFL students' reading attitude, reading comprehension, and vocabulary.

METHODOLOGY

Participants

To ensure the homogeneity of learners' background, all 89 (58 male and 43 female) technological university freshmen aged from 18 to 19 from two classes participated in this study. A total of 46 freshmen was in the experimental group while the other 43 students in the control group. The participant background questionnaire was administered to collect demographic information of the participants. These students majored in management and engineering, and have learned English as a required subject for 10 years at school. Based on their performance of the Mock TOEIC test administered to the participants at the beginning of a semester, the participants scored around 446 in average.

Experimental training program

This study took place during the first semester of 2010. The extensive training program was administered to the experimental group in the third week in September in 2010, and lasted for the subsequent ten weeks.

In this study, while the control group receives only regular English classes, the experimental group receives supplementary extensive reading program via e-books in addition to regular English classes. The experimental group was encouraged to read articles from the categorized library collections in selected websites. In an orientation toward the e-book extensive reading program (ERP) for students, introduction of the extensive reading program and the demonstration of finding the e-books from the categorized collections in selected websites were provided. According to Coady (1997, p. 234), it is crucial to choose the extensive reading materials matching the reader's interest, background knowledge so that it could benefit and encourage the readers to read large amount with successful comprehension. Therefore, in order to choose books with convenience according to our participants' reading level, the researcher categorized the e-books into three library collections named Green Hill, Blue Ocean, Brown Volcano, arranged from the easiest to the most difficult based on authenticity (Bamford & Day, 1997; Nuttall, 1996) and simplification (Day & Bamford, 1998; Cho & Krashen, 1994; Nuttall, 1996). In addition, Coady (1997) also proposed that after reading, the short reviews, summaries or responses to the reading content could check readers' reading comprehension in process. Therefore, for checking their progress and encouraging them to challenge themselves to obtain better achievements, the students were asked to complete some tasks like finding out key words/ phrases worth studying in this reading and guessing the meaning from the context, connecting the contents of the reading selection to current or past real world events and experiences, finding passages they would like to/should hear, and their reflection toward the reading text in the weekly individual reading journals as well as groups' reading worksheets.

Also, it was made clear that students could choose any book according to their interest and proficiency after the diagnosis pretest. However, the participants were allowed to read beyond their level if they liked the challenge. Also, they could read for the overall meaning of the content at their own speed, and were encouraged to read as much as possible in their free time outside the class. The suggested least amount of reading time for the participants was two hours a week, as recommended by Susser and Robb (1990) so as to achieve the benefits of extensive reading.

Before the experiment, pretests assessing students' reading attitude, reading comprehension, and vocabulary were conducted in the first and the second weeks of September in 2010. After the experiment, posttests were conducted in the same semester with another version of Reading Comprehension Tests adapted from the TOFEL 2000 reading test, the same Stokmans's Reading Attitude Scale and another version of Schmitt et al. (2001) vocabulary test. The following section describes the instruments that were used for the pretests and the posttests in this study.

Instruments

The instruments that were employed in this study included Stokmans's Reading Attitude Scale (1999), the TOEFL reading test (2000), and the vocabulary test developed by Schmitt et al. (2001), which were administered both in the pretests before intervention and the posttests after intervention.

The same version of Stokmans's Reading Attitude Scale (1999) was used before and after the intervention of extensive reading via e-books to determine the participants' reading attitude. It contained twenty-four items with the format of 5-point Likert scale ranging from strongly agree (5) to strongly disagree (1). The 24 items were designed to explore how participants' reading attitude reflected on four dimensions including utility (6 items), development (6 items), enjoyment (6 items) and escape (6 items) respectively. With regard to the reliability of the test, the Cronbach's α values of the four constructs were 0.78, 0.8, 0.87 and 0.82 respectively. This confirms that the questionnaire had high reliability.

Two versions of English reading comprehension tests adapted from the TOFEL 2000 reading test were administered to determine the participants' reading comprehension before and after the experiment in the pretest and the posttest. Each version was composed of 20 multiple choice questions with different reading topics. They were in the same format.

Two versions of vocabulary level tests, developed by Schmitt et al. (2001), were given to both groups to assess their vocabulary size before and after the 10-week training period. The vocabulary test is highly recommended by Cameron (2002), and is the most commonly used test to measure readers' vocabulary size (Zhou, 2010). The tests were divided into five levels including the 2,000 word level, the 3,000 word level, the 5,000 word level, the 10,000 word level, and the academic vocabulary. Each level contains 60 words, and was further divided into 10 categories. The total number of words in each version of the vocabulary level test is 300 words. In addition, two versions of the vocabulary test were used in the pretests and the posttest. Both versions of tests were in the same test format. Finally, the researcher calculated the sum of correct choice in every test.

Data Analysis

To address the three research questions, an independent and a paired samples *t*-tests were conducted to examine any difference before and after the implementation of the training program in students' English reading attitude, reading comprehension and vocabulary size. Also, ANCOVA analysis with pretest as a covariate was used if there was any significant group difference in the pretest of attitude, reading comprehension or vocabulary test. After neglecting the by group effect from the pretest, we analyzed the result by using ANCOVA to determine if there was significant difference in the two groups' posttest of reading attitude, English reading comprehension and vocabulary.

RESULT AND DISCUSSION

In this section, the results of the statistical analysis are presented to answer the three research questions of the study.

The effect of e-books extensive reading on tertiary level EFL students' English reading attitude

The results of pretests showed (see Table 1) that no significant group differences were found in reading attitude, and reading comprehension tests before we implemented the training program in this study, but significant group difference was found in vocabulary.

Table 1 *Group Comparison for the Pretest in Reading Attitude, Reading Comprehension and Vocabulary*

	Experimental group (N = 46)		Control group (N = 43)			
Pretest	*M*	*SD*	*M*	*SD*	*t*	*p*
Reading attitude	3.35	0.62	3.31	0.51	0.62	0.54
Reading comprehension	36.07	12.61	37.81	12.84	0.87	0.62
Vocabulary size	15.7	4.39	13.39	3.92	-3.68	0.04*

Note. *$p < .05$

Table 2 showed the positive significance of the posttest on learners' overall attitude rating, the Utility and Development constructs of reading attitude between the experimental group (EG) and the control group (CG). These results suggested at least two possible interpretations. Firstly, e-book extensive reading influenced EFL university students' overall English reading attitude. Secondly, among the constructs, students' had significant changes in the Utility and Development construct, but no differences were found in the construct of Enjoyment or Escape.

Table 2 *Between-Group Comparison for Posttest in Reading Attitude*

Note. ***$p < 0.001$; **$p < 0.01$; *$p < 0.05$

Constructs	test	EG	CG	*p-value*
Utility	posttest	4.05	3.68	0.001**
Development	posttest	3.77	3.56	0.011*
Enjoyment	posttest	3.37	3.17	0.149
Escape	Posttest	2.61	2.60	0.730
Overall Performance	posttest	3.45	3.25	0.000***

The findings were consistent with those reported in some previous studies (Arnold, 2009; Sun, 2003) in that extensive reading had positive effect on EFL learners' reading attitude. According to Day and Bamford (1998), previous second language reading experiences had positive or negative influence on students' attitudes toward reading in the target language. In the case of successful experiences, learners may be motivated to the new experience of reading in L2. In the present study, by respecting the readers' choice, providing a private and easy environment for reading on internet and providing the contents with more interesting, and efficient features of e-books, the successful and pleasurable reading experience seems to be easier to motivate the L2 learners' positive attitude to read.

The effects of e-books extensive reading on tertiary level EFL students' English reading comprehension

In order to answer the question, we used two English reading tests adapted from TOFEL 2000 to examine the participants' English reading comprehension. An independent sample t-test was performed to investigate between group differences in regard to reading comprehension. Significant difference ($p <. 05$) was recognized between the experimental group (M = 55.78, SD = 23.88) and the control group (M = 43.78, SD = 14.21). The findings were consistent with those in some previous studies (Elley & Mangubhai, 1983; Foertsch, 1992; Krashen, 1993), suggesting that extensive reading is effective for the development of learners' reading comprehension. The experimental group did outperform the control group because the former may have more comprehensible input than the latter. As Krashen (1985) highlighted, given comprehensible input, and a lack of affective barriers, language acquisition will take place. In this study, e-book extensive reading program provides the experimental group with comprehensible input in a low anxiety environment associated with unconscious acquisition of the target language.

The e-books extensive reading on tertiary level EFL students' English vocabulary

The effect of E-book extensive reading program on vocabulary size was examined on five different word levels. The ANCOVA analysis was used to eliminate the pre-test by group effect of interference on the model since significant group difference in the pretest was observed.

After neglecting the interference effect from the pretest, significant between group differences were found on the 2000-word level (MD = -2.531, std. error = .854, $p < .05$), the 3000-word level (MD = -1.830, std. error = .843, $p < .05$), the 10000-word level (MD = -1.428, std. error =.558, $p < 0.05$) and the academic-word level (MD = -4.186, std. error =1.485, $p < 0.05$) in the posttests. However, no significant difference was observed in the 5,000 word level test ($p > .05$). Possible reasons for the insignificant difference in the 5,000 word level test might be related to unequal difficulty levels in two versions of the 5,000 word level vocabulary test. As cautioned by Xing and Fulcher (2007), although Version A and Version B of the 5,000 word level vocabulary test were highly correlated and highly reliable, the item analysis showed that the facility values of Version B contained a number of more difficult words. Thus, the performance of both groups in the posttests did not vary greatly enough to yield significant difference.

The finding about the effect of e-book ERP on vocabulary size corresponds with the Input Hypothesis (Krashen, 1985) ─ the lower Affective Barrier set, the more Comprehensive Input got, and the more language acquisition developed. In addition, the result which showed the significant differences of the scores in almost all levels of the vocabulary tests for two groups is also consistent with those of previous studies (Alley, 1991; Cohen, 1968; Krashen, 1989; Polak & Krashen, 1988), suggesting that proposed students exposed to pleasure reading can effectively improve their vocabulary growth.

CONCLUSION

The findings in the present study provide strong support for the hypothesis that the extensive reading of e-books facilitates Taiwanese tertiary level EFL technological students' English reading attitude, reading comprehension, and vocabulary growth. Secondly, the better performance of the experimental group confirmed our hypothesis that the extensive reading via e-books could improve tertiary level EFL students' L2 learning. Possible reasons may be related to the fact that the experimental group was exposed to a low anxiety environment, and rich comprehensible input so that the group achieved larger gains in reading attitude, comprehension and vocabulary growth, and their unconscious acquisition of the target language was accelerated. These results also suggested that certain tasks used in the extensive reading may help development of learners' reading comprehension and vocabulary growth, such as finding out key words/ phrases worth studying in this reading; guessing word meaning from context; connecting the contents of the reading selection to current or past real world events and experiences; finding passages they would like to/should hear; writing their reflection toward the reading text in the weekly individual reading journals as well as groups' reading worksheets.

To conclude, the findings point to a powerful role of e-books extensive reading in stimulating reading attitude, reading comprehension and vocabulary growth with EFL technological university level learners. With freedom to select material according to their interest, associated with positive attitude, these learners achieve not only substantial improvements in their reading comprehension, but also a greater growth in vocabulary.

Based on the result of the present study, pedagogical implications could be drawn. First of all, the result of the study indicated that E-book ERP training played an important role to enhance EFL learners' reading attitudes. Therefore, the school authority or language teacher could provide more convenient and interactive e-book or other online resources for their students. Also, well-developed and easy-access websites might support teachers' design in curricula and promote students' integrated motivation. In addition, more training toward extensive reading could be provided for language teachers so that the innovated teaching might stimulate the whole learning environment more effectively.

The significant improvement of English reading comprehension through e-book ERP was confirmed in this study. However, in real situation, the grammar-translation method still dominates the English teaching in Taiwan. Although it is hard to change the English learning environment in short time, by building a supportive environment for language teachers to implement extensive reading seems to create a path for approaching the target language and building readers the habit for pleasant reading.

There were some limitations of this study, despite some valuable findings. Firstly, in terms of the scope of the present study, only 89 students were chosen from one university, which might not represent the whole population. Therefore, the finding of this study may not be generalized to EFL population. In future studies, researchers could replicate the study by including a lager sample and see to what extent the findings would be generalized. To achieve this, researchers could also recruit the participants from more tertiary level EFL students with different L1 background. Furthermore, the effect of e-book ERP could not be manifested more significantly given the duration of this study, especially in vocabulary development. Researchers could conduct the study for longer duration in future studies to enhance the effects of e-book ERP more significantly. Also, although the quantitative research method was an efficient and objective approach, it was not adequate without taking account of the individual thoughts and feeling toward the project. In addition, some of the data were collected from self-report questionnaires, which might contain incomplete information due to dishonest responses. Therefore, further research could be conducted by incorporating both qualitative (such as interview, classroom observation, etc.) and quantitative method to investigate the subtle changes in students' affection, and to gather a more complete profile of participants' English learning motivation and reading attitude. Such enriched and triangulated data could help make the interpretation of the results more validly and reliably. Furthermore, variation in the study for the research questions was not subjected to the gender differences. In future studies, in order to examine gender differences, researchers may make an even division for genders and replicate the present study.

REFERENCES

Adamson, H. (1995). An experiment in using multimedia to teach language through content. *Journal of Intensive English Studies*, 5, 24-37.

Alley, D. (1991). Contextualizing pronunciation exercises through the use of fluency squares. *Hispania,* 74(4), 1091-1096.

Arnold, N. (2009). Online extensive reading for advanced foreign language learners: An evaluation study. *Foreign Language Annals,* 42(2), 340-366.

Asraf, R., & Ahmad, I. (2003). Promoting English language development and the reading habit among students in rural schools through the guided extensive reading program. *Reading in a Foreign Language,* 15(2), 83-102.

Bamford, J., & Day, R. R. (1997). Extensive reading: What is it? Why bother? *Language Teacher-Kyoto-Jalt, 21*, 6-8.

Bamford, J., & Day, R. R. (2004). *Extensive reading activities for teaching language,* Cambridge University Press.

Bell, T. (2001). Extensive reading: Speed and comprehension. *The Reading Matrix,1*. Retrieved October 28, 2006, fromhttp://www.readingmatrix.com/archives/archives_vol1_no1.html

Brown, D. (2009). Why and how textbooks should encourage extensive reading. *ELT Journal*, 63(3), 238-245.

Cameron, L. (2002). Measuring vocabulary size in English as an additional language. *Language Teaching Research,* 6(2), 145.

Cho, K. S., & Krashen, S. D. (1994). Acquisition of vocabulary from the Sweet Valley Kids series: Adult ESL acquisition. *Journal of Reading,* 37(8), 662-667.

Chu, M. (1995). Reader response to interactive computer books: Examining literary responses in a non-traditional reading setting. *Literacy Research and Instruction,* 34(4), 352-366.

Chun, E., Choi, S., & Kim, J. (2012). The effect of extensive reading and paired-associate learning on long-term vocabulary retention: An event-related potential study. *Neuroscience Letters,* 521(2), 125-129.

Coady, J. (1997). L2 vocabulary acquisition through extensive reading. *Second language vocabulary acquisition*, 225-237.

Cohen, D. (1968). The Effect of Literature on Vocabulary and Reading Achievement. *Elementary English, 45(2)*, 209-217.
Davis ,C . (1995). Extensive reading: an expensive extravagance? *ELT Journal*, 49, 329-335.
Day, R. R., & Bamford, J. (1997). *Extensive reading: what is it? Why bother.* retrieved from University of Hawaii, Document URL: http://langue.hyper.chubu.ac.jp/jalt/pub/tlt/97/may/extensive.htmlR
Day, R. R, & Bamford, J. (1998). *Extensive reading in the second language classroom*: Cambridge University Press.
De Jong, M., & Bus, A. (2003). How well suited are electronic books to supporting literacy? *Journal of Early Childhood Literacy, 3*(2), 147-164.
Dungworth, N., Grimshaw, S., McKnight, C. & Morris, A. (2004). Reading for pleasure?: A summary of the findings from a survey of the reading habits of year 5 pupils. *New Review of Children's Literature and Librarianship*, 10, 169-188.
Dunn, R., & Griggs, S. A. (1995). Multiculturalism and learning style: teaching and Counseling adolescents. Westport, CT: Praeger.
Elley, W. B. (2000). The potential of book floods for raising literacy levels. *International Review of Education/Internationale Zeitschrift fur Erziehungswissenschaft/Revue internationale l'education*, 46(3), 233-255.
Elley, W. B., & Mangubhai, F. (1983). The impact of reading on second language learning. *Reading Research Quarterly,* 19(1), 53-67.
Ellis, R. (1995). Interpretation tasks for grammar teaching. *TESOL Quarterly, 29*(1), 87-105.
Foertsch, M. A. (1992). Reading in and out of school: *Factors influencing the literacy achievement of American students in grades 4, 8, and 12, in 1988 and 1990.* DIANE Publishing.
Garan, E. M. & DeVoogd, G. (2008). The Benefits of Sustained Silent Reading: Scientific Research and Common Sense Converge. *The Reading Teacher, 62*(4), 336–344. DOI:10.1598/RT.62.4.6
Grabe, W. (2009). *Reading in a second language: Moving from theory to practice*. New York: Cambridge University Press.
Grabe, W. (2010). Fluency in reading--Thirty-five years later. *Reading in a Foreign Language*, 22(1), 71-83.
Green, C. (2005). Integrating extensive reading in the task-based curriculum. *ELT Journal, 59*(4), 306-311.
Grimshaw, S. (2007). Electronic books: Children's reading and comprehension. *British Journal of Educational Technology, 38*(4), 583-599.
Groot, P. J. M. (2000). Computer assisted second language vocabulary acquisition. *Language Learning and Technology*, 4(1), 60-81.
Hashimoto, S. I., & Okazaki, H. (2012). PREMA: An extensive reading work-in-progress. *Procedia - Social and Behavioral Sciences, 34*(0), 88-93.
Hayashi, K. (1999). Reading strategies and extensive reading in EFL classes. *RELC Journal, 30*(2), 114.
Hitosugi, C. I., & Day, R. R. (2004). Extensive reading in Japanese. *Reading in a foreign language, 16*(1), 20-39.
Horst, M. (2005). Learning L2 vocabulary through extensive reading: A measurement study. *Canadian Modern Language Review/La Revue Canadienne des langues vivantes, 61*(3), 355-382.
Hou, Y. J. (2006). The impacts of using reading journal and learning strategy on improving college students' reading and writing skills: A case study in Taiwan. Annals of language and Learning: proceedings of the 2009 international Online Language Conference. 283-286
Huang, H. T., & Liou, H. C. (2007). Vocabulary learning in an automated graded reading program. *Language Learning & Technology, 11*(3), 64-82.
Kelley, M., Clausen-Grace, N. (2006). R5: The Sustained Silent Reading makeover that transformed readers. *The Reader Teacher*, 60(2), 148-156. DOI:10.1598/RT.60.2.5
Kirin, W., Poolsap, P., & Plongthong, J. (2012). Promoting Extensive Reading among Chinese Students Learning Thai as a Foreign Language. *Procedia Engineering*, 32, 1178-1182.
Korat, O. (2010). Reading electronic books as a support for vocabulary, story comprehension and word reading in kindergarten and first grade. *Computers & Education*, 55(1), 24-31.
Korat, O., & Shamir, A. (2012). Direct and Indirect Teaching: Using E-Books for Supporting Vocabulary, Word Reading, and Story Comprehension for Young Children. J*ournal of Educational Computing Research*, 46(2), 135-152.
Krashen, S. D. (1982). *Principles and practice in second language acquisition*. Longman.
Krashen, S. D. (1985). *The input hypothesis: Issues and implications*: Longman.
Krashen, S. D. (1989). We acquire vocabulary and spelling by reading: Additional evidence for the input hypothesis. *Modern Language Journal*, 440-464.
Krashen, S. D. (1993). The case for free voluntary reading. *Canadian Modern Language Review,* 50(1), 72-82.
Krashen, S. D. (1996). The case against bilingual education. *Linguistics, language acquisition, and language variation: current trends and future prospects* (pp. 55-69). Books.Google.Com

Krashen, S. D. (2004). Free Voluntary reading: New Research, Applications, and Controversies. Paper presented at the RELC conference, Singapore, April, 2004.
Krashen, S. D. (2008). Language education. *RELC Journal*, 39(2), 178-187.
Lai, Y.-S., Tsai, H.-H., & Yu, P.-T. (2009). A Multimedia English Learning System Using HMMs to Improve Phonemic Awareness for English Learning. *Educational Technology & Society*, 12(3), 266–281.
Lefever-Davis, S., & Pearman, C. (2005). Early readers and electronic texts: CD-ROM storybook features that influence reading behaviors. *The Reading Teacher*, 58(5), 446-454.
Lems, K. (2005). A study of adult ESL oral reading fluency and silent reading comprehension. In
B. Maloch, et al., (Ed.), *54th Yearbook of the National Reading Conference* (pp. 240–256). Chicago, IL: National Reading Conference.
Lin, C. C. (2010). " E-Book Flood" for changing EFL learners. *US-China Education Review*, 7(11), 36-43
Lituanas, P. M., Jacobs, G. M., & Renandya, W. A. (2001). An investigation of extensive reading with remedial students in a Philippines secondary school. *International Journal of Educational Research*, 35(2), 217-225.
Liu, M., Moore, Z., Graham, L., & Lee, S. (2003). A look at research on computer based technology using in second language learning: a review of the literature from1990-2000. *Journal of Research on Technology in Education*, 34(3), 250-273.
Liu, P. L., Chen, C.J. , Chang, Y. J. (2010). Effects of a computer-assisted concept mapping learning strategy on EFL college students' English reading comprehension. *Computers & Education*, 54(2), 436-445.
Marzban , A. (2011). Investigating the role of multimedia annotations in EFL reading comprehension. *Procedia - Social and Behavioral Sciences*, 28, 72-77.
Mason, B. (2003). A Study of Extensive Reading and the Development of Grammatical Accuracy by Japanese University Students Learning English. Ed.D. Dissertation, Temple University, Osaka, Japan.
Mason, B., & Krashen, S. (1997). Extensive reading in English as a foreign language. *System*, 25(1), 91-102.
Matthew, K. (1996). The impact of CD-ROM storybooks on children's reading comprehension and reading attitude. *Journal of Educational Multimedia and Hypermedia, 5*, 379-394.
Maynard, S. (2005). Can electronic textbooks help children to learn? *The Electronic Library*, 23(1), 103.
McFall, R. (2005). Electronic textbooks that transform how textbooks are used. *The Electronic Library*, 23(1), 72-81.
Moody, A. (2010). Using electronic books in the classroom to enhance emergent literacy skills in young children. *Journal of Literacy and Technology*, 11(4), 22-52.
Nation, I. S. P. (2009). *Teaching ESL/EFL reading and writing*. New York: Routledge.
Nuttall, C. (1996). Teaching reading skills in a foreign language: *Heinemann Pr.*
Pino-Silva, J. (2006). Extensive reading through the internet: Is it worth the while
The Reading Matrix, 6(1).
Polak, J., & Krashen, S. (1988). Do we need to teach spelling? The relationship between spelling and voluntary reading among community college ESL students. *TESOL Quarterly*, 22(1), 141-146.
Powell, S. (2005). Extensive reading and its role in Japanese high schools. *The Reading Matrix*, 5,28-42.
Rankin, J (2005). Easy reader: A case study of embedded extensive reading in intermediate German L2 . *Die Unterrichtspraxis/Teaching German*, 38(2), 125-134.
Reutzel, D. R., Fawson, P. C., & Smith, J. A. (2008). Reconsidering silent sustained reading: An exploratory study of scaffolded silent reading. *The Journal of Educational Research*, 102(1), 37-50. DOI: 10.3200/JOER.102.1.37-50.
Rhodes, J. A., & Milby, T. M. (2007). Teacher-created electronic books: Integrating technology to support readers with disabilities. *The Reading Teacher*, 61(3), 255-259.
Robb, T. N., & Susser, B. (1989). Extensive reading vs. skill building in an EFL context. Reading in a Foreign Language, 5(2), 239-251.
Rodrigo, V., Greenberg, D., Burke, V., Hall, R., Berry, A., Brinck, T., Joseph, H., Oby, M.(2007). Implementing an extensive reading program and library for adult literacy learners. *Reading in a Foreign Language*, 19(2), 106–119.
Rusanganwa, J. (2013). Multimedia as a means to enhance teaching technical vocabulary to physics undergraduates in Rwanda. *English for Specific Purposes*, 32(1), 36-44.
Safaeia, L. A., & Bulca, M. (2013). Extensive Reading and Creative Practices. *Procedia - Social and Behavioral Sciences*, 70(25), 592-597.
Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and exploring the behaviour of two new versions of the vocabulary levels test. *Language Testing*, 18(1), 55.
Sheu, P. H. (2004). Extensive reading as a breakthrough in a traditional EFL curriculum: experimental research in junior high schools in Taiwan. *Journal of National Taipei Teachers College*, 17(2), 213~228.
Smeets, D. J. H. , Bus, A. G. (2012). Interactive electronic storybooks for kindergartners to promote vocabulary growth. *Journal of Experimental Child Psychology*, 112(1), 36-55.

Stakhnevich, J. (2002). Reading on the Web: Implications for ESL professionals. *Reading Matrix: An International Online Journal,* 2(2).
Stokmans, M. (1999). Reading attitude and its effect on leisure time reading. *Poetics,* 26(4), 245-261.
Sun, Y. C. (2003). Extensive reading online: an overview and evaluation. *Journal of Computer Assisted Learning*, 19(4), 438-446.
Susser, B., & Robb, T. (1990). EFL extensive reading instruction: Research and procedure. *Jalt Journal*, 12(2), 161-185.
Taguchi, E., Takayasu-Maass, M., & Gorsuch, G. J. (2004). Developing reading fluency in EFL: How assisted repeated reading and extensive reading affect fluency development. *Reading in a Foreign Language*,16, 1–23.
Yamashita, J. (2004). Reading attitudes in L1 and L2, and their influence on L2 extensive reading. *Reading in a Foreign Language,* 16(1), 1-19.
Yamashita, J. (2008). Extensive reading and development of different aspects of L2 proficiency. *System,* 36(4), 661-672.
Yang, S. (2001). Language learning on the world wide web: An investigation of EFL Learners attitudes and perceptions. *Journal of Educational Computing Research,* 2\4(2), 155-181.
Takase, A. (2007). Japanese high school students' motivation for extensive L2 reading. *Reading in a foreign language*, 19(1), 1-18.
Xing, P. L., & Fulcher, G. (2007). Reliability assessment for two versions of Vocabulary Levels Tests , *System*, 35(2), 182-191.
Zhou, S. (2010). Comparing Receptive and Productive Academic Vocabulary Knowledge of Chinese EFL Learners. *Asian Social Science,* 6(10). 14-20.

THE INNOVATIVENESS AND SELF-EFFICACY PREDICT THE ACCEPTANCE OF USING iPAD2 AS A GREEN BEHAVIOR BY THE GOVERNMENT'S TOP ADMINISTRATORS

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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 a key in the maintenance of their competitive advantage. The Environmental Protection Administration (EPA) of Taiwan 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 predict 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 2.
Keywords: iPad 2; iPad self-efficacy; innovativeness; TAM

INTRODUCTION
Green behavior 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 Administration (EPA), 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 (TAM): 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) TAM to examine the participants' intent to use the new technological device. Davis' TAM was based on the theory of reasoned action (TRA) (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, perceived usefulness (PU) and perceived ease of use (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 expands 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).

Although TAM is considered as a well-recognized model in the field of information systems, little systematic research has been conducted in the environmental concern, this context indicating a significant gap in knowledge. Therefore, there is a strong current need to develop and gain empirical support for the TAM within environmental organizations. Several researchers have adapted the above frameworks to describe adoption of ICT by elder employees, indicating PU and PEU are the primary determinants affecting attitude toward use (ATU), which affects intention to use (IU) (Adams, Stubbs, & Woods, 2005; Phang et al., 2006; Hill, Beynon-Davies, & Williams, 2008). 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, observation and trial-ability, and additionally the social context and social norms of an organization (Woodside & Biemans, 2005). 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 attaining 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: 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 "ATU" with "satisfaction with usage (SU)" as the construct of success, and used innovation and iPad self-efficacy (iPad SE) as the external variables to form the research hypotheses as follows.

H1: PEU is significantly correlated to PU of an iPad used for document processing.
H2: PEU is significantly correlated to SU of an iPad used for document processing.
H3: PU is significantly correlated to SU of an iPad used for document processing.
H4: PU is significantly correlated to intention to use an iPad.
H5: SU usage is significantly correlated to intention to use an iPad for document processing.
H6: Innovativeness is significantly correlated to PU of an iPad used for document processing.
H7: Innovativeness is significantly correlated to PEU of an iPad used for document processing.
H8: iPad SE is significantly correlated to PU of an iPad used for document processing.
H9: iPad SE innovation is significantly correlated to PEU of an iPad used for document processing

RESEARCH DESIGN

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.

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**.** This study employed Compeau and Higgings' (1995) computer self-efficacy and Lam and Lee's (2005) Internet self-efficacy to define iPad self-efficacy. 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.

Data analysis: Based on the research evidence, we used Visual PLS 1.04 software to perform reliability analysis, factor analysis, structural equation modeling (SEM), and other research tests on the data from valid questionnaires. SEM was used to explore the causal relationship between variables and to examine the relationships among different hypothetical models to verify our theoretical framework.

RESEARCH RESULTS

Item analysis with composite reliability and convergent validity: The study used Visual PLS 1.04 as an analytical tool to carry out descriptive statistics, factor loading, and t-value calculations in order to understand the items of the study. Internal consistency can be determined by examination of the composite reliability (CR) of the constructs (Fornell & Larcker, 1981), and all CR values in the present study ranged from .895 to .963, 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 offer terminology instead of a methodology (Refsgaard & Henriksen, 2004). Convergent validity referred to the degree to which multiple items measure one construct. Convergent validity in the present study was evaluated by checking 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 .5 (Nunnally, 1978). All these conditions were met, indicating acceptable convergent validity. Additionally, all t-values were significant, showing that all items were discriminative, and all items were able to identify the degree of response for different samples (see Table 1). The results showed that the alpha values for innovativeness, iPad SE, PEU, PU, ATU, and BI were .848, .890, .950, .867, .856 and .929 respectively.

Table 1. Factor Loadings, CR, and AVE

Items	Mean	SD	Loading	t-value
Innovativeness: CR=.895; AVE=.634, α=.848				
1. I would like to try all kinds of new inventions or new ideas.	4.24	.91	.851	22.060
2. I would try to use new methods to sort things out.	4.38	.58	.854	18.019
3. I could often think of different ways to solve difficult problems.	4.52	.59	.630	4.136
4. My thinking and behavior are original.	4.19	.77	.745	7.139
5. I believe new technology devices can trigger my creativity	4.38	.66	.875	16.739
IPad 2 self-efficacy: CR=.924; AVE=.710, α=.890				
1. I can use iPad 2 without any obstruction even when no one has taught me how to use it.	3.21	1.42	.730	5.712
2. I'm able to use iPad 2 if I have the user manual as a reference.	3.74	1.15	.763	8.886
3. I have confidence in utilizing all the functions on the iPad 2.	3.67	1.00	.878	24.059
4. I have the confidence to use iPad 2 if someone could demonstrate the operating methods briefly for me once.	3.86	1.03	.912	27.014
5. I am very confident to in using new technology devices.	3.95	.96	.914	35.743
Perceived ease of use: CR=.964; AVE=.842, α=.950				
1. The function of iPad 2 is easy to learn	4.02	.75	.958	60.350
2. The function of iPad 2 is easy to master	4.02	.75	.958	60.350
3. It is convenient for me to use iPad 2 for any occasion.	4.19	.67	.944	45.008
4. The implicit knowledge of iPad 2 is easy to figure out by myself.	4.10	.85	.928	46.326
5. In meeting occasion, I can use iPad 2 for document process easily.	4.21	.72	.791	11.896
Perceived usefulness: CR=.899; AVE=.607, α=.867				
1.Using iPad 2 can enhance the efficiency of the document process	4.02	.75	.805	12.500
2.Using iPad 2 can promote job performance	3.88	.92	.912	43.268
3. Using iPad 2 can enhance the effectiveness of meetings	4.05	.88	.912	48.222
4. Using iPad 2 can promote the convenience in organizational communication.	3.83	1.01	.840	17.821
5. Using iPad 2 can really reduce the paper usage	4.81	.51	.626	5.308
Satisfaction with usage: CR=.924; AVE=.802, α=.856				
1. I am satisfied with using iPad 2 as an organization	4.36	.66	.928	33.257

communication tool.				
2. I am satisfied with using iPad 2 as a document processing tool.	4.45	.59	.848	17.677
3. I am satisfied with the reduced rate of paper use by using iPad 2.	4.10	.93	.910	40.830
Behavior intention to use: CR=.954; AVE=.838, α=.929				
1. I will continue using iPad 2 as a document processing tool	4.50	.67	.909	23.848
2. I will continue using iPad 2 as a tool of searching relative information.	4..40	.63	.920	28.316
3. I will continue using iPad 2 as an organization communication tool.	4.38	.66	.922	32.046
4. I will recommend the use of iPad 2 as a document processing tool for all occasions.	4.26	.86	.911	44.877

Factor analysis with internal reliability and construct validity: The construct validity of the research instruments was established using confirmatory factor analysis (Byrne, 2001). All factor loadings were statistically significant and ranged from .899 to .964. To evaluate the consistency of the variables, reliability analysis of the questionnaire was identified using Cronbach's *α*. According to Nunnally (1978), a Cronbach's α value above .5 indicated an acceptable level of reliability. Table 1 showed Cronbach's α values and indicated that all values were above 0.5 and that the reliability coefficient for the entire questionnaire was .952, which suggests that the variables were reliable. According to Kaiser (1970; 1974), if the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy wass above .5, then the construct validity was acceptable. Table 2 presented the KMO values and indicates that all values were above .5 and that the composite validity of the entire questionnaire was .678, which further indicates that the variables are reliable. Table 1 showed that the mean values of each dimension were between 3.69 and 4.39 and that the standard deviations were small, indicating a low degree of dispersion.

Table 2 Factor and reliability analysis

Dimension	Mean	SD	Cronbach's *α*	KMO
Overall	4.18	.55	.952	.678
Innovativeness	4.34	.56	.848	.751
iPad SE	3.69	.94	.890	.751
PU	4.12	.81	.950	.553
PEU	4.11	.68	.867	.670
SU	4.30	.65	.856	.714
BI	4.39	.64	.929	.737

Correlation analysis: Table 3 showed that there was a significant positive correlation between most of the various dimensions. Only innovativeness was not significantly correlated to iPad SE, and iPad SE was not significantly correlated to perceived usefulness.

Table 3 The correlation matrix

	Innovativeness	iPad SE	PEU	PU	SU	BI
Innovativeness	1					
iPad SE	.178	1				
PEU	.599***	.273	1			
PU	.541***	.693***	.736***	1		
SU	.596***	.532***	.817***	.728***	1	
BI	.590***	.353*	.818***	.629***	.788***	1

* $p < .05$ ** $p < .01$ *** $p < .001$.

Path Analysis: Figure 1 shows the results of the path relationship among the hypotheses. It is evident that all the hypotheses were supported. Figure 2 indicates and supports that the test of innovativeness influenced participant PU and PEU with standardized regression coefficients (SRC) of .26 and .38. The test of iPad SE influenced and supported PU and PEU with an SRC of .37 and .63. The test of PEU influenced and supported PU with an SRC of .85. The test of PU and PEU influenced and supported SU with an SRC of .60 and .30. Finally, the test of PU and SU influenced and supported BI with a SRC of .55 and .33.

DISCUSSION

A majority of the research participants were older than 55 years old, they were assumed to have used iPad 2 as a tool to reduce paper usage in governmental organization. A revised TAM was used as the basic framework to examine how much innovativeness of top administrators and the self-efficacy in using iPad 2 would predict their SU and behavioral intention mediated by PU and PEU. Consequently, the statistical results indicated all hypotheses were supported, that is, the higher level of self-efficacy the research participants in using iPad 2, the higher level of PEU and PU they would have, and further reflect to higher level of SU and IU towards iPad 2. This evidence somewhat contradicted the common assertion that limited willingness in of technology use by older adults stems from low self-efficacy, computer anxiety, or technophobia — a negative attitude toward modern technology in general (Selwyn, 2004, 2006). In addition, the results of the present study were consistent with Selwyn's studies which showed a higher level of iPad self-efficacy led to a higher PU and PEU, as well as the study results from previous researches (Agarwal and Prasad (1998), Gilly and Zeithaml (1985), and Zeithaml and Gilly (1987)).

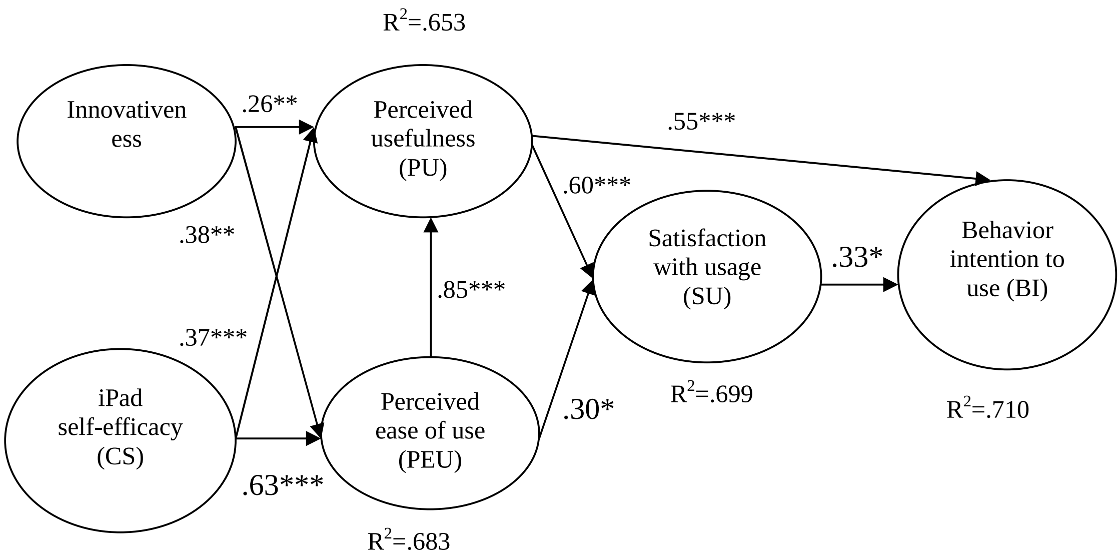

Figure 1: Verification of research model

Another finding of this study indicated the innovativeness also revealed the positive correlation to PEU and PU, which in turn reflected to a high level of SU with using iPad 2 and IU for administrative jobs. The mean of personal innovativeness of those top administrators was found to be 4.34 in the present study, which revealed tendency in participants' to adopt new information technologies. The result was supported by Woodside and Biemans' (2005) argument, personal innovativeness, or the tendency to accept innovations, is influenced by perceived compatibility and complexity. In this view, the prerequisites of innovativeness acceptance can be said to relate to interface design of a certain product, as well as its PEU. However, the finding was in contrary to Rogers' (2002) highlights, that resistance to use new technological device exhibits in people, even to individuals with high innovativeness when they first encounter a new technology. Conclusively, the present findings may be explained by participants who had no difficulties in using the interface of iPad and were satisfying the new policy, in short, the results indicated the role of innovativeness was essential for top administrators, as elder adults were to accept new technological devices.

CONCLUSION AND FUTURE STUDY

There are numerous factors that affect the use of a new technological device. In the present study, TAM was adopted to examine the innovativeness and iPad self-efficacy. The results of present study disagreed with the proverb "old dog cannot learn new skills", that is, when elderly had the innovativeness and iPad self-efficacy, they were found to willingly adopt new technological device, such as iPad 2.

The issue of new technologies acceptance has been widely discussed by researchers and others within the different industries, each shown to have different influential factors towards technology acceptance, however, in order to enhance future technology use by other government sections, such as the ministry of education (promotes environment education), the results of the present study may be applied to encourage more top administrators in applying iPad 2 to replace their paper document processing. In the end, the samples of this study were limited to EAP employees, as they exhibit stronger Green sense over other employees from government units. Thus, the future studies may focus on studying the innovativeness and self-efficacy toward technological device in other government units for further understanding into innovativeness and iPad acceptance in promoting a greener workplace.

REFERENCES

Adams, N., Stubbs, D., & Woods, V. (2005).Psychological barriers to Internet usage among older adults in the UK. *Informatics for Health and Social Care, 30*(1), 3-17.

Agarwal, R., & Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, *9*(2), 204–215.

Ajzen, I. (1988). *Attitudes, personality, and behavior*. Milton-Keynes, England: Open University.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. New Jersey: Prentice-Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation- confirmation model. *MIS Quarterly*, *25*(3), 351–370.

Cassidy, S & Eachus, P. (2002). Developing the computer user self-efficacy (CUSE) scale: Investigating the relationship between computer self-efficacy, gender and experience with computers. *Journal of Educational Computing Research*, *26*(2), 169-189, 2002.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly, 19*(2), 189-211.

Czaja, S. J., Charness, N., Fisk, A.D., Hertzog, C., Nair, S.N., Rogers, W.A., & Sharit, J. (2006). Factors predicting the use of technology: Findings from the center for research and education on aging and technology enhancement (create). *Psychology and Aging, 21*(2) 333–352.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer-technology: a comparison of two theoretical-models. *Management Science*, *35*(8), 982–1003.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Social Psychology, 22*(14), 1111-1132.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

Eastin, M. S., & LaRose, R. (2000). Internet self-efficacy and the psychology of the digital divide. *Journal of Computer-Mediated Communication, 6*(1). Retrieved 02/02/2012 from http://www.asusc.org/jcmc/vol6/issue1/eastin.html

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Readings, MA: Addision-Wesley.

Gefen, D., Karahanna, E., & Straub, D. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly, 27*(1), 51-90.

Heart, T., & Kalderon, E. (2011). Older adults: Are they ready to adopt health-related ICT? *International Journal of Medical Informatics*, Retrieved from: http://www.ncbi.nlm.nih.gov/pubmed/21481631

Hill, R., Beynon-Davies, P., & Williams, M. D. (2008). Older people and internet engagement. *Information Technology & People*, *21*(3), 244.

Hurt, H. T., Joseph, K., & Cook, C. D. (1977). Scale for the measurement of innovativeness. *Human Communication Research, 4*(1), 58-65.

Ifinedo, P. (2006). Acceptance and continuance intention of web-based learning technologies (WLT), use among university students in a Baltic country. *Electronic Journal of Information Systems in Developing Countries*, *23*(6), 1-20.

Igbaria, M., & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Omega*, *23*(6), 587-605.

Lichtenstein, S., & Williamson, K. (2006). Understanding consumer adoption of IPAD Banking: In interpretive study in the Australian banking context. *Journal of Electronic Commerce Research, 7*(2), 50–66.

Likert, R. A. (1932). Atechnique for the measurement of attitudes. *Archives of Psychology*, *140*, 44-53.

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel Psychology, 53*(2), 375–403.

Phang, C. W., Sutanto, J., Kankanhalli, A., Li, Y., Tan, B.C.Y., & Teo, H. H. (2006). Senior citizens' acceptance of information systems: A study in the context of e-Government services. *IEEE Transactions on Engineering Management, 53*(4), 555-569.

Rice, R. E., & Katz, J. E. (2003). Comparing internet and mobile phone usage: digital divides of usage, adoption, and dropouts. *Telecommunications Policy, 2*7(8), 597-623.

Rogers, E. M. (1976). New Product Adoption and Diffusion. *The Journal of Consumer Research, 2*(4), 290-301.

Rogers, E. M. (1983). *Diffusion of innovation* (3rd ed.). New York: The Free Press.

Rogers, E. M. (2002). Diffusion of preventive innovations. *Addictive Behaviors, 27*, 989–993

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Selwyn, N. (2004). The information aged: A qualitative study of older adults' use of information and communications technology. *Journal of Aging Studies*, *18*(4) 369–384.

Selwyn, N. (2006). Digital division or digital decision? A study of non-users and low-users of computers. *Poetics*, *34* (4–5), 273–292.
Selwyn, N., Gorard, S., & Furlong, J. (2005). Whose internet is it anyway? Exploring adults' (non)use of the internet in everyday life. *European Journal of Communication, 20*(1), 5–26.
Selwyn, N., Gorard, S., Furlong, J., & Madden, L. (2003). Older adults' use of information and communications technology in everyday life. *Aging and Society, 23*(5) 561–582.
Torkzadeh, G., & Dyke, T. P. V. (2001). Development and validation of an internet self-efficacy scale. *Behaviour & Information Technology*, *20*(4), 275–280.
Udo, G. J., Bagchi, K. K., & Kirs, P. J. (2010). An assessment of customers' e-service quality perception, satisfaction and intention. *International Journal of Information Management*, *30*(6), 481-492.
Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a research agenda on interventions. *Decision Sciences, 29*(2), 273–315.
Woodside, A. G., & Biemans, W. G. (2005). Modeling innovation, manufacturing, diffusion and adoption/rejection processes. *Journal of Business and Industrial Marketing, 20*(7), 380-393.
Zhao, L., Lu, Y., Huang, W., & Wang, Q. (2010). Internet inequality: The relationship between high school students' internet use in different locations and their internet self-efficacy. *Computers & Education*, *55*(4), 1405-1423.

THE USAGE OF E-JOURNAL AMONGST LECTURERS AT A PUBLIC UNIVERSITY IN MALAYSIA

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ABSTRACT
With the development of electronic publishing, e-journal is readily and widely available to academicians. This study was carried out to assess the usage of e-journal amongst education lecturers at a public university in Malaysia. A total of 55 education lecturers participated in the study by completing a self-developed questionnaire to answer the following questions; (1) how often do education lecturers uses e-journal as a tool for academic purposes? and (2) What are their preferential characteristics of e-journal which factors in its usage for academic purposes? The major findings of the study revealed a positive indication on the usage of e-journal where 83.6% preferred to use e-journal for academic purposes compared to printed journals. Responses to the usage of e-journal for academic purposes also revealed a positive result with all the six academic activities rated as "often". Responses to the preference for using e-journal also produced a positive result where respondents rated as "agree" to the 10 statements. Based on the findings of the study, e-journal is widely used by education lecturers and has the potential to be diffused in teaching and learning as proposed by the Diffusion Theory (Rogers 1995).
Keywords: electronic publishing, education lecturers, e-journal, teaching and learning

INTRODUCTION
Electronic publishing has been widely used for scholarly communication and has seen an increase in its demand since the past decade (Phil 2010). In a survey done by Kling (2003), it indicated that scholars highly value e-journal access and most of the scholars preferred e- journal over print. Hence, this study aims to assess the usage of e-journal amongst education lecturers particularly from a public university in Malaysia. The participants for this study were chosen from a local public university; Universiti Teknologi MARA (UiTM), specifically lecturers from the Faculty of Education. These participants were chosen due to specific attributes which are most likely to provide a strong assessment and are able to act as a foundation for further studies in this area.

With the ease of accessibility of the Internet, lecturers and students are able to easily use e-journal for their academic purposes and should also integrate this technological advancement into all of their scholarly works. In any practice of education, a piece of scholarly work is considered to be more exquisite in terms of its content, validity and professionalism if a good amount of journals related to its field is used as one of its data and referential tool. Journals therefore play a major part in any academicians' scholarly work and are also one of the most preferential tools of the trade apart from books. A survey done by Kling (2003) indicated that 85% of scholars preferred e-journal over print and additionally other research shows how this preference is transformed into reading patterns (Tenopir, King 2003). Although it is suggested and proved that lecturers and scholars are avid users of e-journal, a study needs to be done to discover and assess their usage and preferential characteristics of an e-journal which factors in its usage.

The evolution of electronic journal had begun as early as in the 1960s (Lancaster 1995) and today it has managed to proclaim itself as one of various academic tools available on the Internet. However, how far has this technological advancement of e-journal been assimilated and incorporated amongst academic members or lecturers in institutions of higher learning in Malaysia has to be studied and assessed. As a developed country which is able to boast on many amazing ICT initiatives and structures, the major question to ask is are academic staffs really using, if not for another word, reaping the various benefits which electronic journals provide?

In the survey done by Kling (2003), scholars highly value electronic journal access and most of the scholars preferred electronic journals over print mostly for the following reasons: e-journals saves time, makes work easier, result in better quality research, and enables the scholar to find more materials. One of the main key point in Kling's study (2003) is that the ease of accessibility and the wide range of e-journal on the internet; literally being able to access a plethora range of journals from as many field as possible, highly promotes the usage of e-journal amongst scholars. Apart from these preferential, this study aims to uncover other aspects of characteristics which may or may not factor in the usage of e-journal. Certain preferences which would directly be in question relates to the possible constraints faced during the search and usage of e-journal online which would determine if any constraints might exists, and if it does would it discourage the usage of e-journal amongst students.

OBJECTIVES AND SIGNIFICANCE OF STUDY

The objectives of this study are to assess how often does education lecturers use e-journal as a tool for academic purposes and to identify what are the education lecturers' preferential characteristics of e-journal which factors in its usage for academic purposes. In order to achieve these research objectives these following research questions were developed for this study:

1. How often do education lecturers use electronic journals as a tool for academic purposes?

2. What are their preferential characteristics of electronic journals which factors in its usage for academic purposes?

This study involves respondents who are academic members or lecturers from the Faculty of Education, UiTM, which is one of the largest public universities in Malaysia. The selected participants in this study will be assessed by gauging their usage and preference of using e-journal for academic purposes and their usage of e-journal in their instruction. Through assessing the compiled data, it would represent the best model of influential power as by principle; it is the medium with the highest probability in spreading the influence as their main profession and perfection is in molding and developing future teachers.

This study hopes to further propagate the usage of e-journal for academic purposes especially amongst lecturers in institutions of higher learning, specifically amongst the students. Equipped with one of the best and modern educational tool, not to mention usually free and easily accessible, lecturers would be able to disseminate all types of information from various sources with only the use of a single computer for all their academic purposes. This would undoubtedly improve not only their works but also their students' learning experiences to better prepare them for the world after university.

With a better understanding of the preferential characteristics of e-journal and its foreseeable constraints which factors in its usage amongst lecturers, this study would be able to provide information and feedback which could then be applied to further improve both the quality and usage of e-journal amongst higher institution students. Together with the exposure of existing e-journal and also selected ones; collection guided by preferential and constraints, universities as well as policy makers could then have a general perspective on how to develop and sustain academic e-journal for the use of academicians, the nation and its people. Any initiative taken by government in assuring that e-journal maintains to be one of the widely used education tool amongst its future generation could only bear positive results in the pursuit of academic excellence and the nation's growth into a highly educated developed country.

Another significant result this study would hope to achieve is the advancement of higher education institutions in Malaysia in order to be the center of educational excellence as aspired by the government an also as one of the best in the world. Practicing an education system which highly emphasizes the use of journals; both printed and electronic, would result in high quality academic works amongst its lectures and students, thus not only perpetuating that the level of education system is higher but also better than other universities which does not encourages the usage of journals.

METHODOLOGY

As the main purpose of this study focuses on an assessment of the usage of electronic journals amongst education lecturers, a mixed method combining both quantitative and qualitative research design was employed in order to get both quantitative and qualitative data. As stated by Creswell (2005), mixed methods research is a good research design as it allows the researcher to assess both outcomes of the study (quantitative) as well as the process (qualitative). Creswell further stated that the combination of research design provides a rich and comprehensive picture of any social phenomena. There are three types of mixed method research designs presented by Creswell (2005) which are the triangulation design, explanatory design and exploratory design. For the purpose of this study, the exploratory design was used as it permitted the researcher to simultaneously collect both quantitative and qualitative data, merge the data compiled and use the results to understand a research problem. A survey method using a questionnaire specially designed for this study was utilized to gather both quantitative and qualitative data.

The research population will consist of 70 lecturers from the Faculty of Education, UiTM, comprising of lecturers, senior lecturers, associate professors and professors. A minimum of 50 samples represents more than

70% of the total academic members of the faculty thus is adequate to provide a valid and reliable research data for the study. The total sample of this study is 55 lecturers from the faculty.

THEORETICAL FRAMEWORK

This study uses the diffusion theory as proposed by Rogers (1995) as reference. Specifically this study will refer to the diffusion theory to the use of ICT as an innovation in instructional technology especially the use of e-journal in instruction or teaching and learning process by lecturers at the Faculty of Education (UiTM) who are identified as the respondents for this study. Based on the four major theories that deal with the diffusion of innovations as proposed by Rogers (1995), two of the theories are relevant to this study. The two theories are the 'The Innovation-Decision Process Theory' and the 'The Theory of Perceived Attributes'.

The Innovation-Decision Process Theory suggests five stages. The first stage requires the potential adopters to learn and to have basic knowledge about the innovation. Secondly they should be persuaded as to the merits of the innovation. Thirdly, they must decide to adopt the innovation. Fourthly they must implement it, and finally, they must confirm that their decision to adopt the innovation was the appropriate decision. Diffusion will result once all of these five stages are achieved.

The Theory of Perceived Attributes on the other hand suggests that individuals will adopt an innovation if they perceive that the innovation has some relative advantages over an existing innovation; that the innovation must be compatible with existing values and practices; that the innovation should not be too 'complex'; that the innovation must have trialability, that is the innovation can be tested for a limited time without adoption, and finally, the innovation must offer observable results (Rogers, 1995).

Surry and Farquhar (1997) as cited in Yates (2001), suggests that educational technologist should study diffusion theory for three reasons. By studying diffusion theory, they may be able to explain, predict and account for facts that may influence or impede adoption and diffusion of innovation; understanding the best way to identify innovations for potential adoption is necessary as the materials used need to be introduced and diffused into the educational system, and finally, educated technologist may be able to develop a systematic model of adoption and diffusion. Surry and Farquhar (1997) conclude that such model has been useful in instructional development and it is wise to explore the factors that affect the diffusion and attempt to build an effective model of diffusion. Based on the foregoing discussion, and by referring to Rogers (1995) diffusion theory, the innovation in this study refers to the use of electronic journals for academic purposes especially in instruction at an institution of higher learning.

RESEARCH FINDINGS

Demographic data of respondents

The total number of respondents at the faculty during the period of study (February and March 2011) was 95. Of this number, only 70 were serving at the faculty at that moment and were identified as the population for the study. The remaining 25 lecturers were either on sabbatical leave, study leave, school attachment, on leave without pay or seconded to other departments at the university. The breakdown of the gathered data is as presented in Table 1.

Table 1: Lecturers at Faculty of Education

Details	No.
Currently serving during the period of study	70
Sabbatical leave	3
School attachment	1
Study leave	13
On leave without pay	3
Seconded to other departments at the university	5
Total	95

A total of 70 questionnaires were distributed and of that number, 55 were completed and returned and were used for the analysis of the study. The 55 respondents' current positions at the Faculty of Education and their gender are as presented in Table 2.

Of the 55 respondents, 26 (49.1%) were lecturers, comprising of 9 (17%) male and 18 (32.1%) female; 12 (22.6%) were senior lecturers, comprising of 1 (5%) male and 11 (7%) female; 12 (22.6%) were Associate Professors, comprising of 5 (9.4%) male and 7 (13.2%) female, and 3 (5.7%) Professors, comprising of 2 (3.8%) male and 1 (1.9%) female.

Table 2: Respondents' Position and Gender

Position	Male	Female	Total
Lecturer	9	17	26
	17.0%	32.1%	49.1%
Senior Lecturer	1	11	12
	5%	7%	22.6%
Associate Professor	5	7	12
	9.4%	13.2%	22.6%
Professor	2	1	3
	3.8%	1.9%	57%
Total	17	36	55

Table 3 presents the respondents' qualification. In line with the current requirements of UiTM and the Faculty of Education, the minimum qualifications of the respondents are the Master's Degree and Doctor of Philosophy.

Of the 55 respondents, 34 (61.8%) respondents have a Master's Degree and 21 (38.2%) respondents have attained a Doctor of Philosophy.

Table 3: Qualification

Qualification	Frequency (N=55)	Percentage (%)
Master's Degree	34	61.8%
Doctor of Philosophy	21	38.2%

Table 4 presents the respondents' teaching experience at the Faculty of Education, UiTM, ranging from a minimum of 1 year to more than 10 years.

Of the 55 respondents, 7 (12.7%) respondents has 1-3 years teaching experience, 7 (12.7%) respondents has 4-5 years teaching experience, 8 (14.5%) respondents has 6-10 years teaching experience, 33 (60.0%) respondents have more than 10 years of teaching experience.

Table 4: Teaching Experience

Experience	Frequency (N=55)	Percentage (%)
1-3 years	7	12.7%
4-5 years	7	12.7%
6-10	8	14.5%
More than 10 years	33	60.0%

The usage of e-journal as a tool for academic purposes

Table 5 presents the respondents' usage of e-journals for academic purposes. All the 6 items were listed; as "Often" in the following order of frequency of usage: (i) for research (mean=4.01), (ii) writing articles for presentation in seminars, etc. (mean=3.98), (iii) writing proposals for research (mean=3.93), (iv) writing articles for publication (mean=3.84), (v) preparation of teaching session (mean=3.80) and (vi) writing proposals for research grants (mean=3.60). Each item was given a 5-point value ranging from 1 "never" to 5 "Very often".

Table 5: Usage of E-journal for Academic Purposes

	Frequency and percentage						
	Never	Rarely	Sometimes	Often	Very Often	Mean	Std. Dev
For research	0	1	11	21	22	4.01	.811
	0.0%	1.8%	20.0%	38.2%	40.0%		
Writing articles for presentation in seminars, etc.	0	6	5	28	16	3.98	.913
	0.0%	10.9%	9.1%	50.9%	29.1%		
Writing proposals for research	1	3	14	18	19	3.93	.997
	1.8%	5.5%	25.5%	32.7%	34.5%		
Writing articles for publication	0	6	12	22	15	3.84	.958
	0.0%	10.9%	21.8%	40.0%	27.3%		
Preparation of teaching session	1	4	18	14	18	3.80	1.043
	1.8%	7.3%	32.7%	25.5%	32.7%		

Proposals for research grants	3	7	14	16	15	3.60	1.180
	5.5%	12.7%	25.5%	32.7%	34.5%		

Mean
1.00 – 1.49 = Never 2.50 – 3.49 = Sometimes
1.50 – 2.49 = Rarely 3.50 – 4.49 = Often
4.50 – 5.00 = Very Often

Of the 6 items, the highest mean of 4.01 or "Often" was achieved on the usage of e-journal for research; however 1 (1.8%) respondent rated "rarely" and 11 (20.0%) respondent rated "sometimes". 21 (38.2%) respondents rated "often" and 22 (40.0%) respondents rated "very often"; giving a high percentage (78.2%) of usage of e-journal amongst education lecturers for research purposes..

This is followed by a mean of 3.98 or "Often" on the usage of e-journal for writing articles for presentation in seminars, etc.; while 6 (10.9%) respondents rated "rarely" and 5 (9.1%) respondents rated "sometimes". 28 (50.9%) respondents rated "often" and 16 (34.5%) respondents rated "very often"; giving a high total of 85.4% respondents who uses e-journal as a preparation for writing articles for presentation in seminars, etc.

A mean of 3.93 or "Often" was achieved on the usage of e-journal for writing proposals for research; however 1 (1.8%) respondent rated "never", 3 (5.5%) respondents rated "rarely" and 14 (25.5%) respondents rated "sometimes". 18 (32.7%) respondents rated "often" and 19 (34.5%) respondents rated "very often"; giving a total percentage of 67.2% of respondents who often use e-journal for writing proposals for research.

A mean of 3.84 or "Often" was achieved on the usage of e-journal for writing articles for publication; while 6 (10.9%) respondents rated "rarely" and 12 (21.8%) respondents rated "sometimes". 22 (40.0%) respondents rated "often" and 15 (27.3%) respondents rated "very often"; giving a total percentage of 67.3% who often uses e-journal for writing articles for publication.

A mean of 3.80 or "Often" was achieved on the usage of e-journal for preparation of teaching sessions; however 1 (1.8%) respondent rated "never", 4 (7.3%) respondents rated "rarely" and 18 (32.7%) respondents rated "sometimes". 14 (25.5%) respondents rated "often" and 18 (32.7%) respondents rated "very often"; giving a total of 58.2% of respondents who uses e-journal for preparation for teaching sessions.

A mean of 3.60 or "Often" was also achieved on the usage of e-journal for writing proposals for research grants; however 3 (5.5%) respondents rated "never", 7 (12.7%) respondents rated "rarely" and 14 (25.5%) respondents rated "sometimes". 16 (32.7%) respondents rated "often" and 15 (34.5%) respondents rated "very often"; giving a total of 67.2% of respondents who uses e-journal for writing proposals for research grants.

The preferential characteristics of e-journal
Table 6 presents the respondents' preferential characteristics of e-journal and the 10 items were listed according to rank order as follows: (i) good source of information (mean=4.35), (ii) current and timely (mean=4.33), (iii) saves time (mean=4.31), (iv) ease of storage (mean=4.20), (v) ease of dissemination (mean=4.09), (vi) ease of access (mean=4.09), (vii) interactive (mean=4.02), (viii) results in better quality research (mean=3.84), (ix) mostly free (mean=3.78) and (x) paperless (mean=3.76). All the 10 items were rated as "Agree" which means the respondents agreed with all the 10 characteristics of e-journal and which factors in its usage amongst education lecturers.

Table 6: Preference for E-journals

Frequency and Percentage							
Preference for using e-journals	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Std. Dev
Good source of information	2	0	1	26	26	4.35	.844
	3.6%	0.0%	9.1%	47.3%	40.0%		
Current and timely	2	0	0	29	24	4.33	.818
	3.6%	0.0%	0.0%	52.7%	43.6%		
Saves time	2	1	0	27	25	4.31	.879
	3.6%	1.8%	0.0%	49.1%	45.5%		
Ease of storage	2	0	5	26	22	4.20	.890
	3.6%	0.0%	9.1%	47.3%	4.3%		
Ease of dissemination	2	0	6	27	20	4.09	.867

	3.6%	0.0%	10.9%	49.1%	36.4%		
Ease of access	2	0	6	30	17	4.09	.867
	3.6%	0.0%	10.9%	54.5%	30.9%		
Interactive	2	1	7	29	16	4.02	.913
	3.6%	1.8%	12.7%	52.7%	29.1%		
Results in better quality	2	3	10	27	13	3.84	.977
research	3.6%	5.5%	18.2%	49.1%	23.6%		
Mostly free	4	4	8	23	16	3.78	1.166
	7.3%	7.3%	14.5%	41.8%	29.1%		
Paperless	5	6	4	22	18	3.76	1.276
	9.1%	10.9%	7.3%	40.0%	32.7%		

Mean
1.00 – 1.49 = Strongly Disagree
1.50 – 2.49 = Disagree
4.50 – 5.00 = Strongly Agree
2.50 – 3.49 = Neutral
3.50 – 4.49 = Agree

A mean of 4.35 or “Agree” was achieved on respondents agreeing that e-journal is a good source of information; while 2 (3.6%) respondents rated “strongly disagree” and 1 (9.1%) respondents rated “neutral”. 26 (47.3%) respondents rated “agree” and 26 (40.0%) respondents rated “strongly agree”; this suggests that 87.3% agreed that e-journal is a good source of information.

A mean of 4.33 or “Agree” was achieved on respondents agreeing that e-journal is current and timely; while 2 (3.6%) respondents rated “strongly disagree”. 29 (52.7%) respondents rated “agree” and 24 (43.6%) respondents rated “strongly agree”: the data suggests that 96.3% agreed that e-journal is current and timely.

A mean of 4.31 or “Agree” was achieved on respondents agreeing that e-journal saves time; however 2 (3.6%) respondents rated “strongly disagree” and 1 (1.8%) respondents rated “disagree”. 27 (49.1%) respondents rated “agree” and 25 (45.5%) respondents rated “strongly agree”; the data indicates that a very high percent, 94.6% of respondents agreed that e-journal saves time.

A mean of 4.20 or “Agree” was achieved on respondents agreeing that e-journal provides ease of storage; while 2 (3.6%) respondents rated “strongly disagree” and 5 (9.1%) respondents rated “neutral”. 26 (47.3%) respondents rated “agree” and 22 (40.3%) respondents rated “strongly agree”; this gives a combined percentage of 87.6% who agreed that e-journal provides ease of storage.

A mean of 4.09 or “Agree” was achieved on respondents agreeing that e-journal provides ease of dissemination; while 2 (3.6%) respondents rated “strongly disagree” and 6 (10.9%) respondents rated “neutral”. 27 (49.1%) respondents rated “agree” and 20 (36.4%) respondents rated “strongly agree”; giving a high total percentage of 85.5% who agreed that e-journal provides ease of dissemination.

A mean of 4.09 or “Agree” was achieved on respondents agreeing that e-journal provides ease of access; while 2 (3.6%) respondents rated “strongly disagree” and 6 (10.9%) respondents rated “neutral”. 30 (54.5%) respondents rated “agree” and 17 (30.9%) respondents rated “strongly agree”; giving a high percentage of 84.5% who agreed that e-journal provides ease of access.

A mean of 4.02 or “Agree” was achieved on respondents agreeing that e-journal is interactive; while 2 (3.6%) respondents rated “strongly disagree”, 1 (1.8%) respondent rated “disagree” and 7 (12.7%) respondents rated “neutral”. 29 (52.7%) respondents rated “agree” and 16 (29.1%) respondents rated “strongly agree”; the data suggests that 81.8% respondents agreed that e-journal is interactive.

A mean of 3.84 or “Agree” was achieved on respondents agreeing that using e-journal results in better quality research; while 2 (3.6%) respondents rated “strongly disagree”, 3 (5.5%) respondents rated “disagree” and 10 (18.2%) respondents rated “neutral”. 27 (49.1%) respondents rated “agree” and 13 (29.1%) respondents rated “strongly agree”; the data suggest that 78.2% respondents agreed that using e-journal results in better quality research.

A mean of 3.78 or “Agree” was achieved on respondents agreeing that one of the benefits e-journal is that e-journal is mostly free; however 4 (7.3%) respondents rated “strongly disagree”, 4 (7.3%) respondents rated “disagree” and 8 (14.5%) respondents rated “neutral”. 23 (41.8%) respondents rated “agree” and 16 (29.1%)

respondents rated “strongly agree”; the data suggests that 70.9% respondents agreed that one of the benefits of e-journal is that is is mostly free.

A mean of 3.76 or “Agree” was achieved on respondents agreeing that another benefit of e-journal is that e-journal is paperless; while 5 (9.1%) respondents rated “strongly disagree”, 6 (10.9%) respondents rated “disagree” and 4 (7.3%) respondents rated “neutral”. 22 (40.0%) respondents rated “agree” and 18 (32.7%) respondents rated “strongly agree”; the data suggests that 72.7% respondents agreed that one of the advantage of e-journal is it is paperless.

Table 7 presents the respondents’ usage of either e-journal or printed journal for their academic purposes.

Of the 55 respondents, 46 (83.6%) respondents uses e-journal more often for their academic purposes as compared to only 9 (16.4%) respondents who more often use printed journal for their academic purposes.

Table 7: Used More Often for Academic Purposes

Items	Frequency (N=55)	Percentage (%)
Electronic journals	46	83.6
Printed journals	9	16.4

The collected data of this study promises an encouraging assessment on the usage of e-journals amongst its participants. All the six items relating to the frequency of usage of e-journal for academic purposes were rated “Often”. References to the 10 statements relating to education lecturers’ preference on using e-journal for academic purposes also indicates a positive and promising usage of e-journal as the respondents “Agree” with all the 10 statements. Responses to the usage of e-journal in their teaching also produced a high percentage of an average of 80% amongst all participants. Encouraging results were followed through to other research questions where all collected data resulted in good and promising status.

DISCUSSION

All the six items relating to the frequency of usage of e-journal for academic purposes were rated “Often” (Mean of 3.50-4.49) in the following descending order: use of e-journal for research (Mean of 4.16), writing articles for presentations, seminars, etc. (Mean of 3.98), writing articles for proposals for research (Mean of 3.93), writing articles for publication (Mean of 3.84), preparation for teaching session (Mean of 3.80) and writing articles for proposals for research grants (Mean of 3.60).

The high mean ranging from mean of 4.16 to 3.60 for all the six statements indicated a positive and encouraging practice where education lecturers ‘often’ use e-journal for academic purposes. It can be concluded that they are utilizing and capitalizing on the availability of e-journal as well as recognizing the potential of e-journal as a source of reference by using it ‘often’ and ‘very often’ for academic purposes.

References to the 10 statements relating to education lecturers’ preference on using e-journal for academic purposes also indicates a positive and promising usage of e-journal as the respondents “Agree” (Mean 3.50 – 4.49) with all the 10 statements. The reasons for the respondents to ‘agree’ in their preference for using e-journal are presented in the following descending order: e-journal is a good source of information (Mean of 4.35), current and timely (Mean of 4.31), ease of storage (Mean of 4.15), ease of dissemination (Mean of 4.15), ease of access (Mean 4.09), interactive (Mean 4.02), results in better quality research (Mean of 3.84), mostly free (Mean of 3.78) and paperless (Mean of 3.76). An additional item asking respondents to indicate which medium; e-journal or printed journal, that they use more for academic purposes indicated that 83.6% (N=46) used e-journals more often compared to 16.4% (N=9) who used printed journals more often.

Responses to both the 5-point Likert-scale on the preference of using e-journal as well as the percentage of using e-journal which achieved a high Mean of between 3.76 to 4.35 indicating respondents who ‘agree’ on the 10 items relating to their preference of using e-journal as well as a high percentage of 83.6% who indicated preference in using e-journal compared to printed journal is a good indicator of both preference and also frequency of usage of e-journal amongst education lecturers.

CONCLUSION

This study examined how education lecturers often use e-journal for academic purposes. Usage of e-journal for research purposes achieved the highest percentage which suggests a high percentage of frequency of usage of e-journal for purposes of research amongst education lecturers. Two other items related to research also indicated a high combined percentage for both “Often” and “Very Often” for writing proposals for research and writing proposals for research grants. These data further suggest that the usage of e-journal amongst education lecturers were frequent for research purposes. Overall, it can be concluded that the highest percentage of usage of e-journal amongst education lecturers were for activities related to research. Activities related to publication such as writing articles for presentation in seminars, etc. yielded a high percentage which suggest that the usage of e-journal amongst education lecturers for purposes of publication were often and frequent. The usage of e-journal amongst education lecturers for preparation of teaching suggest that the frequency of usage of e-journal for activities related to teaching at the moment is satisfactory. With more exposure, training and encouragement, the usage of e-journal amongst education lecturers for preparation for teaching may increase in the future.

REFERENCES

Ackerman, L. V. and Simonaitis, A. 1997. RSNA Electronic Journal: Beyond Paper Images: Radiology on the Web. *The Journal of Electronic Publishing*, Vol. 3 No. 1.

Bailey Jr, C. W. 2001. Evolution of an Electronic Book: The Scholarly Electronic Publishing Bibliography. *The Journal of Electronic Publishing*, Vol. 7, No. 2.

Berners, L. T. 1989. Information Management: A Proposal. *CERN; The European Organization for Nuclear Research.*

Bolter, J. D. 1991. *Writing Space: The Computer, Hypertext, and the History of Writing*. New Jersey, Lawrence Erlbaum Associates Publishers.

Busha, C. H. and Harter, S. P. 1980. Research Methods in Librarianship: Techniques and Interpretation. *The Bible of Library Research*, Orlando. Academic Press Inc.

Coulter, G. 2010. Launching (and Sustaining) a Scholarly Journal on the Internet: The International Journal of Baudrillard Studies. *The Journal of Electronic Publishing*, Vol. 13, No. 1.

Creswell, J. W. 2003. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (2ed). California, Sage Publications.

Creswell, J. W. 2005. *Educational Research: Planning, conducting, and evaluating quantitative and qualitative research* (2ed). California, Sage Publications.

Davis, M. 1997. Fragmented by Technologies: A Community in Cyberspace Online. Interpersonal Computing and Technology: *An Electronic Journal for the 21st Century*: 7-18.

Day, C. 1995. Economics of Electronic Publishing. *The Journal of Electronic Publishing*, Vol. 1, No. 2.

Deibert, R. J. 1997. *Parchment, Printing, and Hypermedia*. New York, Columbia University Press.

Dutton, G. 1998. Turning Electronic Pages. *Popular Science*, August: 33

Ferris, S. P. 2002. Writing Electronically: The Effects of Computers on Traditional Writing. *The Journal of Electronic Publishing*, Vol. 8, No. 1.

Fisher, J. H. 2008. Scholarly Publishing Re-invented: Real Costs and Real Freedoms. *The Journal of Electronic Publishing*, Vol. 11, No. 2.

Gardiner, E. and Ronald, G.M. 2010. The Electronic Book. In: *The Oxford Companion to the Book*. Oxford, Oxford University Press.

Getz, M. 1997. An Economic Perspective on E-Publishing in Academia. *The Journal of Electronic Publishing*, Vol. 3, No. 1.

Harnad, S. 2003. Eprints: Electronic Preprints and Postprints. In: *Encyclopedia of Library and Information Science*. New York, Marcel Dekker.

Holden, C. 1998. Electronic Books on the Horizon. *Science*, July: 335

Immink, K. 1998. The CD Story. *Journal of the AES*. Vol. 46.

Kiernan, V. 1999. Reprint: Why Do Some Electronic-Only Journals Struggle, While Others Flourish? *The Journal of Electronic Publishing*, Vol. 4, No. 4.

Kling, R., Covi, L. 1999. What is Social Informatics and Why does it Matter? *D-Lib Magazine*, Vol. 5, No. 1.

Kling, R. and E. Callahan. 2003. Electronic journals, the internet, and scholarly communication. *Annual Review of Information Science and Technology*. : 127-177.

Kling, R. and McKim. G. 1999. Scholarly communications and the continuum of electronic publishing. *Journal of the American Society for Information Science*, Vol. 50, No. 10: 890-906.

Lancaster, F. W. 1995. The Evolution of Electronic Publishing. *Library Trends*, Vol. 43, No.4.

Lawrence, S., Giles, C.L. and Bollacker, K. 1999. *Digital libraries and Autonomous Citation Indexing*. New Jersey, Princeton.

Luther, J. 2001. Reprint: White Paper on Electronic Journal Usage Statistics. *The Journal of Electronic Publishing*, Vol. 6, No. 3.

Mahathir, M. 1991. Speech on: *Malaysia: The Way Forward*. Malaysian Business Council; Kuala Lumpur.

Malcolm, G. 1999. Electronic Publishing in Academia: An Economic Perspective. *The Serials Librarian*, Vol. 36, No. 1.

Maron, N. L. 2009. Current Models of Digital Scholarly Communication: Results of an Investigation Conducted by Ithaka Strategic Services for the Association of Research Libraries. *The Journal of Electronic Publishing*, Vol. 12, No. 1.
Mohd Yahya, M.A. and Roosfa, H. 2011. The Impact of E-Journals on the Malaysian Scholarly Community. *Digital Publishing and mobile Technologies: 15th International Conference on Electronic Publishing*, June 22-24, Istanbul, Turkey, Proceedings.
Myernik, M. 2007. The Prevalence of Additional Electronic Features in Pure E-Journals. *The Journal of Electronic Publishing*, Vol. 10, No.3.
Neuman, W. L. 2003. *Social Research Methods: Qualitative and Quantitative Approaches* (5th ed.) Pearson Education Inc.
Odlyzko, A. 1998. Reprint: The Economics of Electronic Journals. *The Journal of Electronic Publishing*, Vol. 4, No. 1.
Partridge, C. 2008. *Technical Development of Internet Email. IEEE Annals of the History of Computing*. Vol. 30, No. 2.
Phil, P. 2010. UP 2.0: Some Theses on the Future of Academic Publishing. *The Journal of Electronic Publishing*, Vol. 13, No. 1.
Phil, P. 2008. Scholarly Publication at the Digital Tipping Point. *The Journal of Electronic Publishing*, Vol. 11 No. 2.
Robert, M, G. 2009. *Survey Methodology* (2nd ed.) New Jersey, John Wiley & Sons Ltd.
Robert, M, O. 1998. Web-Based Customer Decision Support Systems. *Communications of the ACM Magazine*. Vol. 41 No.3.
Rohe, T. A. 1998. How Does Electronic Publishing Affect the Scholarly Communication Process? *The Journal of Electronic Publishing*, Vol. 3, No. 3.
Rogers, E. M. 1995. *Edition: Diffusion of Innovations* (4th ed.) New York, Free Press.
Sharmilla, P. F. 2002. Writing Electronically: The Effects of Computers on Traditional Writing. *The journal of Electronic Publishing*, Vol. 8 No. 1.
Sharples, H. 1998. “Managing Content to Link Print, Web”. *Graphics Arts Monthly*, April: 94-96.
Swan, A. 2006. Overview of scholarly communication. In Open Access: *Key Strategic, Technical and Economic Aspects*, edited by Neil Jacobs. Oxford, Chandos Publishing.
Sweeney, A. E. 2000. Tenure and Promotion: Should You Publish in Electronic Journals? *The Journal of Electronic Publishing*, Vol. 6, No. 2.
Surry, D. W. and Farquhar, J .D. 1997. Diffusion Theory and Instructional Technology. *Journal of Instructional Science and Technology*, Vol.2, No.1.
Tenopir, C. and King, D. W. 1998. Designing Electronic Journals With 30 Years of Lessons from Print. *The Journal of Electronic Publishing*, Vol. 4, No. 2.
Trosby, F., Holley, K. and Harris, I. 2010. *Short Message Service: The Creation of Personal Global Text Messaging*. West Sussex, John Wiley & Sons Ltd.
Varian, H. R. 1998. Reprint: The Future of Electronic Journals. *The Journal of Electronic Publishing*, Vol. 4, No. 1.
Vinzant, C. 1998. Electronic Books Are Coming At Last!. *Fortune*, July: 119-124
Yates B. L. 2001. Applying Diffusion Theory: Adoption of Media Literacy Programs in Schools. *Studies in Media & Information Literacy Education*, Vol. 4, No. 2.

Websites

Malaysia Budget 2012 Highlights, http://www.asiaone.com/News/AsiaOne%2BNews/Malaysia/Story/A1Story20111007-303836.html
Mahathir, Malaysia and Globalisation: Challenging Orthodoxy, http://globalization.icaap.org/content/v4.2/wong.html
Malaysia: Internet Usage Stats and Marketing Report, http://www.internetworldstats.com/asia/my.htm

TOOL USE AND PERFORMANCE: RELATIONSHIPS BETWEEN TOOL–AND LEARNER-RELATED CHARACTERISTICS IN A COMPUTER-BASED LEARNING ENVIRONMENT

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ABSTRACT
It is still unclear on what and how tool and learner characteristics influence tool use and consequently performance in computer-based learning environments (CBLE's). This study examines the relationships between tool-related characteristics (tool presentation: non-/embedded tool and instructional cues: non-/explained tool functionality) and learner-related characteristics (self-efficacy and goal orientation) as well as their effects on tool use (quantity and quality) and performance in a CBLE. One hundred and forty students, without statically difference in prior knowledge, were randomly assigned to the four conditions (Embedded and non-embedded with explained tool functionality and embedded and non-embedded with non-explained tool functionality) to study a hypertext. Results reveal that embedding tools influenced positively quantity of tool use and negatively quality of tool use. Partial effects of explained tool functionality were found. There were significant interactions of goal orientation (mastery avoidance) and condition on quality of tool use. Performance approach influenced quality of tool positively and self-efficacy influenced negatively quantity of tool use. Only quantity of tool use affected performance. The implications of these results for future research on tool use in CBLE's are discussed.
Keywords: adjunct questions; self-efficacy; goal orientation; tool presentation; instructional cues

INTRODUCTION
In computer-based learning environments (CBLE's) support devices, also referred as tools, (Iiyoshi & Hannafin, 1998; Viau & Larivée, 1993) are often implemented under the assumption that tool use can have a positive impact on learning outcomes/performance (Moos & Azevedo, 2009). Tool use is generally explored either quantitatively and/or qualitatively. The frequency in which learners access tools and the time they spend on the tools are commonly considered as indicators of quantity of tool use. On the other hand, when and how learners use the tools and whether the usage is in line with the instructional intentions of particular tools are considered as the quality of tool use.

Jiang and Elen (2011) reported that the quality of tool use, specifically the use of adjunct questions (i.e., reading attention, reading sequence and the answers provided to the questions) accounts for the performance (post-test). Quantity of tool use (frequency of tool use and time on tool) showed mixed effects on performance. In a different study, Viau and Larivée (1993) examined the effects of the usage of two tools, namely a glossary and a navigation map, on performance. They found that the quantity of tool use (frequency of tool use and time on tool) were the best predictors of performance (post-test). Quality of tool use was not studied.

While the clear effects of tool use on performance are not concrete, they give an indication that using tools appropriately can lead to better performance and therefore tool usage should not be taken for granted. However, positive effects of tool use on performance can only be expected, according to Perkins (1985), only if the tool(s) is present and functional, if learners recognize the tools and the tools' functionality and if learners are motivated to use the tools and use the tools optimally. Unfortunately, learners tend to not use the tools and when they do, they do it suboptimally (e.g., Aleven, Stahl, Schworm, Fischer, & Wallace, 2003; Elen & Louw, 2006; Perkins, 1985). This problematic tool use may related to the interaction between different learner and tool characteristics (see reviews: Aleven, et al., 2003; Clarebout & Elen, 2006) which is congruent with the theory of aptitude-treatment interaction (ATI) (Cronbach & Snow, 1977). The ATI points out that instructional strategies or treatments, namely tools interact with aptitudes, defined as any measurable characteristic of the learner (Regian & Shute, 1992), in this case learner-related characteristics.

The present contribution will explore in a CBLE the relationship between different learner-related and tool-related variables on tool use and performance. These variables are described in detail as follows.

LEARNER CHARACTERISTICS
Prior knowledge has been identified as a learner characteristic affecting tool use and performance (Aleven, et al., 2003; Clarebout & Elen, 2006). Elen and Louw (2006) found that learners with higher prior knowledge had

better performance in the post-test. Renkl (2002) reported that low prior knowledge learners used tools more frequently than high prior knowledge learners. Iiyoshi and Hannafin (1998) suggested that prior knowledge may impact performance through different quantitative and qualitative aspects of tool use, for instance, the frequency of tools use. While prior knowledge seems to be an important characteristic regarding tool use, this study only controls for prior knowledge and focused on Perkins's last condition on tool use (learners are motivated to use tools), hence learner motivational characteristics will be investigated.

Motivational characteristics seem crucial to determine tool use (Perkins, 1985). Motivation is a broad term that derives in many associated constructs exploring different motivational aspects (Murphy & Alexander, 2000). Self-efficacy and goal orientation are two motivational characteristics that have caught the attention of research on tool use (Aleven, et al., 2003; Newman, 1994). Self-efficacy is defined as the beliefs about one's capabilities to organize or perform the courses of action to produce a given achievement (Bandura, 1997). Goal orientation is defined as the set of beliefs that reflect the reasons and intentions to engage and achieve a task (Dweck, 1986).

Subcategories of goal orientation have been identified, mainly a mastery orientation (defined in intrapersonal terms) and a performance orientation (defined in normative terms) (Dweck & Legget, 1988), which at the same time are further subdivided and valenced into mastery avoidance and mastery approach as well as performance avoidance and performance approach, respectively (Elliot & McGregor, 2001). Mastery approach, positively valenced, refers to the focus of individuals on developing competence, expanding knowledge, task completion and understanding, learning, mastery, solving problems, and developing new skills. Mastery avoidance, negatively valenced, refers to the focus individuals have about striving to avoid misunderstanding or failing, avoid making mistakes or doing anything wrong or incorrectly from an intrapersonal perspective (Elliot & McGregor, 2001). Performance approach, positively valenced, is exemplified by learners' concerns about how well they perform and how others perceive their behavior. It focuses on personal ability, a normative social comparison with others, and a desire for public recognition of performance. Performance avoidance, negatively valenced, focuses on avoiding normative competence, refers to low competence expectancies, fear of failure and avoidance of failure (Elliot & Church, 1997; Elliot & McGregor, 2001).

In this study, it is expected that self-efficacy and the different subscales of goal orientation will influence tool use in relation to different tool characteristics. This expectation is based on empirical studies which have given some indication that different self-efficacy levels and goal orientation may affect tool use to a certain extent. However, the results of these studies are rather inconclusive and further research where tool characteristics interact with these motivational variables is has yet to be reported. For instance, it has been suggested that learners with high self-efficacy levels increase quantity of tool use; that means, they used tools more frequently (Wu, Lowyck, Sercu, & Elen, 2012). In contrast, Jiang and Elen (2010) indicated that high levels of self-efficacy affected the quantity of tool use negatively (i.e. the frequency of use) but the quality of tool use positively (e.g., the answers provided on adjunct questions).

Regarding goal orientation, the effect has also not been consistent. It has been found a negative relationship between mastery approach goal orientation and quantity of tool use (time spent on tool) (Clarebout & Elen, 2009) and (frequency) (Nesbit et al., 2006), also a positive relationship between performance goal orientation (approach and avoidance) on quantity of tool use (frequency) (Crippen, Biesinger, Muis, & Orgill, 2009). However, Huet, Escribe, Dupeyrat, & Sakdavong (2011) reported a significant negative correlation between performance goal orientation (approach and avoidance) and quantity of tool use (frequency of tool use). That means, learners with high performance approach and avoidance accessed the tools less frequently (Huet, et al., 2011). No results from mastery avoidance goal orientation on tool use were retrieved in either study.

TOOL CHARACTERISTICS

Theoretically, the effectiveness of CBLE's may be enhanced if appropriate cognitive tools are provided (Iiyoshi & Hannafin, 1998). Cognitive tools are support devices that scaffold the cognitive processes associated with learning or performing (Derry, Hmelo-Silver, Nagarajan, Chernobilsky, & Beitzel, 2006). By using cognitive tools, learners may be able to identify, locate and retrieve relevant information, to present relevant information they encounter, to structure and establish conceptual relationships, to manipulate information or to simplify their own learning, among others (Iiyoshi, Hannafin, & Wang, 2005). The distinctive role the learner may be able to execute is based on the type of cognitive tool. Adjunct questions, for example, are a cognitive tool that has the potential to guide students to organize, interpret (Elen & Louw, 2006) and influence what it is learned from the learning material (Hamaker, 1986).

Empirically , there is still lack of understanding in the influence of cognitive tool use in CBLE's (Iiyoshi & Hannafin, 1998); more specifically the positive effects of adjunct questions on learning are not always consistent (e.g. Dornisch & Sperling, 2006). Iiyoshi and colleagues (2005) point out that in order to attain positive effects of cognitive tools on learning, learners should receive more procedural assistance and sufficient guidance to use the tools. Therefore, aside from the type of tool, in this case cognitive tool, two additional tool characteristics come into sight.

One of these tool characteristics is tool presentation (Schnotz & Heiss, 2009). Tool presentation refers to the level to which learners are induced to use the tools in the way intended by the designers/instructors. The presentation of a tool can be embedded or non-embedded (Clarebout & Elen, 2006). Tools are non-embedded when learners can decide whether to use the tools or not; on the other hand, when learners have no choice but to use the available tools then the tools are embedded (Clarebout & Elen, 2006). Having the tools embedded or non-embedded is in line with the learner control literature (Lawless & Brown, 1997) because non-embedded tools could benefit those learners that recognize the tool functionality and possess the motivational characteristics that would lead them to use the tool (Perkins' conditions: Perkins, 1985). However, embedded tools could benefit those learners unable to recognize the tool functionality and not motivated (Schnotz & Heiss, 2009).

Effects of the tool presentation, however, remain unclear. Greene and Land (2000) analyzed undergraduate learners' use of cognitive tools: non-embedded (internet search engine machine) and embedded (guiding questions) while they worked on a project. The findings indicated that learners' quality of tool use was low. First, they had difficulty using the searching tools properly. Their searches were too broad or irrelevant in many of the cases. Regarding the embedded questions, learners' use of tools was suboptimal, that is, learners tended to omit questions and/or give superficial answers which did not allow them to benefit from the purpose of the tool. In more recent research (Clarebout, Horz, Schnotz, & Elen, 2010), 60 participants were divided into two conditions: with embedded tool sand with non-embedded tools (tools: graphs). The results indicated that the quantity of tool use in the embedded condition was significantly higher. This means that learners spent proportionally more time on graphs. However, the quality of tool use (interpretation of graphs) was significantly better in the non-embedded condition.

Given that embedding or not embedding tools seems insufficient to assist the learner on the use of tools, instructional cues (Lee & Lehman, 1993) –another tool characteristic-, also addressed as advice (Clarebout & Elen, 2008) or pedagogical agents (Atkinson, 2002), among others have been implemented to increase tool use probabilities without 'forcing' the learner (Atkinson, 2002; Clarebout & Elen, 2008; Lee & Lehman, 1993).

Instructional cues aim at making tool functionality more 'discernible' to the learner. This discernability may help the learner decide when and how to use or not to use tools (Lawless & Brown, 1997). These cues can either provide guidance to the learner during the task (Atkinson, 2002), highlight the use of tools that provide information that the learner has not accessed (Lee & Lehman, 1993), or provide information about the functionality of the tools, as well as, the learning benefits a tool can offer if used (Clarebout & Elen, 2008). Evidence has not only shown positive effects on quantity of tool use and performance (Atkinson, 2002; Lee & Lehman, 1993), but also mixed effects (Clarebout & Elen, 2008). These mixed effects showed that the advice was often ignored (Clarebout & Elen, 2008). Moreover, interactions between advice and learner characteristics have been found.

The purpose of this study is to examine the role of self-efficacy and goal orientation in relation to tool presentation (non-/embeddedness of tool) and an instructional cue on the use of tools, namely adjunct questions. The instructional cues will be addressed, from now on, as explanation of tool functionality. The explanation of tool functionality followed the same focus as previous research (Clarebout & Elen, 2008) and will therefore provide information about the tools and their learning benefits. Tool use will be explored in a quantitative and a qualitative way. Lastly related to Perkins' (1985) first condition of the 'tool is there,' this contribution addresses tool functionality by analyzing the effects of quantity and quality of tool use on performance. The addressed questions illustrated in figure 1 are:

1. Does non-/embeddedness of tool influence quality and quantity of tool use?
2. Does the (no) explanation of the tool functionality influence quality and quantity of tool use?
3. Do self-efficacy and goal orientation influence tool use in relation to embeddedness and the explanation of the tool functionality? If so, how?
4. Do quality and quantity of tool use influence performance?

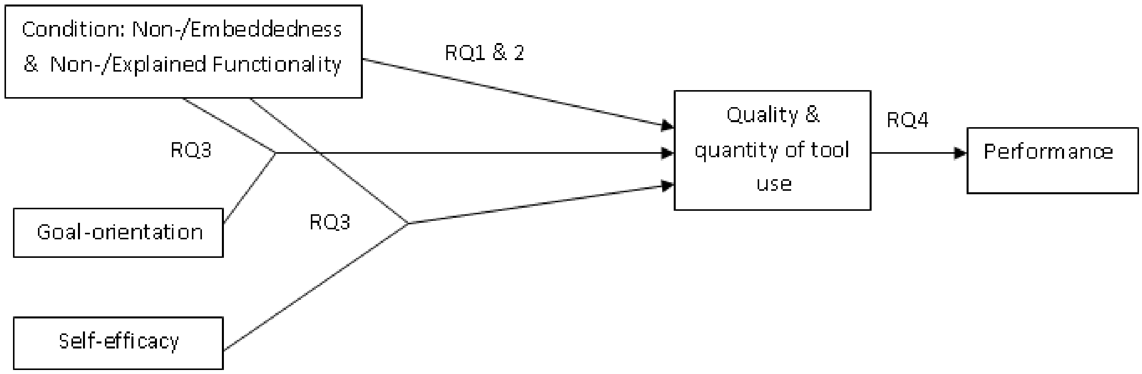


Figure 1. Schema of research questions. The schema is in abbreviated forms for simplicity and clarity.

METHODOLOGY

Participants and design

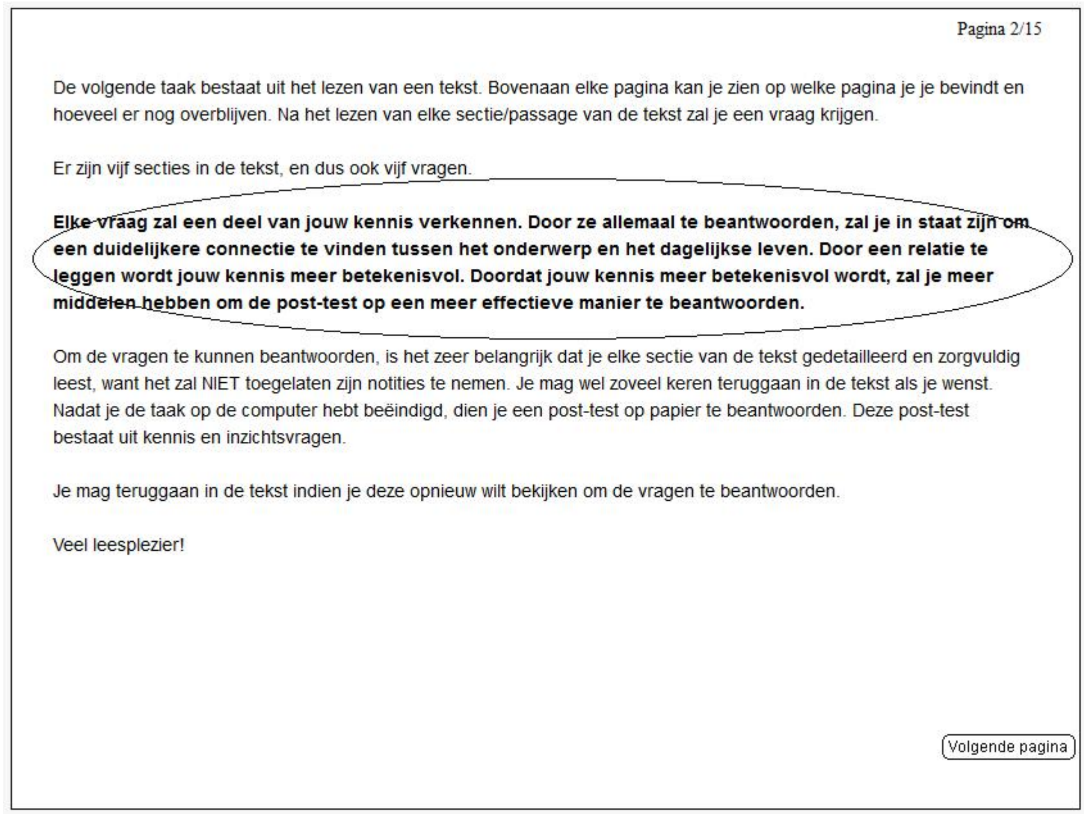
Participants were one hundred and forty first-year university students of Educational Sciences which represented 89.74 % of the whole population. Participation was a part of a course on Learning and Instruction. The average participants' age was 18 (*SD*= 2.59), and the majority was female (94.3%). This was a quasi-experimental pre-post-test study with a 2 (non-/embedded tool) × 2 (with/without explanation of tool functionality) design. Participants in the study were randomly and equally assigned to one of four conditions (35 participants in each condition): a condition with embedded tools and the explanation of the tool functionality, a condition with non-embedded tools and the explanation of the tool functionality, a condition with non-embedded tools and no explanation and a condition with embedded tools and no explanation.

Materials

Learning Environment. The learning environment consisted of a hypertext which was developed using Macromedia Director. Two introductory pages were displayed before the hypertext. Participants filled in their personal data on the first page. In the second page a description was given of the structure of the text.
The conditions with explained tool functionality had an extra paragraph on the second page with a detailed description of the functionality of the tool (adjunct questions) provided in the hypertext (figure 2). The explanation of the tool functionality read as follows: "Each question will explore a part of your knowledge. If you answer each of the questions, you will be able to find a clearer connection between the topic of the text and everyday life situations. By establishing this link, your knowledge will become more meaningful. If your knowledge is more meaningful, you will have more sources to answer the post-test in a more effective way."

After the introductory pages, the hypertext was presented. The hypertext was an environmental article titled *Waarom water broodnodig is* (Why water is essential)(Raes, Geerts, & Vanuytrecht, 2009). The article comprising 1,544 words was adapted in format for the task, and was therefore divided into five sections. Each section consisted of a page. After each section, an adjunct question (tool) was attached. In the non-embedded conditions, participants could access the tool through a button placed in the upper right of the page (figure 3). In the embedded conditions, the question was automatically displayed and had to be answered (figure 4). This text was not part of the curriculum and was chosen for this study as to raise environmental awareness.

Tool: Adjunct question. The adjunct questions in this study were "inserted high-order post questions" (Hamaker, 1986). This means that there was a question after each of the five sections of the hypertext, and the question elicited more than a simple collection of factual information as induced more complex cognitive processes in the learner (Hamaker, 1986). Ten adjunct questions were first designed by two researchers who agreed on selecting five of them. An example is shown in figure 4, and it is translated as follows: "Imagine that water was well-distributed on earth. Would food production still be a problem?" Example of another adjunct question (not shown in figure 4) is "According to the article, can the problem related to food production be solved by simple using less water?"



Pagina 2/15

De volgende taak bestaat uit het lezen van een tekst. Bovenaan elke pagina kan je zien op welke pagina je je bevindt en hoeveel er nog overblijven. Na het lezen van elke sectie/passage van de tekst zal je een vraag krijgen.

Er zijn vijf secties in de tekst, en dus ook vijf vragen.

Elke vraag zal een deel van jouw kennis verkennen. Door ze allemaal te beantwoorden, zal je in staat zijn om een duidelijkere connectie te vinden tussen het onderwerp en het dagelijkse leven. Door een relatie te leggen wordt jouw kennis meer betekenisvol. Doordat jouw kennis meer betekenisvol wordt, zal je meer middelen hebben om de post-test op een meer effectieve manier te beantwoorden.

Om de vragen te kunnen beantwoorden, is het zeer belangrijk dat je elke sectie van de tekst gedetailleerd en zorgvuldig leest, want het zal NIET toegelaten zijn notities te nemen. Je mag wel zoveel keren teruggaan in de tekst als je wenst. Nadat je de taak op de computer hebt beëindigd, dien je een post-test op papier te beantwoorden. Deze post-test bestaat uit kennis en inzichtsvragen.

Je mag teruggaan in de tekst indien je deze opnieuw wilt bekijken om de vragen te beantwoorden.

Veel leesplezier!

Volgende pagina

Figure 2. Second introductory page with explanation of tool functionality. The explained functionality is illustrated inside the ellipse. Participants only saw the explanation boldfaced without ellipse. Non-explained functionality conditions did not have the boldfaced explanation.

Self-efficacy. The questionnaire consisted of eight questions using elements from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991) and the Self- and Task-Perception Questionnaire (STPQ) (Lodewyk & Winne, 2005). The questions were adapted to the context of tool use and translated to Dutch using the translation/back translation method in order to avoid semantic problems. This questionnaire has previously been used and shown high reliabilities (Jiang & Elen, 2010). Examples of the items are “I believe I will receive an excellent grade in the test over the text” or “I’m certain I will master the skills necessary for learning this text.” A six-point Likert scale was employed where one indicated total disagreement and six indicated total agreement. The reliability obtained was α=.84.

Goal orientation. Goal orientation was measured by merging two questionnaires of Elliot et al. (Elliot & Church, 1997; Elliot & McGregor, 2001). The initial questionnaire of Elliot et al.(Elliot & Church, 1997) only measured three dimensions of goal orientation (mastery approach, performance avoidance and performance approach). The revised questionnaire (Elliot & McGregor, 2001) incorporated mastery avoidance and mastery approach making a 2 x 2 framework of goal orientation (performance avoidance, performance approach, and mastery avoidance and mastery approach). Participants also responded on a six-point Likert scale. One indicated totally disagree and six totally agree. The reliabilities were above an α value of .70: Performance approach (α=.93) and avoidance (α=.83), mastery approach (α=.84) and avoidance (α=.71).

Tool use: Quantity- Time spent on tool and frequency of tool access -. The time spent on the tool was considered as a measure for quantity of tool use in all four conditions. Log files were kept in a Microsoft Access database which contained the learner’s identity and the time spent on the tools in seconds. Another indicator of quantity of tool use was considered but only in the non-embedded conditions. This was the clicks made to access the tool, namely, frequency of tool use. This data was also obtained through the log file which recorded the amount the times the learners click on the button to access the tool, namely adjunct question.

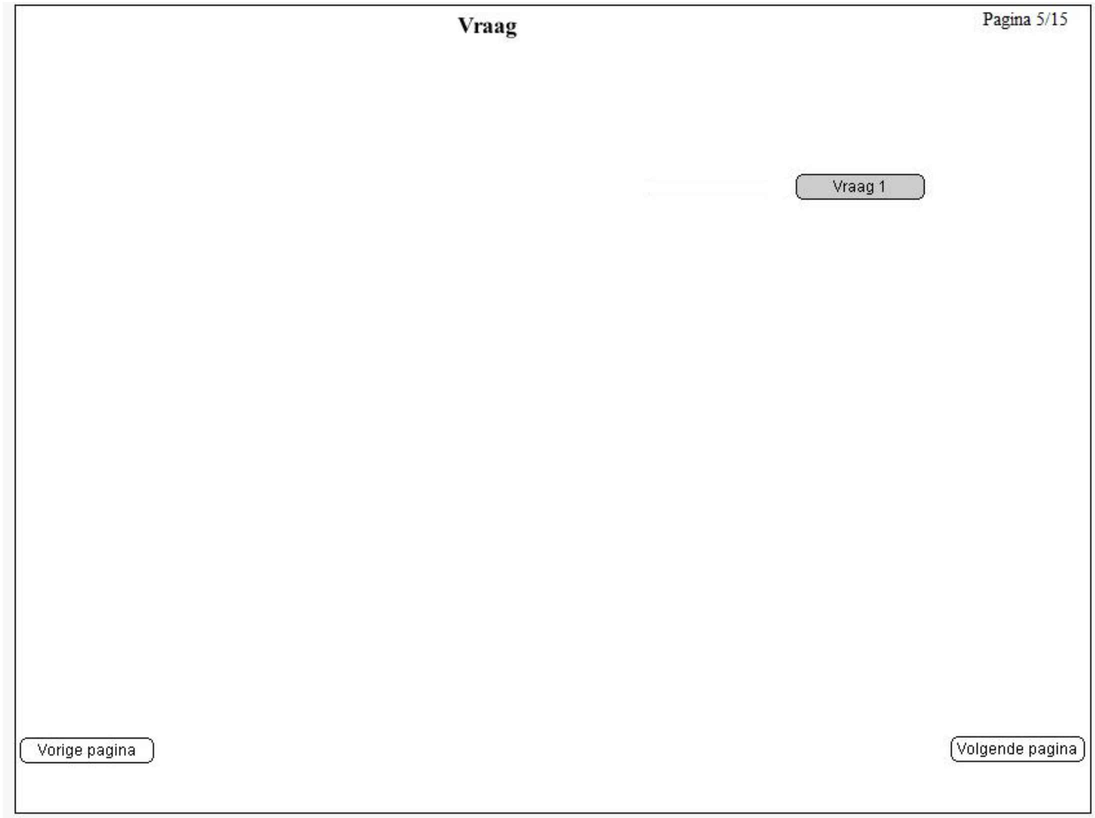


Figure 3. Screenshot of non-embedded conditions. After learners read a section they had a blank page with a button that read 'vraag' (question). Learners had the option to access the tool or not by clicking on that button.

Tool use: Quality. Answers on the adjunct questions were individually logged as text files. The correctness of the answers was used as the quality indicator of tool use. Participants could obtain from zero to three points per answer on each adjunct question. Zero indicated no answer, an incorrect answer or an incorrect answer without any rationale. One point was given to a correct answer without rationale and/or explanation. Two points were given to a correct answer but with little or no rationale. Three points reflected correct answer with a high rationale and well thoroughly provided answer. Participants could obtain in total 15 points. The answers were scored by three different researchers. The inter-rater reliability using Intraclass correlation (ICC) was considered to be appropriate if the value was above .80 (Shrout & Fleiss, 1979). The ICC for grading the adjunct questions showed outstanding agreement among the three raters (ICC= .99, p <.001). Two out of the three raters were social researchers who were not involved in the present study.

Learning outcomes. Prior knowledge was measured by a pre-test (n_{items}=9) in order to assess possible differences among conditions. Performance was assessed using a post-test (n_{items}= 13). Both tests were designed by three researchers, authors of this paper, two of which had experienced in the design of these types of materials. Consequently, the design of the pre- and post-test followed similar criteria used in previous studies (Clarebout, et al., 2010). The nine pre-test questions were multiple choice questions which explored learners' factual knowledge related to the topic of the hypertext. Each question had four different choices. Two examples of such questions are as follows: "How much water in average does a Belgian use per year?" and "What does water footprint refer to?" Each correct question was worth a point. Therefore, learners could obtain a maximum nine points. In the post–test, learners could obtain up to 16 points. It included seven multiple -choice factual knowledge questions (e.g., what does FAO stand for?) and six insight questions among which three were open questions (e.g., what did the author imply with "more crop per drop"?) and three were fill-in-the-blank questions with optional words ("In the next 50 years the demand of food will __________"). Every correct answer was given one point except for the open questions which could be graded from zero to two. Learners obtained two points for correct answer and a deep rationale answer, one point for a correct answer weak rationale answer and zero points for no rationale, no answer or incorrect answer. The inter-rater reliability for the scoring procedure of the open questions among the three raters was found to be outstanding (*ICC*= .97, *p* <.001). As in the pre-test two out of the three raters were researchers from other study domains.

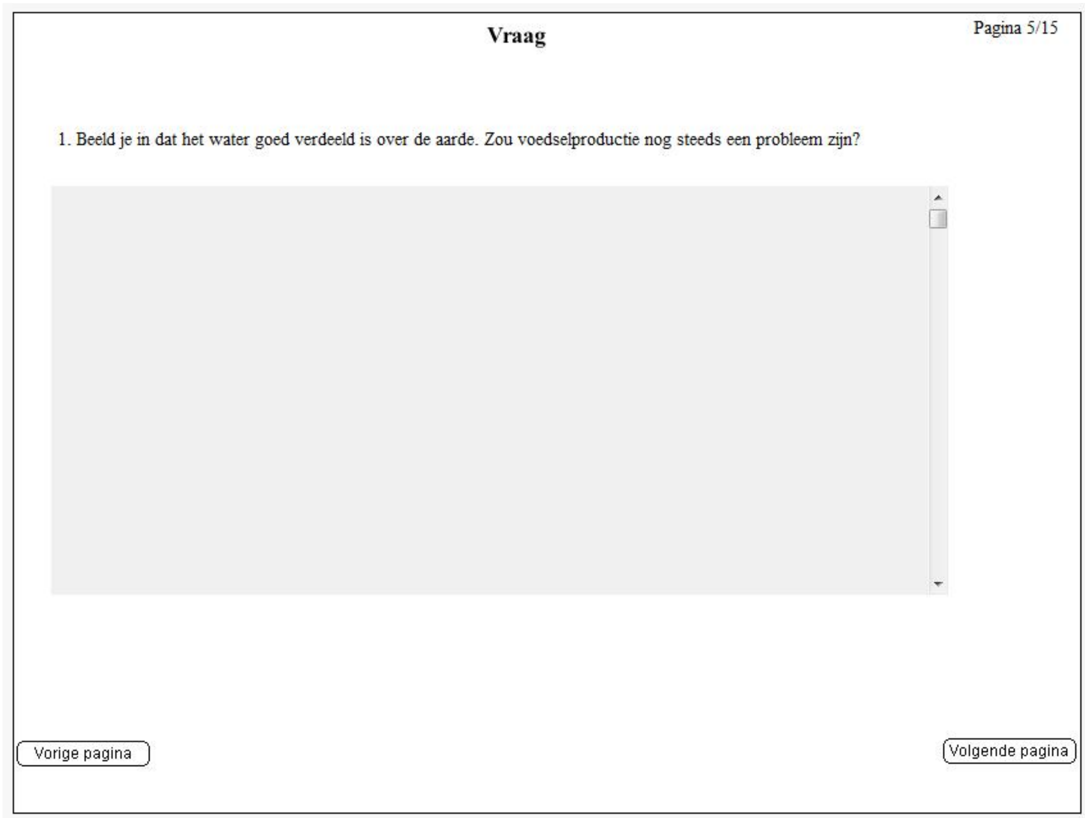


Figure 4. Screenshot of embedded conditions. Embedded conditions accessed the tool after clicking the button to go to the next page. The darkened space was provided to write the answer.

Procedure

The study was carried out in two steps. First, the self-efficacy and goal orientation questionnaires were administered to all participants during their Learning and Instruction class. Answering the questionnaires was a pre-requisite to attend the second part of the experiment; also, participants had to register themselves in a learning platform where they selected a session time in which they could attend. The second part was spread over different sessions in a computer laboratory with a maximum of 20 participants assigned to different conditions per session (maximum 40 minutes duration).

In the second part of the experiment, first, participants answered the pre-test on paper. Afterwards, they were introduced to the CBLE and started reading the hypertext. When the participants finished, they raised their hand and waited in silence until the researcher approached them. Once the researcher, who was conducting the research session, approached them, she checked the log files and made sure the learners' answers to the adjunct questions, time and clicks were recorded. If everything was appropriately saved, the researcher closed the program and handed the post-test on paper to be answered. Once participants completed the post-test, they were given proofs of the attendance and left the computer lab.

Data analyses

First, a MANOVA was used to check whether the conditions differed with respect to goal orientation, self-efficacy the pre-test (prior knowledge) and the post-test (performance). Condition was the independent variable and the learner characteristics, pre- and post-tests were the dependent variables. If groups showed a difference among conditions, then any of these variables were to be considered covariates in the further analyses.

Research questions 1& 2: Does non-/embeddedness of tool influence quality and quantity of tool use? Does the (no) explanation of the tool functionality influence quality and quantity of tool use? And Research question 3: Do self-efficacy and goal orientation influence tool use in relation to embeddedness and the explanation of the tool functionality? If so, how?

For questions 1 and 2, descriptive statistics were run between conditions and quantity and quality of tool use to see the effect of condition, more specifically, non-/embeddedness and (no) explained functionality on tool use.

Next, to answers research questions 1,2 and 3, a MANOVA was conducted with all the conditions; self-efficacy, performance approach, performance avoidance, mastery approach and mastery avoidance respectively as independent variables to see their effect on quality and quantity (time spent on tool) of tool use (dependent variables). For the effect of frequency of tool use (quantity), only the non-embedded conditions were considered. It is important to mention that all participants were considered given that all of them accessed the tools. Herein, a factorial ANOVA was conducted in which non-embedded conditions; self-efficacy, performance approach, performance avoidance, mastery approach and mastery avoidance were independent variables and quantity of too use (frequency) the dependent variable.

Research question 4: Do quality and quantity of tool use influence performance?

To answer the last research question, first, correlation analyses were conducted in order to see any possible correlations among tool use measurements. Second, regression analyses were conducted. The first regression with performance as dependent variable and tool use, namely quality of tool use and time spent on tool as independent variables. The second regression was done with frequency of tool use (quantity) as independent variable and only in the non-embedded conditions.

RESULTS

The MANOVA indicated that the mean of each condition regarding self-efficacy, the scales of goal orientation, the pre-test (prior knowledge) and the post-test (performance) did not significantly differ between conditions, *Wilks' lambda* = .84; F (21,373)= 1. 12, p=. 32 $\eta^2_{partial}$ =.06. Therefore in the further analyses, none of these variables were considered as covariates.

Research questions 1& 2: Does non-/embeddedness of tool influence quality and quantity of tool use? Does the (no) explanation of the tool functionality influence quality and quantity of tool use?

The descriptive statistics in Table 1 show that both embedded conditions and non-embedded conditions used all tools. The MANOVA indicated a significant effect of condition on quality and quantity of tool use (time spent on tool) *Wilks'lambda*=0.632, F (6, 230)=9.89, p<.001. $\eta^2_{partial}$ =.20. The separate ANOVA's on the outcome variables confirmed this significance: quality of tool use F (3, 116) = 4.22, p<.01, $\eta^2_{partial}$ =.10 and quantity F (3, 116) =17.04, p<.001, $\eta^2_{partial}$ =.31. Post hoc analyses using the Tukey post hoc criterion for significance indicated that the time spent on tools was significantly higher in the embedded condition with explained functionality (p <.005); and without explained functionality (p<.05) in comparison with both non-embedded conditions. However, the embedded condition with explanation was significantly higher than the embedded condition without explanation (p<.001).

Table 1. Descriptive statistics of quantity (time spent in seconds) and quality (answers on adjunct questions) of tool use across conditions. Non-embedded conditions show also tool use frequency, that is, clicks learners made to access tool.

Condition	Tool use	*N*	Mean	*SD*
Embedded, explained functionality	Quality (max. 16 points)	34*	9.12	2.17
	Quantity: Time spent (seconds)	35	793.03	370.85
	Performance (max. 13 points)	35	11.26	1.67
Embedded, non-explained functionality	Quality (max. 16 points)	35	8.43	1.82
	Quantity: Time spent (seconds)	35	583.31	235.23
	Performance (max. 13 points)	35	11.26	2.10
Non-embedded, explained functionality	Quality (max. 16 points)	35	9.77	2.30
	Quantity: Time spent (seconds)	35	402.17	143.04
	Quantity: Frequency (clicks)	35	16.77	9.38
	Performance (max. 13 points)	35	11.71	2.08
Non-embedded, non-explained functionality	Quality (max. 16 points)	35	9.94	1.51
	Quantity: Time spent (seconds)	35	398.11	175.95
	Quantity: Frequency (clicks)	35	18.09	10.77
	Performance (max. 13 points)	35	11.06	2.01

* Data from one participant was lost

The descriptive statistics also revealed that non-embedded conditions tool usage quality was higher than the embedded conditions. The Tukey post hoc narrows down this finding and points out that non-embedded condition with explained functionality (p<.05) and without explained functionality (p<.005) were significantly different only with the embedded without explained functionality. However, significant differences between the embedded condition with explanation and without explanation on quality of tool use were not retrieved in the post hoc test (p=.55).

Although the descriptive statistics in the non-embedded conditions suggested that participants accessed tools relatively more frequently in the condition without the explanation of tool functionality (M = 18.09) than in the condition with explained functionality (M = 16.77), the ANOVA indicated that such difference was not significant F (1, 58) =.19, p=.67. $\eta^2_{partial}$ =.00.

Research question 3: Do self-efficacy and goal orientation influence tool use in relation to embeddedness and the explanation of the tool functionality? If so, how?

Performance approach had a significant direct effect on tool use, Wilks *lambda*=0.95; F (2,115) =3.09 p<.05. $\eta^2_{partial}$=.05. Univariate ANOVA's revealed that performance approach did influence quality of tool use F (2, 95) = 3.88, p=.05, $\eta^2_{partial}$ =.03 but did not affect quantity of tool use (time). The particular effect of performance approach on quality of tool use was mainly positive meaning that learners with high levels of performance approach used tools more qualitatively in comparison with learners with low levels of performance approach (Figure 5).

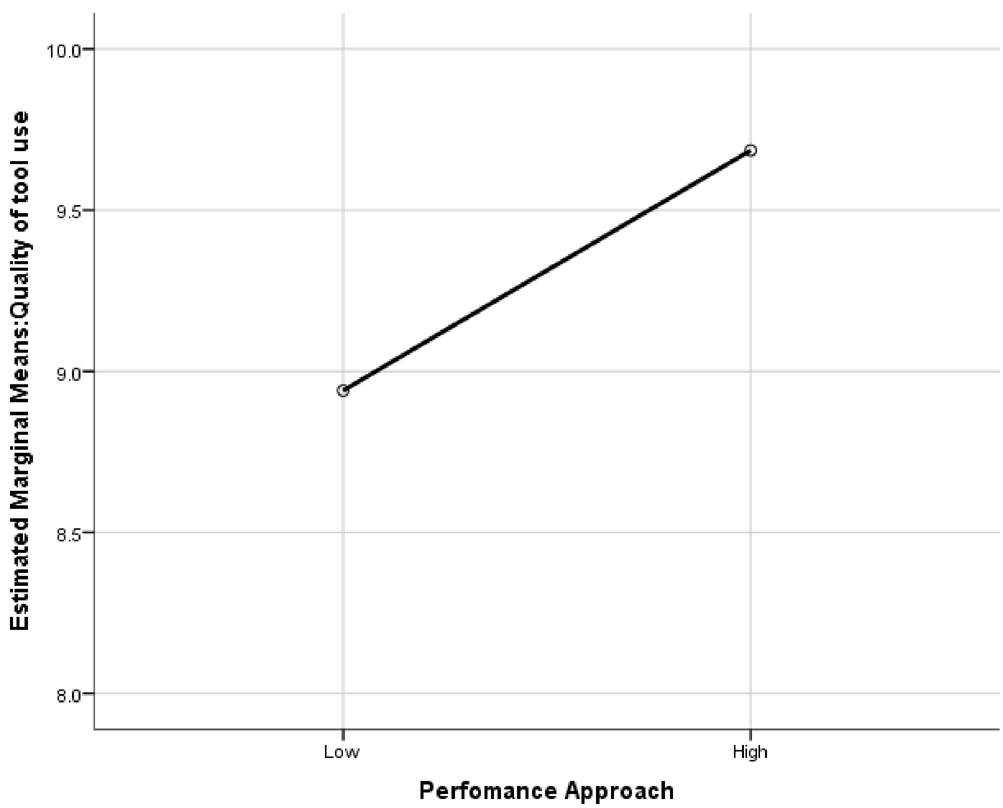


Figure 5. Effects of performance approach on quality of tool use.

Another variable that showed an effect on tool use was master avoidance, but this in interaction with condition. This effect could only be observed using Roy's statistics. Roy's largest root =0. 88; F (3,116) =3.40 p=.02. $\eta^2_{partial}$=.08. The further univariate ANOVA's confirmed that master avoidance in interaction with condition did influence quality of tool use F (3,116) = 3.19, p<.05, $\eta^2_{partial}$ =.08 but did not affect quantity of tool use (time). Both low and high levels of master avoidance used tools more qualitatively in both non-embedded conditions (with explained and non-explained functionality) than in both embedded conditions. The interaction effects can be observed in more detailed in table 2 and figure 6 which show the estimated marginal means given that means of unequal sizes were compared. The MANOVA revealed no further significant (interaction) effects of performance avoidance, master approach and self-efficacy on tool use.

Table 2. Estimated marginal means, standard errors for quality of tool use of the different conditions, and the low and high levels of master avoidance.

Condition	Mastery Avoidance levels	*N*	Estimated Marginal Mean	*SE*
Embedded, explained functionality	Low	18	8.94	0.57
	High	17	8.46	0.61
Embedded, non-explained functionality	Low	25	8.09	0.45
	High	10	9.14	0.71
Non-embedded, explained functionality	Low	25	9.11	0.45
	High	10	11.18	0.69
Non-embedded, non-explained functionality	Low	22	10.55	0.47
	High	13	9.02	0.67

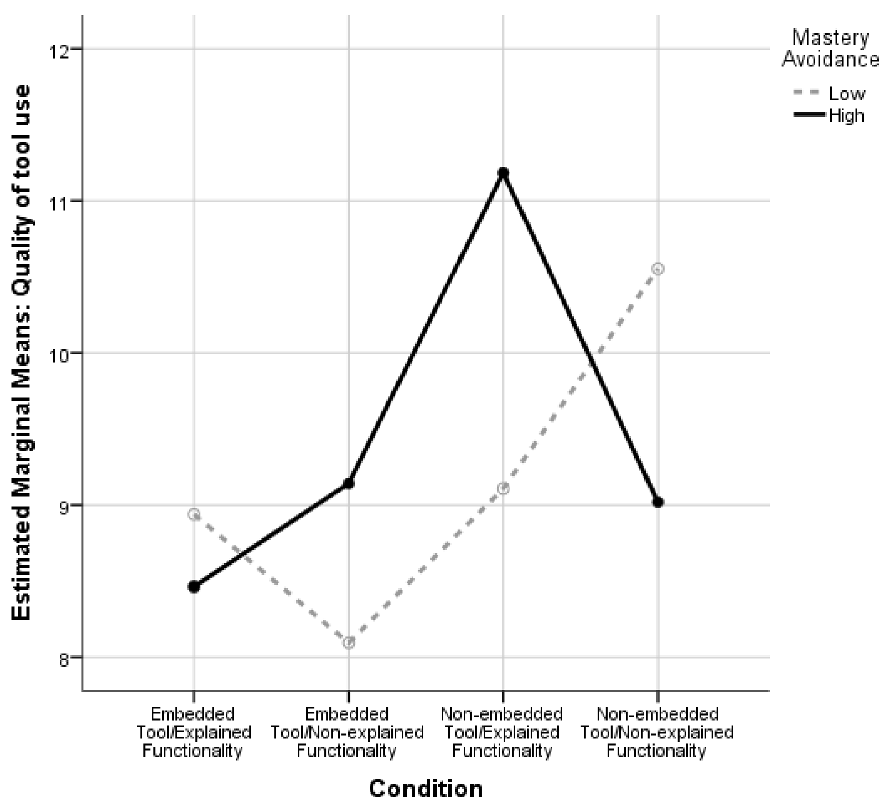


Figure 6. Interaction effects of mastery avoidance and condition on quality of tool use.

The ANOVA analysis in the non-embedded conditions (*N*=70 each) showed that no variable in interaction with condition had a significant impact on frequency of tool use. Only after it was controlled for condition, self-efficacy had a significant effect on quantity of tool use (frequency) F (1, 58) = 8.45, p<.01, $\eta^2_{partial}$ =.13. This effect was negative, meaning that the lower the self-efficacy in learners the more frequent they accessed the tools (Figure 7).

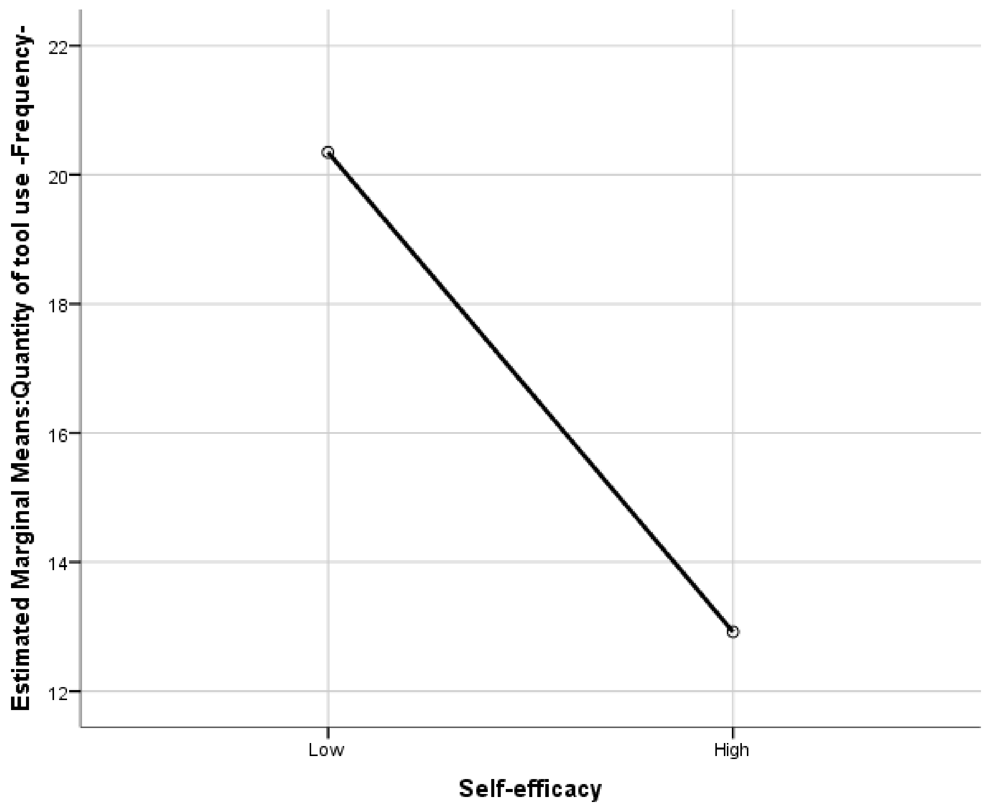


Figure 7. Self-efficacy on frequency of tool use.

Research question 4: Do quality and quantity of tool use influence performance?
A significant negative correlation between frequency of tool use and quality of tool use was observed (*r*= -.26, *p*<.05) but none of these tool use measurement affected performance significantly. That means that, as illustrated in Table 3, only quantity of tool use, namely time spent on the tool, seemed to be the only aspect of tool use that affected performance. Although all learners in all conditions used the tools, it seemed that only time spent on tool had a significant impact.

Table 3. Regression analyses on the effects of tool use on performance.

	Performance all conditions*				Performance non-embedded conditions**		
	B	**SE B**	**β**		**B**	**SE B**	**β**
Step 1							
(Constant)	10.57	0.37		(Constant)	11.67	0.50	
Quantity (time on tools)	0.001	0.001	0.19***	Quantity (frequency)	-0.02	0.03	-0.08
Step 2							
(Constant)	9.23	0.85					
Quantity (time on tools)	0.001	0.001	0.20***				
Quality tool use	0.14	0.08	0.15				

*R^2 = .19 for Step 1, p<.05. ΔR^2= ,24 for Step 2, *p*=.08.

**R^2 = .01 for Step 1, p.52 (one step only)

*** *p* <.05

DISCUSSION & CONCLUSION

This contribution was aimed at gaining more insight into learners' quantitative and qualitative use of tools by exploring the impact of tool characteristics (non-/embeddedness, with/without the explanation of tool functionality) and motivational characteristics (self-efficacy and goal orientation) on performance in a CBLE. Some learners had to answer the questions (embedded conditions) whereas others could choose whether to use the questions or not (non-embedded conditions). Within these conditions the explanation of the tool functionality was added in two of the four conditions (one embedded and one non-embedded condition).

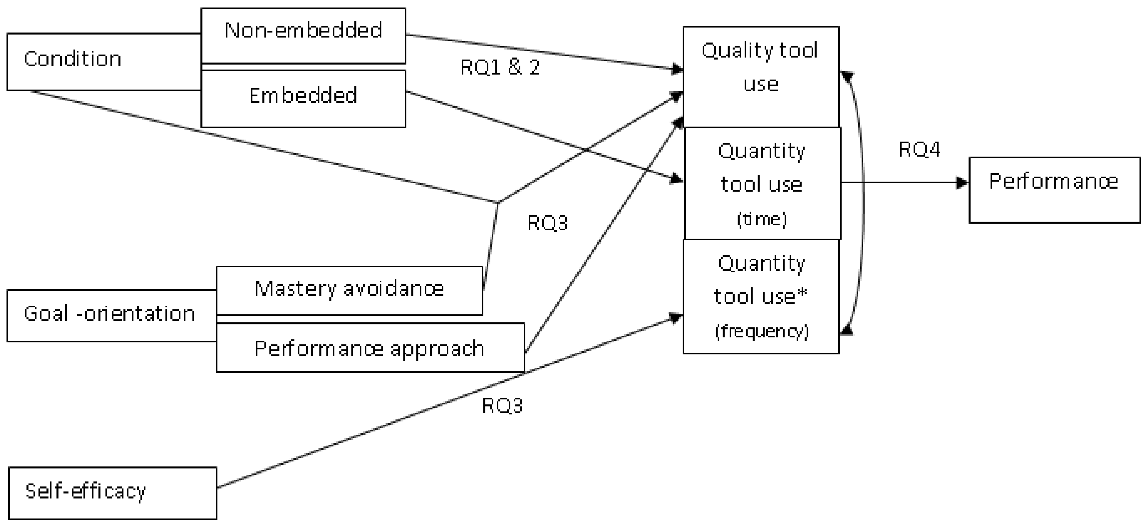


Figure 8. Summary of significant results from present study.

One of the results illustrated in figure 8 is that learners in both embedded conditions spent proportionally more time on the tools than both of the non-embedded conditions. Moreover, the results from the Tukey post hoc test also suggested that the explanation of tool functionality affected the time spent on the tool. This is because the embedded condition with explained functionality was significantly higher (in time) than the embedded condition without explanation. Additionally, learners in the non-embedded conditions with and without explained functionality had better results in the quality of tool use which means they answered the adjunct questions more thoroughly than the embedded condition without explained functionality, but not more than the one with explained functionality.

The findings on the relationship between tool presentation (non-/embedded tool) and quantity (time) and quality of tool use are similar to previous research (Clarebout, et al., 2010) where participants in the embedded condition used tools more but less qualitatively than participants in the non-embedded condition. Therefore embedded tools may be in the end a straightforward solution to avoid non-use of tools, but non-embedded tools may ensure the quality of tool use. This discrepancy brings to light the two standpoints of the learner control debate (see: Lawless & Brown, 1997). One point supports the idea of giving the learners control over their learning, as for example, in the component display theory (Merrill, 1983) whose one of the main principles is that learners should be given control over the number of instances or practice items they receive. The second point claims that learning is not effective in environments with little control over learning. However given that in the present study quality of tool use did not impact performance, possibly in the present experimental setting embedding tools may be more optimal.

The finding on the explanation of the tool functionality, on the other hand, seems inconclusive. While it provides evidence that (a) explained tool functionality may augment time spent on the tool when tools are embedded, and that (b) non-embedded tools (with and without explanation) and embedded tool with explained functionality may increase quality of tool use, it may also suggest that the non-/embeddedness has a stronger effect on tool use than the explanation itself. One possible reason why the explanation of the tool functionality was not significant could be attributed to the nature of the explanation itself. The explanation of the tool functionality was presented only once, namely at the beginning of the text. Having the explained tool functionality at one moment was probably too 'minimal'; moreover, the explanation to use tools was perhaps not formulated in an encouraging way for these types of learners. These two reasons may have lead to an ineffectiveness on the explanation of the tool functionality (Kirschner, Sweller, & Clark, 2006). This finding may also explain why quality of tool use did not affect performance (further discussion below). Hence to increase the possibility of having a positive effect of explained functionality on the use of tools, and consequently on performance, a specific more guided instruction on the use of tools should be provided (Kirschner, et al., 2006). It is proposed that this could be done by increasing the amount of times the explanation of the tool functionality is present, for example, before accessing the tool and probably also by adapting the explanation in a way that encourage learners towards a more optimal tool use.

While a direct effect of the explanation of the tool functionality on tool use could not be confirmed, it could also be argued that the partial effect found through the post hoc tests could be mediated by affective characteristics. In broad terms, research has suggested that affective characteristics may impact use and effects of technology (Proost, Elen, & Lowyck, 1997). Moreover, it has been indicated that how learners perceive the explanation of the tool functionality may impact on the effect of the explanation (Clarebout & Elen, 2008). This means that the emotional reactions towards the tool were probably different among conditions (with/without explanation), making the emotional reactions towards the tool more positive in the conditions with the explained functionality. Further study research on tool use introducing qualitative approaches could possibly widen the perspectives on tool use, for example, through observations.

This contribution also revealed that two aspects of goal orientation (figure 8) influenced tool use. Specifically, high levels of performance approach positively influenced quality of too use. This means that performance approach learners, namely learners with high concerns about how well they perform and how others perceive them, answered the adjunct questions more thoroughly. Crippen and colleagues (2009) also found that performance approach was positively related to tool use , but Huet, et al. (2011) revealed opposite results. In both studies (Crippen, et al., 2009; Huet, et al., 2011) the measures of tool use was based on the times learners accesses the tools (frequency). Our result is more in line with the results obtained by Crippen and colleagues (2009) because of the positive relationship found, and also add to the literature by suggesting that performance approach is also positively related of the quality of tool use. This result may also suggest that that the quality of tool use was better in learners with high performance approach levels because quality of tool use was viewed as a simpler task to demonstrate success than spending more time on the tool or accessing it more (Crippen, et al., 2009).

Considering the definition of mastery avoidance, learners that strived at avoiding misunderstanding, failing or making mistakes from an intrapersonal perspective showed no direct effect on tool use. Only when interacting with condition an effect of master avoidance was found to influence the quality of tool use (students' answers given to the adjunct questions). Learners with high and low mastery avoidance levels in non-embedded conditions showed more quality of tool use. These findings are related to the results obtained from tool presentation and explanation of tool functionality on tool use which means they could confirm the fact that both non-embedded conditions use tools more qualitatively. Moreover, an indirect influence of the interaction between mastery avoidance and condition on frequency of tool use could also be suggested given that frequency of tool use and quality of tool use were negatively correlated. This influence would be negative, which implies that learners that avoided misunderstanding or making mistakes accessed tools less frequently in the non-embedded conditions. However no further implications could be made given that neither frequency of tool use nor quality of tool use influenced performance. In general, the finding showing the interaction effects of mastery avoidance could sustain the theory of aptitude-treatment interaction (Cronbach & Snow, 1977) and bring to light the role of learners characteristics in relation to tool characteristics, in this case the presentation of tools in CBLE's.

For the other aspect of quantity of tool use–frequency-, no interaction effects between learner characteristics and conditions were found. However, significant direct effect of self-efficacy, on frequency of tool use was found (figure 8). The further analysis suggested that high self-efficacy levels influenced negatively the frequency of tool use and hence -due to the found correlation- indirectly had a positive influence on the quality of tool use. Considering that self-efficacy is defined as "the beliefs in one's ability to plan/execute a behavior" (Bandura, 1997), if people, in this case learners, believe they have a great ability to organize and execute the course of actions required to succeed and reach a certain goal, then they will be capable of adapting their use of tools. Moreover, this finding might also be related to the optimization stage for tool use (Iiyoshi & Hannafin, 1998), as to the third condition of Perkins (1985): Learners, with a high level of self-efficacy -a motivational characteristic-use the tools, attempted to optimize the tool use by decreasing the frequency of tool use.

In this study, it was assumed that quantity and quality of tool use would influence performance. Confirming this would fulfill Perkins's first condition (1985) of the tool is there, more specifically, the tool is functional for the learner (Clarebout, et al., 2010). The findings may raise the question on whether the present tool was fully functional as they revealed that only the time spent on the tool (quantity of tool use) influenced performance and neither frequency of tool use nor quality of tool use revealed a significant impact.

Additionally, the fact that only time spent on tool had a positive effect on performance also question whether it is appropriate to explore tool use from a quantitative (time and frequency) and qualitative perspective in a single study. Literature on tool use has explored one of the three (frequency:Crippen, et al., 2009) obtaining positive results on performance. Other studies have focused on two of them (time & frequency: Elen & Louw, 2006; Viau & Larivée, 1993) . Elen & Louw (2006), for instance, saw only partial effect of frequency of tool use on performance, while Viau & Larivée (1993) showed effects of both time and frequency on performance but only in one of the two tools. Few studies have explored the three of them (Clarebout, et al., 2010; Jiang & Elen, 2011). Clarebout and colleagues (2010) only found significant positive effects of time and quality on tool use on performance; Jiang and Elen (2011) had positive effects of quality of tool use on performance but negative effects of frequency of tool use on performance, partial effects of time on tool on performance were revealed. Other studies have not analyzed the effects of tool use on performance (quality: Greene & Land, 2000; frequency: Huet, et al., 2011).

The results in the present investigation could also question whether quantity and quality of tool use are separate measurements for tool use, given that a correlation between frequency of tool use and quality of tool use was found. It is also questioned whether the time spent on the tool could be indirectly related to what is conceived as the quality of tool use. That is to say, the time spent on the tool –adjunct question- could also be an indicator of quality of tool use because learners possibly took more time thinking on the question than actually writing down a thorough answer. Learners may see the value of thinking about the questions but not the value of writing all their thoughts down and making the answers look 'perfect.'

Overall, the results reveal the complexity involved when using tools in CBLE's. They also add to our understanding of the relationships between learner and tool characteristics on tool use in university students. In general, the findings suggest that goal orientation, self-efficacy and tool characteristics interact and affect the quantity and quality of tool use; and quantity of tool use affects performance.

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REFERENCES
Aleven, V., Stahl, E., Schworm, S., Fischer, F., & Wallace, R. (2003). Help seeking and help design in interactive learning environments. *Review of Educational Research, 73*(3), 277-320.
Atkinson, R. K. (2002). Optimizing learning from examples using animated pedagogical agents. *Journal of Educational Psychology, 94*(2), 416-427.
Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.
Clarebout, G., & Elen, J. (2006). Tool use in computer-based learning environments: Towards a research framework. *Computers in Human Behavior, 22*(3), 389-411. doi: 10.1016/j.chb.2004.09.007
Clarebout, G., & Elen, J. (2008). Advice on tool use in open learning environments. *Journal of Educational Multimedia and Hypermedia, 17*(1), 81-97.
Clarebout, G., & Elen, J. (2009). The complexity of tool use in computer-based learning environments. *Instructional Science: An International Journal of the Learning Sciences, 37*(5), 475-486.
Clarebout, G., Horz, H., Schnotz, W., & Elen, J. (2010). The relation between self-regulation and the embedding of support in learning environments *Educational Technology Research and Development 58*(5), 573-587. doi: 10.1007/s11423-009-9147-4
Crippen, K. J., Biesinger, K. D., Muis, K. R., & Orgill, M. (2009). The role of goal orientation and self-efficacy in learning from web-based worked examples. *Journal of Interactive Learning Research, 20*(4), 385-403.
Cronbach, L. J., & Snow, R. E. (1977). *Aptitudes and instructional methods. A handbook for research on interactions.* New York: Irvington Publishers, Inc.
Derry, S. J., Hmelo-Silver, C. E., Nagarajan, A., Chernobilsky, E., & Beitzel, B. D. (2006). Cognitive transfer revisited: Can we exploit new media to solve old problems on a large scale? *Journal of Educational Computing Research, 35*(2), 145-162.
Dornisch, M. M., & Sperling, R. A. (2006). Facilitating learning from technology-enhanced text: Effects of prompted elaborative interrogation. *Journal of Educational Research, 99*(3), 156-165.
Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist, 41*(10), 1040-1048.

Dweck, C. S., & Legget, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review, 95*(2), 256-273.
Elen, J., & Louw, L. P. (2006). The instructional functionality of multiple adjunct aids. *E-Journal of Instructional Science and Technology, 9*(2), 2006.
Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*(1), 218-232.
Elliot, A. J., & McGregor, H. A. (2001). A 2 x 2 achievement goal framework. *Journal of Personality and Social Psychology, 80*(3), 501-519. doi: 10.1037//0022-3514.80.3.501
Greene, B. A., & Land, S. M. (2000). A qualitative analysis of scaffolding use in a resource-based learning environment involving the World Wide Web. *Journal of Educational Computing Research, 23*(2), 151-179.
Hamaker, C. (1986). The effects of adjunct questions on prose learning. *Review of Educational Research, 56*(2), 212-242.
Huet, N., Escribe, C., Dupeyrat, C., & Sakdavong, J.-C. (2011). The influence of achievement goals and perceptions of online help on its actual use in an interactive learning environment. *Computers in Human Behavior, 27*(1), 413-420. doi: 10.1016/j.chb.2010.09.003
Iiyoshi, T., & Hannafin, M. J. (1998, April). *Cognitive tools for open-ended learning environments: Theoretical and implementation perspectives.* Paper presented at the annual meeting of the American Educational Research Association, San Diego, CA, USA.
Iiyoshi, T., Hannafin, M. J., & Wang, F. (2005). Cognitive tools and student-centred learning: Rethinking tools, functions and applications. *Educational Media International, 42*(4), 281-296.
Jiang, L., & Elen, J. (2010). The impact of motivation-related variables on scaffold use. *EARLI SIG 6&7: Instructional design for motivated and competent learning in a digital world*.
Jiang, L., & Elen, J. (2011). Instructional effectiveness of higher-order questions: The devil is in the detail of students' use of questions. *Learning Environments Research, 14*(3), 279-298. doi: 10.1007/s10984-011-9095-x
Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist, 41*(2), 75-86.
Lawless, K. A., & Brown, S. W. (1997). Multimedia learning environments: Issues of learner control and navigation. *Instructional Science, 25*(2), 117-131.
Lee, Y. B., & Lehman, J. D. (1993). Instructional cuing in hypermedia: A study with active and passive learners. *Journal of Educational Multimedia and Hypermedia, 2*(1), 25-37.
Lodewyk, K. R., & Winne, P. H. (2005). Relations among the structure of learning tasks, achievement, and changes in self-efficacy in secondary students. *Journal of Educational Psychology, 97*(1), 3-12.
Merrill, M. D. (1983). Component display theory. In C. M. Reigeluth (Ed.), *Instructional Design Theories and Models: An overview of their current status*. Hillsdale, NJ: Erlbaum Associates.
Moos, D. C., & Azevedo, R. (2009). Learning with computer-based learning environments: A literature review of computer self-efficacy. *Review of Educational Research, 79*(2), 576-600.
Murphy, P. K., & Alexander, P. A. (2000). A Motivated Exploration of Motivation Terminology. *Contemporary Educational Psychology, 25*(1), 3-53. doi: 10.1006/ceps.1999.1019
Nesbit, J. C., Winne, P. H., Jamieson-Noel, D., Code, J., Zhou, M., MacAllister, K., et al. (2006). Using cognitive tools in gStudy to investigate how study activities covary with achievement goals. *Journal of Educational Computing Research, 35*(4), 339-358.
Newman, R. E. (1994). Adaptive help-seeking: A strategy of self-regulated learning. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance. Issues and educational applications*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
Perkins, D. N. (1985). The fingertip effect: How information-processing technology shapes thinking. *Educational Researcher, 14*(7), 11-17.
Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ)*. Ann Arbor, MI: National Center for Research to Improve Postsecondary Teaching and Learning (NCRIPTAL), University of Michigan.
Proost, K., Elen, J., & Lowyck, J. (1997). Effects of gender on perceptions and preferences for telematic learning environments. *Journal of Research on Computing in Education, 29*(4), 370-384.
Raes, D., Geerts, S., & Vanuytrecht, E. (2009). Waarom water broodnodig is. *Bio-Ingenieus, 12*(5), 2-4.
Regian, J. W., & Shute, V. J. (1992). *Cognitive approaches to automated instruction*. Hillsdale, NJ: Lawrence Erlbaum Associates.
Renkl, A. (2002). Worked-Out Examples: Instructional Explanations Support Learning by Self-Explanations. *Learning and Instruction, 12*(5), 529-556.

Schnotz, W., & Heiss, A. (2009). Semantic scaffolds in hypermedia learning environments. *Computers in Human Behavior, 25*(2), 371-380. doi: 10.1016/j.chb.2008.12.016

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86*(2), 420-428.

Viau, R., & Larivée, J. (1993). Learning Tools with Hypertext: An experiment. *Computers & Education, 20*(1), 11-16.

Wu, X., Lowyck, J., Sercu, L., & Elen, J. (2012). Task complexity, student perceptions of vocabulary learning in EFL, and task performance. *British Journal of Educational Psychology*. doi: 10.1111/j.2044-8279.2011.02061.x

TOWARD A DISTANCE EDUCATION BASED STRATEGY FOR INTERNATIONALIZATION OF THE CURRICULUM IN HIGHER EDUCATION OF IRAN

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ABSTRACT
The present study is to investigate the necessity of internationalization of curricula in Higher Education of Iran; it also determines the effect of characteristics of new generation of distance education on curriculum internationalization and presents some influential strategies for internationalizing curricula of Iran Higher Education with distance education approach. For this study, after making 12 personal interviews and conducting 2 sessions of focus groups, 543 professors and students of five universities filled in a questionnaire; the collected data were analyzed using one-sample *t*-test, Friedman test and variance analysis.

The results indicated that internationalizing curricula is necessary in order to follow the globalization trend and to introduce the Iranian culture and civilization to the world; therefore, distance education approach is a thoughtful alternative for this process because of its high flexibility and the harmony of its curricula with the international curricula. Expanding international collaboration of universities, using the international language for teaching, providing resources, founding the infrastructures based on technology, revising rules and their clarification and developing curriculum elements based on the transformative approach are the most essential strategies.
Keywords: Distance education, Internationalization, Internationalizing of curriculum, Higher Education of Iran

INTRODUCTION
The phenomenal growth in distance education systems and the internationalization and globalization of education and curricula have considerably changed educational scenarios especially in higher education. But, can distance education be taken into account as a strategy for internationalizing the curricula? Does internationalization of education make more use of the distance education approach possible? How can one develop international curricula in distance education? These are some challenges which the higher education experts and scholars are involved with.

Nowadays, the distance education approach with the help of ICT[1] has a supporting role in economic and social development and it has been accepted in the national educational systems around the world especially in the developing countries (Moore & Tait, 2002).

The distance education is a process to create and provide access to learning when the source of information and the learners are separated by time and distance and it provides an educational experience of equal qualitative value for the learners to best suit their needs outside the classroom. (Honeyman & Miller, 1993)

The internationalization and globalization of education have been brought up through the increasing demand for appropriate education to achieve better understanding, analyzing and responding to the unpredictable and changing situations and crossing the geographical borders among the nations to establish an international community for better social, occupational and emotional life; therefore, higher education institutions need a different approach to respond to these educational demands qualitatively and quantitatively; they value the participation of international students (Jones & Brown, 2007). Setting internationalization policy in higher education systems and their curricula are in line with this approach.

Internationalization includes international, intercultural and global aspects into the goal, actions and implementation of higher education to increase respect for cultural difference and traditions (Bostrom, 2009). As the knowledge achievement is the main characteristic of a university, internationalizing curricula is the priority in internationalization process (Harari, 1992). Internationalization of curriculum is the process of

[1] - Information and Communication Technology

developing and changing the curriculum in order to infuse international aspects into formal and operational dimensions of curriculum. The formal aspect is related to the objectives, course content and educational materials and the operational aspect includes teaching/learning(Shailer, 2006) and evaluation methods.

The most common approaches for internationalization of curricula are:

1. Add-on: adding international/intercultural content, concepts or subjects and attitudes to the present curricula without changing the main structure or their teaching and learning approaches;
2. Infusion: infusing a sort of content which enriches intercultural understanding and knowledge of students and reflects various attitudes and provides learners with diverse professional performances;
3. Transformative: internationalization of curriculum based on changing its main structure and teaching/learning approaches. There is a change in thought paradigm and attitude through changing what to teach and how to teach that.

Transformative approach has a high flexibility in training intercultural/international students (Williams, 2008) and causes thought growth, analysis power, criticism and metacognition of the learners; however, each institution chooses appropriate approach regarding its goals, structure and limitations (Aspan, 1993).

As mentioned earlier, distance education approach can be used to solve national educational problems and it is also regarded as an effective strategy internationally; in addition to having advantages such as being economical, high speed, more efficiency and effectiveness in teaching/learning process and its common characteristics with international curricula (e.g. flexibility, high accessibility, being interactive, learner-oriented) make this approach as a suitable option for higher education development.

It seems that international distance education or distance education based on ICT is one of the most important factors for the steady development of internationalization and it can be an alternative to the international movement. In fact, IaH[1], with which universities try to provide personal and professional development for all the people as global citizens, can achieve its high goals with support of distance education approach and ICT. In the 21st century, universities should make their activities global using satellites or international multimedia communication in order to perform education successfully, efficiently and effectively (Knight, 1995). Theoretically, the presence of modern technologies implies the increase in global distance education (Thune &Welle- Strand, 2005). Distance education has presented various opportunities for internationalization of curriculum in higher education; therefore, effective performance of graduate students in multicultural societies and global professional environments will be increased with this educational method (Currie & Vidovich, 2000).

Based on UNESCO (2005) statistics, there were 2.5 million international students all over the world in 2004 and it goes up to 7.2 million students in 2025. The increasing rate of international students was 17% in the US, 29% in Great Britain, 46% in Germany, 81% in France, 42% in Australia and 108% in Japan (Bain & Green, 2006). These countries have used various strategies such as national marketing, considering immigration policies for attracting students, presenting curriculum in English and establishing regional educational poles (Verbik, 2006). It is worth mentioning that Asian and Muslim countries like Singapore and Malaysia are among the leading countries in attracting international students (International Study Abroad Guides, 2008); this shows that they give priority to higher education policies and international curricula in order to respond to applicants' needs; therefore, other countries like Iran must be aware of this fact. Iran has a long history in international studies. In the 5th century, Jondi Shapour University was an example a center for medical studies and its curricula covered many research fields. This university was a center for scientific activities and exchange of information among scientists from Iran, India, Greece and Syria. Iran has an enormous potential for attracting international students; however, statistics show that less than 1500 foreign students are at Iranian universities (Iran Higher Education Statistics, 2007-08).

It is obvious that Iran wants to be an economic, scientific, industrial power in the region; so, there should be appropriate infrastructures for removing barriers of non-oil exports and there is an urgent need to achieve a diverse economy and dependent on knowledge, information, human resources and new technology (Nowrouz zade, 2006).

Regarding these facts, the internationalization of curriculum in higher education of Iran is a necessary action and it seems that using educational approaches based on ICT with its facilitative characteristics can strategically affect this process. However, the success of IOC[2] not only can be influenced by environmental factors and out of

[1] - Internationalization of curriculum at Home
[2] -Internationalization of Curriculum

the educational institution control such as political, economic and cultural conditions, but also can depend on factors inside the institution and the participation of all the scientific members of university, available resources, facilities and opportunities, cultural intelligence development and communicative competences (Early, Ang &Tan, 2006), the type and nature of course subjects and teaching/training approaches. In fact, IOC is a multidimensional process that requires the participation and support of faculty members, students, departments, institution management and international bureaus of a college; therefore, the leadership, commitment to the process, intercultural sensitivity, financial support, tendency, enthusiasm, open communication way and consistency among fields of study must be taken into account (Williams, 2008). Morey (2000) provided a framework for change directed to internationalization in higher education institutions; this framework also includes effective factors for change.(Figure-1)

Morey regards internationalization of higher education institutions as a progressive process and in addition to importance of institution management and strategies which guarantee this process, he emphasizes the influential factors such as realization of factors effective on internationalization (needs analysis), organizational structure, planning and implementation, teaching and training (educational content and strategies) and evaluation. Other factors are educational institution missions, professional development of professors, international unifications and collaborations (Walley et al, 1997) , the language of teaching and communication, budget and financial resources, equipment and technology and supportive role of the government (AUCC, 2009).

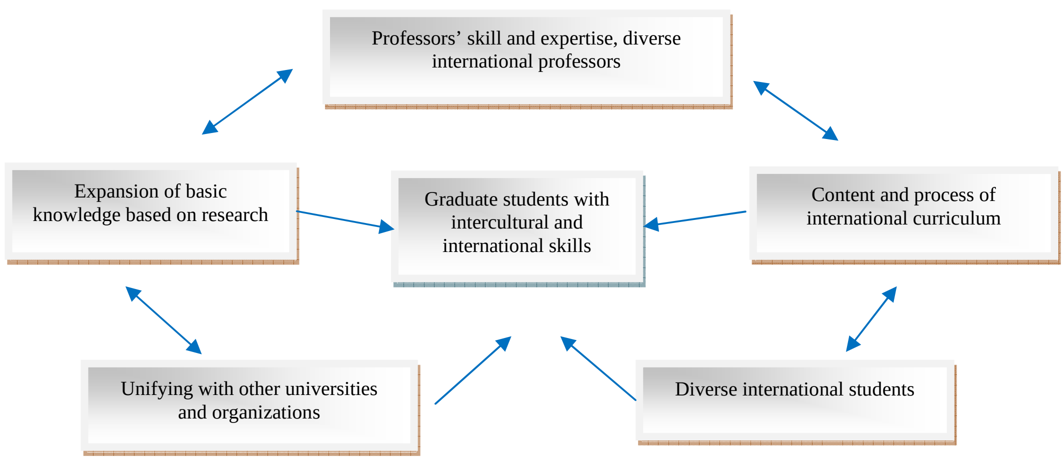

Figure1- The framework internationalization in higher education institutions

Williams (2008) indicated that an international curriculum must be a solution for supporting different needs of international students. Having a transformative approach, which raises critical awareness of deviations from and values related to teaching/learning approaches and curricula, respects different ways of understanding and existence and regards students as active participants, must be the goal of higher education institutions that attempt to help native and international students.

Bond (2006) stated that from the professors' and students' viewpoints, international curriculum should involve most of the students who have not gone aboard for their studies and include new forms of knowledge: basic knowledge about socio-cultural content of other societies, changing how one responds to cultural differences, behaves in intercultural situations and to keep ones cultural unity while understanding others. To get ready for complete participation in a global community, it is essential to learn how to communicate skillfully with people from other cultures. Most of the universities do not focus on the native students while intercultural and international knowledge and experience must be the core of curricula for all the students and the internationalization should be achieved at home.

Ghaheri (2005) studied the effects of international communications of higher education on the curriculum elements (content, teaching methods, evaluation methods and equipment) in Iran. The results showed that the increase in international communications of higher education affects the elements of curriculum and causes content changes in terms of more attention to teaching foreign languages, nurturing communicative skills, teaching how to use internet and technology, teaching research skills, getting students familiar with different cultures, considering global issues using interdisciplinary and multidisciplinary integrative approach; regarding team work in teaching methods, discovery learning methods; using formative evaluation, using oral communication specially about foreign students, more attention to reports, articles and finally more use of electronic networks and electronic/online conference rooms and more use of new technologies such as emails and websites.

Mihailova (2006) investigated this fact whether e- learning can be a main tool or strategy to internationalize the higher education; the results showed that it is necessary for professors to get more help from teaching and training technologists and develop electronic courses mutually. Additionally, blended learning is the best method of teaching and learning and using e-learning can support the traditional method.

Thune & Welle-Strand (2005) studied the role of ICT in internationalization of higher education and concluded that ICT is important as a tool of preparation for internationalization process and international activities but it is not as a running force for internationalization.

Caruana (2004) studied the role of ICT in internationalization of curriculum and concluded that challenges of internationalization of curriculum are similar to the ones related to e-learning and bilateral strategic approach is more effective and useful than parallel strategies.

The purpose of this study is to investigate the internationalization of curricula with distance education approach in higher education of Iran; it is going to answer these questions:

- What are the reasons of necessity of internationalization of curricula in higher education of Iran?
- Which reasons are there to consider distance education approach as a strategy in internationalizing curriculum in higher education of Iran?
- What are strategies for curriculum internationalization with distance education approach in higher education of Iran?

METHODOLOGY

The present study has a mixed method and follows the qualitative and quantitative ones. The first phase began at Tehran University, Sharif University of Technology and Imam Khomeini International University which are pioneers in internationalization in Iran. The researcher had a semi- structural interview with 12 managers and professors and she also had focus group sessions with two groups of 9 and 14 foreign students at these universities. The sampling methods were purposed and snowball ones. The experience of living and studying out of Iran for at least one year; experience of teaching foreign students with a traditional or virtual methods; experience of management in international office of the university or having related books or articles were the criteria of selection of interviewees. The criteria for participants in focus groups were being non native students and having at least 6-month experience of studying in higher education of Iran.

The interviews were documented using recorder and camera. After implementation, classification, summarization and writing the reports, the interviewees checked them for proving reliability and credibility(Member check method).

In the second phase, statistical population consisted of all the faculty members, Ph. D and M.Sc. /M.A. students of Humanities and Art, Engineering and Science department and all the foreign students at the universities in Tehran which have international campus. Sampling was done through cluster/stratified method. Five universities including Sharif University of Technology, Shahid Beheshti University, Tarbiat Modarres University, Tehran University and Payame-noor University were selected from the all universities; using Cochran formula (α=0.05, d=0.l) the number of samples was determined for each cluster. ?The final sample consisted of 543 professors and students. The research instrument was a questionnaire developed by the researcher; the questionnaire was constructed using the findings of interviews and theoretical and analytical studies and then its validity was approved by some experts and its reliability was measured using Cronbakhs Alpha (α=0.82). The questionnaire included three questions and 46 sub questions with Likert scale. For data analysis, one-sample *t*-test and then Friedman Test and variance analysis were used in SPSS win15 and Minitab applications.

FINDINGS

In this section to answer the research question, at first the results of individual interviews and sessions with focus groups are presented and then the results collected through implementing the questionnaires are addressed.

Q1. Is it necessary to internationalize the curricula in higher education of Iran?

According to what the interviewee said and their experiences, the internationalization of curriculum is dependent on the globalization trend; for this purpose, it is emphasized that graduate students should have the competences for living and working in intercultural and international societies, knowledge about other nations and cultures and respect for them, the presence in the international areas and competitions. For knowing other cultures and countries, one of the interviewees said:

> *"It is necessary for graduate students to know different cultures and nations in order to be able to live anywhere".*

Making Iran the most scientific country in the region and reducing the educational and scientific gap are the most important reasons for internationalization. One of the interviewees believed that:

> *"It is necessary for us to have information about the research and educational programs and technology production in order to compare with each other and identify weak and strong points".*

The capacities of Iranian civilization and the necessity of introducing this civilization to the world make higher education of Iran have an international viewpoint. One of participants said:

> *"According to existing capacity in the era of communication and cyberspace, it is necessary for a country like Iran, with such a history, civilization and historical position in the world of science and culture, to be introduced to the world and others get to know the ideas of its philosophers and scholars."*

Another professor said:

> *"In order to have an appropriate share in international community and to resist domination of the ruling powers in science and culture, there should simultaneously be exports along with imports of science, culture and civilization from other countries. therefore it is necessary to increase the flow of Iranian civilization to go beyond its boundaries; for this reason, physically and virtually presence of international students should be considered. Thus, to respond to the needs of these international students, the curriculum also needs to be internationalized".*

According to interviewees, one of the most important factors to keep the elite and professionals in Iran as well as not to human resources is providing the appropriate educational and research conditions, interacting and making use of scientific and cultural achievements of other nations. One of interviewees believed that:

> *" if developing countries do not try to internationalize their higher education, the top higher education systems will attract their elite and it means brain drain."*

Q2. Which effective factors in distance education approach make it as a strategy for internationalization of curriculum in higher education?

High flexibility of new generation of distance education deeply affects the internationalization of higher education and curricula.

According to one of interviewees:

> *"Having features such as considering learning without time and place constraints, learner-centeredness, using a variety of educational materials with different intellectual and cultural roots, utilizing different teaching and learning approaches and facilities such as providing immediate feedback as well as holding meetings to discuss the possibility of using simulations prepare the proper environment for international and intercultural learners who have different needs, personal characteristics, learning styles, cultural and educational backgrounds".*

Increasing efficiency is another advantage of distance education approach in the internationalization of curriculum. One of professors says:

> *"distance education based on technology is a perfect tool for distributing content internationally; using it we can provide a widespread content in a smaller size and higher speed for the unlimited number of audiences without extra costs."*

Or According to one of the managers:

> *"Using cyberspace can spread Iranian power into other countries and lead to more presence in the world of higher education; thus, efficiency will be improved."*

Anotherof professors said:

> *"This approach may increase the possibility of study of foreign students who do not have any interest in physical presence in Iran. As a result, this may be economical."*

But can this approach be used as an independent or blended one; there are various perspectives and options. One of the participants said:

> *"Depending on the university's mission, productivity rate is different. Some universities may consider this approach as damage to their reputation and prefer to pay attention to distance education approach along with the traditional one only in some courses."*

One of the professors stated:

> *"In some courses such as management that there is less need for laboratory and experimental studies, the distance education approach is more effective compared to technical issues that need laboratory and experimental activities."*

But, some interviewees had different believe. For example one of them said:

> *"Noting that the presence of higher education of Iran in the international area greatly depends on the cultural advantages and hidden or implicit curriculum and requires physical presence of foreign students in the host country so the distance education approach is not appropriate strategy since the cultural attraction cannot be sensed in the distance education."*

Also some of interviewees believed that although recent technological advances reduce the negative points of virtual training but due to lack of infrastructure, facilities and financial issues, we are not able to rely on the absolute use of the virtual spaces. So classrooms are inevitable.

Q3: What are strategies for curriculum internationalization with distance education approach in higher education of Iran?

Resource developments are the strategies on which several interviewees emphasized. In this regard, one of them stated:

> *"If a university has financial resources, it has more research and educational facilities and equipment. Consequently, it is likely that other more advanced universities pay more attention to it; therefore, there is an increase in the attraction of faculty and foreign students."*

Greater recognition of other higher education systems especially those with which Iran higher education cooperates, in macro decision making and strategic planning is noteworthy which is somewhat done with comparative studies, membership in international and regional conventions, foundation of thinking rooms and etc. In this way one of managers stated:

> *"Doing comparative studies in the field of curriculum with other countries shows their potential and strengths and weakness in different domains and, then identifying central points in each domain at the regional level to establish a scientific dialogue can greatly help to develop the international curricula."*

For having international education, the political, cultural, and economic structure of a country may affect this activity and its strategies. The political structure of a country determines the value of presence in global competition and expands its national connections. One of professors declares:

> *"Political structure based on ideological principles is effective on the acceptance of foreign patterns and cultures; so, developing the curriculum with transnational perspective will cause the major obstacles and constraints in this way in Iran".*

One of the interviewees stated:

> *"Excessive control and several problems of studying in Iran or giving visa to foreign professors make foreigners reluctant to come to scientific conferences and limit international cooperation of Iran".*

The proper understanding of internationalization and the balance in cultural and scientific exchanges prevent the identity of a nation from dissolving in international movements. One of the interviewees believed:

> *"Regarding Iranian historical background and colonization by foreign countries, the Iranian people somehow hate and mistrust foreigners. However, in order to reach a political and social growth in Iran, we have to be aware that the foreign professors and students are like guests who can revive Iranian culture and it should be necessary to establish a better environment for foreigners in Iran; this can be handled with planning in education system".*

Based on the findings, the economic structure has an effect on higher education in international areas; the internationalization of trade and markets makes the higher education follow the internationalization trend. The economic competitions establish scientific cooperation; because education as a service can be produced and presented.

Some interviewees emphasized the fact that the Islamic environment of Iran for attracting Muslims around the world and Iranian potentiality for research cooperation in Islamic sciences with other countries will be a cultural opportunity and advantage. For example, one of the foreign students in focus groups said:

> *"Iran is an Islamic country and it is an advantage for Muslims especially women who want to continue their studies and their families will be less worried about them".*

To internationalize the curricula, it is appropriate to pay attention to course subjects. An interviewee stated:

> *"In Iran, empirical science is developed using translated books and the internationalization of their curricula needs a lot of research and productive activities and there must be more attention to the intercultural aspects. On the other hand, internationalizing their curricula in distance education approach requires the technical, hardware and software substructures. Limitations in resources, facilities and equipment will hinder developing effective curricula. However, subjects such as Persian language and literature, Iranian civilization history, knowledge about Iran and Islamic sciences, which depend on the Iranian culture and civilization and are less empirical, have more chance to be internationalized."*

To internationalize the curriculum, we should consider not only goals, content, educational resources and material, teaching-learning methods but also strategies and activities at implementation level and in physical and virtual classes.

An interviewee said:

> *"It is better to design contents in such a way in which local culture and other cultures are infused. It is possible through comparison of thoughts and findings of the Iranian philosophers and scholars with the ideas of great thinkers and scientists from other countries and even it can be beneficial to use the information about countries, cultures and religions of other nations in our course books".*

An interviewee believed:

> *"To development the international content, it is necessary to consider the language proficiency and knowledge level of foreign students and design content based on the rules, simplicity, difficulty and applicability. It appears more appropriate to develop special materials for foreign students".*

One of the students in focus groups said:

> *"Regarding prior teaching-learning methods of students and flexibility in using different teaching methods in harmony with field of study and subject can decrease the problems due to language incompatibility as well as educational and cultural issues of international students".*

An international curriculum has evaluation methods with diverse and intercultural framework. A student believed:

> *" if students were free to do their homework and research projects, it would somehow be in line with intercultural approach".*

Here the findings of implementing questionnaires are used to answer the research questions.

Q1. Is the internationalization of curricula necessary in Iran Higher education?

To answer this question, three variables were studied. Table 1 shows the results about each of these variables. The questions are designed with Likert scale(5 options); therefore, the middle one(3) was selected as the mean and each question was studies with this hypothesis. H0:$\mu<=3$, H1: $\mu>3$.

Table 1. Descriptive statistics and *t*-test results, mean and priority of variables necessary for internationalization of curriculum in Iran higher education

R	Variable	n	$\bar{x}$	SD	T	df	Pv	rank	priority
1	How much determinant is globalization trend	541	3.94	01.1	20.60	540	0.00	2.15	1
2	How much determinant is 20-year perspective document (making Iran the most powerful country in the region)	537	3.61	18.1	12.07	536	0.00	1.87	3
3	How much determinant is introduction of Iranian culture and civilization to the world	530	3.76	09.1	16.08	529	0.00	1.98	2

Test value=3

Table 1 shows that the mean of responses about the effects of each variable on internationalization of curriculum is acceptable ($\bar{x} > 3$, $\alpha = 0.05$, p-value <0.05) .It is worth mentioning that Friedman test showed that globalization trend is the highest one. Based on Friedman test results in Table 4, ($\alpha = 0.05$)there is a significant difference among the mean of ranks of these effective variables.

Q2. Which effective factors in distance education approach make it as a strategy for internationalization of curriculum in higher education?

To answer this question, the effectiveness of five variables as the strategic characteristics in distance education approach and one variable for the refusal of this approach are studied and the inferential statistics are presented in Table 2.

Table 2- Descriptive statistics and *t*-test results, mean and priority of effective variables as strategic characteristics of distance education approach for internationalization of curriculum in Iran higher education

R	Variable	n	$\bar{x}$	T	SD	df	Pv	rank	priority
1	The effect of high flexibility of distance education environment	536	3.83	16.60	0.98	535	00.0	3.72	2
2	The effect of using distance education along with traditional one (blended education)	534	3.83	20.13	0.95	533	00.0	3.66	4
3	The effect of using distance education independently or in a blended way in internationalization of curriculum regarding subject	537	3.82	21.71	0.88	536	00.0	3.68	3
4	the prevalence of our higher education internationally using distance education approach	537	3.72	19.42	0.88	536	00.0	3.47	5
5	the effect of the harmony of distance education with internationalization due to pass of geographical, cultural, economic, political borders in this approach	536	3.87	21.81	0.95	535	00.0	3.76	1
6	the effect of the necessity of traditional education (classroom) in Internationalization and refusing distance education approach	531	3.13	2.71	1.14	530	003. 0	2.72	6

Test value=3

It is clear that the mean of the responses about the effects of each variable as a strategy in internationalization of the curriculum is acceptable ($\bar{x} > 3$, $\alpha = 0.05$,p-value< 0.05). Friedman Test showed that the harmony of distance education with internationalization due to pass of geographical, cultural, economic, political borders in this approach has the highest rank and refusing distance education approach has the lowest rank. Friedman test results have been shown in Table 4.

Q3. What are the strategies of internationalization of the curricula with distance education approach in higher education of Iran?

To answer this question, the effectiveness of 37 strategies or variables at macro and micro level were investigated; the inferential statistics are shown in Table 3. It is worth mentioning that the macro strategies are the one which relate to policy-making, decision-making, planning and management out of the institution; micro strategies relate to the implementing issues and inside-the-classroom matters.

Table 3- Descriptive statistics and *t*-test results, mean and priority of effective variables as strategies for internationalization of curriculum with distance education approach in Iran higher education

R	Variables	n	$\bar{x}$	SD	T	df	Pv	rank	priority
1	The effect of having a development perspective plan emphasizing the internationalization of higher education	538	3.76	0.97	22.18	537	0.00	17.12	2
2	the effect of having programs, rules and guidelines in harmony with the perspective	537	3.84	0.92	10.21	536	0.00	18.14	28
3	The effect of comparative studies for various subject with cooperation of other countries	536	4.13	1.94	55.13	535	0.00	21.08	10
4	the effect of knowing about educational systems of other countries	538	4.21	0.82	24.34	537	0.00	23.19	2
5	the effect of using ICT and cyberspace	538	4.20	0.90	74.30	537	0.00	22.94	3
6	The effect of finding common interests in the region and having joint educational courses	538	3.96	0.88	35.25	537	0.00	19.64	18
7	the effect of inviting foreign professors and students to participate in conference in order to attract to Iran higher education	539	3.95	0.93	57.23	538	0.00	19.10	22
8	The effect of having courses with interdisciplinary to respond to current issues	539	3.96	0.89	99.24	538	0.00	19.84	16
9	The effect of having thought rooms to produce thought	532	3.76	0.97	97.17	531	0.00	17.09	33
10	The effect of specific committees in Science ministry for developing international curriculum	537	3.96	0.93	90.23	536	0.00	19.64	19
11	The effect of membership in regional and global higher education conventions	535	4.08	0.87	72.28	534	0.00	21.15	9
12	The effect of having the goals of curriculum for nurturing intercultural and international competences (professionally and socially)	536	3.92	0.87	61.24	535	0.00	18.62	25
13	The effects of giving optional subjects about other countries and culture to native and foreign students	538	3.76	0.93	89.18	537	0.00	16.97	35
14	The effect of giving free choice to foreign students to have subjects totally related to the culture of host country	538	3.70	0.99	28.16	537	0.00	16.23	37
15	The effect of familiarity with one's own culture and other culture in content of the general subjects	534	3.71	1.01	34.16	533	0.00	17.01	34
16	The effect of familiarity with one's own culture and other culture in content of the specific subjects	533	3.63	1.08	50.13	532	0.00	16.47	36
17	The effect of considering educational and language level of the learners	533	3.90	0.97	43.21	532	0.00	19.27	21
18	The effect of developing and presenting the content in the international language	536	4.14	0.90	22.29	535	0.00	21.97	4
19	The effect of having international texts for international students	535	3.89	0.93	11.22	534	0.00	18.34	26
20	The effect of developing and presenting the content in audio, visual, reading, and hypertextual formats	532	4.10	0.88	64.28	531	0.00	21.35	8
21	The effect of using valid and up-to-date scientific resources and books	535	4.38	0.75	67.42	534	0.00	24.59	1
22	The effect of introducing extra resource in the international language	535	4.13	0.87	01.30	534	0.00	21.36	6
23	The effect of content orientation to specialized subjects	530	4.08	0.83	13.30	529	0.00	20.91	11

24	The effect of lack of localization in international content	532	3.90	1.01	60.20	531	0.00	19.04	24
25	The effect of analysis and criticism of different views about global issues in content	523	4.01	0.92	35.25	522	0.00	20.34	12
26	The effect of avoiding national bias in developing international content	539	4.12	0.94	74.27	538	0.00	21.51	5
27	The effect of presenting the content electronically and virtually along with traditional education	538	4.07	0.94	61.26	537	0.00	21.36	7
28	The effect of presenting educational material and resources from different cultural roots	537	3.80	0.91	56.20	536	0.00	17.50	31
29	The effect of more educational support for international students in the initial weeks and months	533	3.84	0.88	93.21	532	0.00	17.81	29
30	The effect of flexibility in using different teaching-learning methods	536	4.01	0.88	63.26	535	0.00	20.14	14
31	The effect of participation of international students in classroom discussions and activities	537	3.98	0.84	23.27	536	0.00	19.61	20
32	The effect of reviewing students' viewpoints toward world issues from other cultural attitude	536	3.94	0.90	15.24	535	0.00	19.05	23
33	The effect of encouraging students to do their projects in other countries	538	4.04	0.84	81.28	537	0.00	20.25	13
34	The effect of having cooperative opportunities in international projects	535	4.02	0.87	98.26	534	0.00	19.70	17
35	The effects of giving international research projects	536	4.01	0.86	32.27	535	0.00	20.07	15
36	The effect of evaluating students in authentic situation or simulated intercultural setting	531	3.80	0.97	90.18	530	0.00	17.50	30
37	The effect of using extra curriculum for internationalization and getting familiar to other cultures	531	3.86	0.97	50.20	530	0.00	18.22	27

Test value=3

It is obvious that the mean of responses about the effect of each variable as a strategy for the internationalization of curriculum with distance education approach is acceptable ($\bar{x} > 3$, $\alpha = 0.05$, p-value <0.05). Friedman test showed that using valid and up-to-date resources and books had the highest rank and giving free choice to foreign students to have subjects totally related to the culture of host country had the lowest rank. (Table 4).

It is worth mentioning that the respondents in Table 4 are those who answered all the questions and the significant level is $\alpha = 0.05$.

Question	**n**	χ^2	**d f**	**P v**
First	528	31.71	2	00.0
Second	524	168.89	5	00.0
Third	462	726.12	37	00.0

Table4- The result of Friedman test for all questions

DISCUSSION

Based the findings of this study, it is necessary to internationalize the curricula in Iran higher education; its main reasons are the globalization trend, the necessity of introducing Iranian culture and civilization to the world and making Iran the most scientific power in the region. According to the survey of AUCC[1](2006), the most important reason of internationalization is to make graduate students internationally competent in terms of information, understanding and perception.

It seems that distance education approach is an effective strategy for internationalization because it has high flexibility, accessibility and speed and also common characteristics of its curriculum elements with international curricula. Collis & Van der Wende (2002) found that international students will affect more their institutions

[1]- Association of Universities and Colleges of Canada

and their policies in order to use ICT and other related educational approaches because of its high flexibility in educational methods.

It is clear that in the current century, the universities must prepare the students who have the competency of living and working as well as responding to the needs of international and intercultural communities; this is obligatory for the graduates to have enough knowledge and perception about various cultures and to have a sort of international/intercultural attitude toward other nations; therefore, the international orientation of curricula in higher education system can give an opportunity to both Iranian students and foreign students.

The scientific cooperation of universities with other universities, research centers and scientific, commercial and professional associations can be an effective strategy for the internationalization of curriculum of distance education in higher education of Iran. Having educational workshops or sabbaticals for native students can be thoughtful. The more scientific cooperation of native professors with their foreign colleagues can be a good way to attract international students to Iran higher education. Whalley, Langley & Villareal (1997) found that making international bonds and cooperation with educational institutions is one of the priorities of international curriculum. Ghaheri (2005), Zare ,Fathi Vajargah& Yamani (2009) concluded that lack of international cooperation with top universities around the world, lack of exchange of professors and students as well as lack of implementation of international projects in Iran are the barriers to internationalization of curricula.

Based on research finding, because Farsi does not have any international dimension as well as it is almost impossible to learn it in a short period of time; therefore, it can be a serious issue for internationalization of curriculum in higher education. Williams' (2008) study emphasized the challenges of language inconsistency for international students in the host country.

To overcome these limitations, there are some strategies: developing subjects in international language for non native students, having bilingual course content, teaching in the international language, introducing resources and books in international language, availability of different language options for content study, removing difficult rules for teaching in a language except Farsi.

In order to internationalize higher education in Iran, some effective strategies must be taken into consideration: having international attitude toward higher education; being active at international levels and training skillful human resources for it; a proper perception of internationalization; flexibility and avoiding bias; dominance of thought in the society and getting to know the global environment. Sometimes there is possibly some resistance to new changes such as distance education and ICT; therefore, it is a must to change the present structures. Zare et al (2009) found that using technology requires reviving structure and extensive organizational changes in higher education of Iran and authorities' unfamiliarity with ICT as well as inflexibility in higher education system are barriers to IOC.

The current rules related to international cooperation and international students are unclear, outdated and inflexible. Zare et al (2009) indicated that denying the position of university as well as lack of academic freedom are the obstacles in the way of IOC. Therefore, it is necessary to give performance freedom to the universities and to avoid putting them into bureaucratically difficult challenges and inflexible structures.

One of the reasons of Iranian low performance in presenting the international appropriate content is due to scientific weakness and language incompetency of professors and lack of skillful human resources for this field. The professors do not have enough experience using virtual learning environments and they are unable to communicate in the international language well. According this finding, Benick, Newby & Samuel (1996) found that most of the professors do not perceive the disciplines of a universal environment because of lack of motivation, interest, experience, commitment, flexibility and an open mind.

Whereas the virtual learning environments cross the borders easily, the professors will be more motivated when they see the results of their attempt in a wider scope all around the world; therefore, they make much more effort to produce content and curriculum in an intercultural and standard framework. On the other hand, distance education can pass the time and space limitations; so, the professors have more time doing their work outside their workplaces.

For professional development and intercultural sensitivity, holding educational workshops, فرصت های مطالعاتی)sabbaticals to abroad studies, interacting with the professors from other culture and doing shared research projects can develop knowledge, experience and international attitudes of Iranian professors. According to Schuerholz et al (2007), most of faculty members emphasized the application of international attitudes in their teaching as well as the need for having opportunities for professional development. In Ellingboe's study, however some professors had international experience; they did not have cognitive change for this (Mestenhauser & Ellingboe, 1998).

The technical and technological substructures, educational equipment and facilities such as software, supportive educational kits, Learning & Content Management System and online educational technology are necessary for internationalization of curriculum with distance education approach in higher education of Iran. In fact, providing opportunities for international students can be one of the main goals of institutions in using ICT. According to Ghaheri (2005) and Zare et al (2009), the barriers related to equipment are the most important ones in the way of IOC in Iran.

To be successful in internationalization of higher education of Iran, the cultural and linguistic similarities of the Middle Eastern countries can be an advantage to attract their students to Iranian educational system. Using ICT and distance education and enough advertisement, we can introduce out higher education to this region.

For internationalization, it is quite useful to get to know higher education systems better, to have seats in regional and international conventions of higher education and distance education, to hold thinking rooms consisted of local and international experts in order to identify the strength and weakness of the current curricula as well as changing them to intercultural/international ones. It is worth mentioning that there should be a specialized organization in Science and Technology Ministry to investigate the issues and challenges of internationalization of higher education and curricula.

The strategies and activities are of great importance at the executive and class levels which affect internationalization of curriculum elements in goals, content, educational materials and resources, teaching - learning and evaluation methods. The content must be developed in such a way that is up- to-date, scientifically and culturally diverse and applicable and understandable for the learners. This content needs to be based on different learning styles. Teaching-learning and evaluation methods must be flexible and diverse as well as regarding learner-centeredness. Being flexible in using different methods including lecture, discussion, problem solving, projects, research, internship, laboratories, educational films, video conferencing, virtual discussion forum, a virtual visit of historical sites, meeting famous people, the student teams, field and tour trips regarding the field of study and subject can reduce linguistic, cultural and training inconsistency. The results of Williams' (2008) study also confirm these findings.

What is recommended here is the emphasis on achieving metacognition, critical teaching and training as well as active and experiential learning which motivate students to do research and have critical analysis; so, it develops intercultural knowledge and skills. These principles make fundamental change in thoughts and attitudes of students and this is the ideal which is important in transformative approach as well as the best approach for internationalization of the curriculum, though not the most appropriate option. The basic change is what to teach and how to teach in transformative approach to IOC and based on research findings most of the strategies and activities in curriculum elements are based on this approach; therefore, based on the statistical results, all of them are significantly influential on the IOC with distance education approach in higher education of Iran.

Hooks (2003) stated that the transformative approach to IOC makes the students and professors to change their thought paradigms and to look at the world from different ethnical, cultural and gender perspectives.

It is worth mentioning that the current approach in curricula of Iran higher education are far away from the research, analytical and critical ones and even in virtual space they are based on lecture, memorization, translation and outdated pamphlets; so it is obligatory to revise them. The results of Ghaheri's (2005) and Zare et al (2009) confirm this.

Because of the high flexibility and effectiveness of distance education approach, this can be a considerable strategy in developing and presenting an international curriculum. Additionally, distance learning can remove the bias as well as cultural and ethnical issues.

Giving free choice to students for their homework, research projects and diversifying evaluation methods can somehow foster intercultural approach. According to the results of a study at Monash University (2005), one of the basic principles in designing international curriculum is the use of various evaluation types. It is better that evaluation be in authentic situations or simulated intercultural settings. In distance learning at an international level it is necessary to clarify course goals, performance, expected results, the style of evaluation.

All in all, based on what was discussed about, it seems to achieve the scientific goals in an international endeavor in the current globalization of the higher education, using distance education approach and presenting the curricula in a virtual and electronic framework can be a deeply thoughtful strategy for the internationalization of curricula in higher education system of Iran. Flexibility, availability and high productivity of this educational environment make it an appropriate option to change what is taught and how to teach(Transformative approach) for internationalizing curriculum, especially IaH and it can be used in an independent or blended way based on the conditions, subjects, environmental factors, inside-the-organization factors, resources, facilities, limitations and the current opportunities. Although there are some motivational and cognitive barriers as well as the shortcomings such as substructures, technology, financial and human resources to distance education as a considerable approach to learning in Iran, blended learning is the best option.

REFRENCES

Aspan, J. (1993). *Curricular and administrative considerations*. In Cavusgil, S. T. (Ed.) Internationalizing business education: Meeting the challenge (pp.15-30). Michigan: Michigan state university press.

AUCC(2006). Internationalization survey update: *Internationalization of the curriculum*,Ottawa.available online: www.aucc.ca/_pdf/english/publications/ curriculum

AUCC(2009). *Internationalization of the curriculum: A practical guide to support Canadian universities' efforts*, ISBN: 9780888762763, available at : www. aucc. ca /pdf /English /publications /curriculum

Bain,O., Luu ,D.T, Green,M.F.(2006) *Students on the Move: The Future of International Students in the United States* .Available online**:** www.acenet.edu/programs/international

Bond,Sh.(2006).*Transforming culture of learning: Evoking the international dimension in Canadian university curriculum*. York University,Canada.

Bostrom,Ch.A.(2009). *Diffusion of internationalization in Turkish higher education*, Journal of studies in international education,Vol 10. No 5.

Caruana,V.(2004) *International mission impossible? ICT and alternative approaches to internationalizing the curriculum*, Networked learning conference .

Collis, B.&van der Wende, M.(2002). *Models of Technology and change in higher education: An international coparative survey on the current and future use of ICT in higher education*, Center for Higher Education Policy Studies(CHEPS).

Currie,J.,&Vidivich,L.(2000), *Privatization and competition policies for Australian universities*. International journal of educational development, 20(2), 135-151.

Early,P.C., Ang,S. &Tan, J. (2006) CQ: *Developing culture intelligence at work*, Palo Alto, CA: standford university press.

Ghaheri, Razieh (2005), *A Study of Effects of Higher Education International Communication in Curricula from the Viewpoints of Faculty Members of State Universities in Tehran and Curriculum Development Experts*, M. A. Thesis, Curriculum Development, Shahid Beheshti University. (http// :www fep. sbu. ac. ir/ Portals/ 7/ Payannameh IMG /p16/ 508. doc)

Harari, M. (1992) *The internationalization of the curriculum*. In C. B. Klasek (Ed.), Bridges to the future: Strategies for internationalizing higher education (pp. 52-79). Carbondale, IL: Association of International Education Administrators.

Hooks,B.(2003) *Teaching community:A pedagogy of hope* ,New York:Routledge.

International study abroad guides, malaysis, asia (2008), avaiable at: www. topuniversities. com/ country_guides/ malaysia

Jones, E&, Brown, S.(2007), *Internatonalising higher education*,Routledge,Great Britain

Knight, J. (1995). *Internationalization at Canadian universities*: The changing landscape. Ottawa, ON: Association of Universities and Colleges of Canada , available at : www. aucc. Ca / /English /publications /curriculum

Mestenhauser, J. A. & Ellingboe, B. J. (1998) *Reforming the higher education curriculum: Internationalizing the campus*, Arizona, American council on education & Oryx Press.

Mihhailova,G.(2006) *E-Learning as internationalization strategy in higher education: Lecturer's and student's perspective*, Baltic journal of management, vol. 1 No.3.

Moore,M.& Tait,A. (2002) *Open and Distance Learning: Trends, Policy and Strategy Considerations*. [Electronic version]. UNESCO, Division of Higher education. Retrieved August 31, 2007 from: http:// unesdoc. unesco. Org /images /0012 /001284 /128463 e.pdf

Morey, A. I. (2000) *Changing higher education curricula for a global and multicultural world*. Higher Education in Europe 25(1): 25-39.

Nowrouz Zadeh, Reza (2006) *The Study Of Top Documents And Inducing Policies To Write Fifth Program In Higher Education, Research And Technology*, Tehran, Ministry Of Science, Research And Higher Education, Research And Planning of Higher Education Institution.

Schuerholz-Lehr, S. (2007) Teaching *for global literacy in higher education: How prepared are the educators?* Journal of Studies in International Education, 11(2), 180-204.
Shailer,K.(2006*) Internationalizing the curriculum:An inventory of key issues,model programs and resources*,Canada, Academic colleague, OCAD
Statistics of Higher education in Iran (2006-2007) Ministry Of Science, Research And Higher Education, Research And Planning of Higher Education Institution.
Thune,T.&Welle- Strand,A.(2005). *ICT for and in internationalization process:A business school case study*, Journal of higher education,50:593-611
Verbik,L.(2006). *Students on the move : the future of international students in USA*.ACE issue brief.
Whalley,T., Langley,L & Villareal,L.(1997). *Best practice guidelines for internationalizing the curriculum*, Dougls college for the province of British Columbia, Ministry of education, skills and training and the Centre for Curriculum, Transfer and Technology.
Williams,Sh.(2008). *Internationalization of the curriculum:A remedy for international students'academic adjustment difficulties*, Memorial University of Newfoundland.
Zare'e, Ozra; Fathi Vajargah, Kourosh; Yamani, Mohammad (2009) *A Study of International Barriers of Curricula in Higher Education Institutions And Universities from viewpoints of Faculty Members (Shahid Beheshti University*), Research and Planning in Higher Education Journal, Vol. 54, pp. 63-82

TWITTER USAGE OF UNIVERSITIES IN TURKEY

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ABSTRACT
Universities are among the users of the most popular social media networks. Usage of social media by especially students and many other people and institutions, which constitutes the target audience for universities, encourages the universities to effectively use this environment. Twitter is among these social media networks which facilitate the communication by providing a faster, easier and economical means to interact with target audience in different parts of the world. In order to contribute to effective use of Twitter, tweets of the top ten most followed state and foundation universities in Twitter were examined in our research. These tweets were then compared with each other by their subjects, by tools they use, and by the participation of users to the tweets posted. Differences among them were attempted to be identified by using the content analysis method.
Keywords: Internet, Twitter, Social Media

1. INTRODUCTION

"Technology provides society with new opportunities to design all things well." (İşman, 2012) Technology's new opportunities are learned quickly and the usage of computer and internet is increasing more and more ever day in Turkey too. Following social media is one of the main reasons of internet usage. According to the results of Survey on Information and Communication Technology in Households conducted by Turkish Statistical Institute (TÜIK), following social media is ranked 6th among other reasons of personal internet usage of individuals who used internet in January-March 2012.

According to the survey, individuals are using internet for reading and downloading online news, newspapers and magazines (72.5%), sending/receiving e-mails (66.8%), searching information about the products and services (61.3%), downloading or playing games, music, movies, images (49.1%), and then for participating in the chat rooms, blogs, newsgroups or sending messages to online discussion forums and instant messaging (41.6%). (Sending messages to social groups such as Facebook, Twitter, chatting, real-time messaging Msn, Skype etc.) (TÜİK, 2012)

History of social media goes back to 1979 to Usenet, established by Tom Truscott and Jim Ellis by which the articles were sent to the newsgroups. Whereas the history of modern social media in which the users may effectively participate, goes back to 1997, to SixDegrees. (Hazar, 2011)

Social media are among the most popular web sites today. According to Alexa.com, Facebook is the 2nd among the most popular websites worldwide and YouTube ranks 3rd. Twitter comes 10th in the list. (Alexa, 2013) Whereas in Turkey, Facebook is at the top, YouTube is placed 3rd and the Twitter is at 13th place. (Alexa, 2013)
"Social media are Internet platforms designed to disseminate information or messages through social interactions, using highly accessible and scalable publishing techniques. Social media is composed of content (information) and social interaction interface (intimate community engagement and social viral activity)." (Li, Shiu, 2012) "Social media is a term, consisting of online tools and websites which build interaction by providing the users to share information, ideas, interests and data. As obvious from its definition, social media is an interface in order to construct a community and network by encouraging the participation and connection within." (Sayımer, 2008) Social Media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content." (Kaplan, Haenlein, 2010) To fall under social media definition an application or a website must have independent users from its publisher, have user related content, establish interaction among its users and must not be limited to a time and place set. Social media is a means of sharing, interaction and communication, in which the discussion is fundamental. (Erkul, 2009)

"Social network sites are also used synonymous with the more broad-based term 'social media' by some authors" (Lasorsa, Lewis, Holton, 2012) Social network sites is described as follows: "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site." by Boyd and Ellison. (Boyd, Ellison, 2007)

Besides being a communication channel, social media can act as a catalyzer for other channels as well. (Güçdemir, 2010) For instance followers can access the website belong the link when links, which is on tweets, click by followers who interest with the subject. Individuals are no longer just watchers or readers but they transform into players who directly spread information with the help of social media. (Yağmurlu, 2011) Social, video, image and information sharing networks as well as microblogs such as Twitter are listed among the social media application.

Twitter, one of the most popular social media, showed up in 2006 and it was accepted as "real-time information network" (Twitter, 2013)"short message service" or "micro-blogging" application (Lovejoy, Waters, Saxton, 2012). "Micro-blogs (e.g., Twitter) are social networking services that enable users to send and read very short messages, which are usually restricted by the number of characters in the message." (Berthon, Pitt, Plangger, Shapiro, 2012)

"Twitter is a real-time network that allows users from across the globe to share information through private and public messages" (Waters, Jamal, 2011) Twitter has over 500 million registered users today. Some Twitter users may have millions of followers, i.e. Justin Bieber has 36 million, Lady Gaga has 35 million, Katy Perry has 33 million, Rihanna has 28 million, Barack Obama has 28 million followers. (Twitter, 2013)

Twitter users construct their own profiles, choose whom they want to follow and send their messages defined as "tweet" and capped at 140 characters in a way to be seen by their followers. Tweets posted by users appear in reverse chronological order on the user's profile. (Rybalko, Seltzer, 2010) Messages can promptly be seen by the followers. Members of a group may be informed of whereabouts of other users and what other users do at a specific time. "Users have the capability to send messages directed to other users (i.e.,@username), to ''retweet'' (or re-broadcast) messages originally posted by others, and to follow or engage in trending topics (i.e., #trendtopic)." (Lasorsa, Lewis, Holton, 2012)

Some Twitter terms and signs means like this; (Twitter, 2013)
-Tweet (verb): "Tweet, tweeting, tweeted. The act of posting a message, often called a "Tweet", on Twitter."
-@: "The @ sign is used to call out usernames in Tweets. When a username is preceded by the @ sign, it becomes a link to a Twitter profile."
-Retweet (noun): "A Tweet by another user, forwarded to you by someone you follow."
-#: "The # symbol, called a hashtag, is used to mark keywords or topics in a Tweet. It was created organically by Twitter users as a way to categorize messages."
"Twitter is a service for friends, family and coworkers to communicate through the exchange of quick, frequent answer to one simple question: What are you doing?" (Scott, 2009) Twitter prompts users to answer this question, "creating a constantly- updated timeline, or stream, of short messages that range from humor and musings on life to links and breaking news." (Marwick, Boyd, 2011)

2. PURPOSE AND METHODOLOGY

In our research, twitter messages of most followed 10 state and foundation universities were examined. Content Analysis method, a research method defined by Berelson (1952) as "objective, systematic and quantitative description of manifest content of communications" was used in order to identify the present content. (Bilgin, 2000)

In Twitter, there are university accounts opened and operated by universities themselves as well as there are different group's accounts which are opened and managed using the name of the universities. Scope of our research covers only official university Twitter accounts. In order to ensure that exclusively official accounts were chosen, only these Twitter accounts were included in our research which were linked in the official websites of universities and whose link were active.

There are 103 state and 65 foundation universities in Turkey according to information provided on the official website of Higher Education Council (YÖK). (YÖK, 2013) YÖK website includes the names and web addresses of all universities as well. University websites were reached by using this information in our research. (YÖK, 2013) Then simply by clicking on Twitter logos and names presented in these official websites, official university Twitter accounts were reached. Ten most followed state and foundation universities were identified and expressed in tables based on the number of followers of their accounts. Ten most followed state and foundation universities are as follows:

Table 1: Ten most followed state universities

University name	Number of follower
İstanbul University	12257
Middle East Technical University	10663
Istanbul Technical University	10227
Yıldız Technical University	9690
Sakarya University	9446
Bogazici University	7610
Ege University	7345
Marmara University	6670
Pamukkale University	4984
Abdullah Gül University	4498

Table 2: Ten most followed foundation universities

University name	Number of follower
Yeditepe University	13501
Bahçeşehir University	10653
İstanbul Bilgi University	10029
İstanbul Aydın University	7961
Bilkent University	7558
Beykent University	6822
İstanbul Kültür University	5443
Nişantaşı University	5173
Fatih University	5091
TOBB University of Economics and Technology	4857

Within the scope of the research, Twitter messages which were posted on the official university Twitter accounts between July and December 2012 were reached. Tweets posted on the first day of each month were selected and in some cases where there were no tweets on the first day, tweets of the next day were counted in. Those tweets then, which were obtained from different university accounts, were compared.

Messages posted on the Twitter accounts were examined and as a first step, it was attempted to define to which questions these messages were responding. Questions, which will then be used in our research, have been chosen based on previous article "Use of News Articles and Announcements on Official Websites of Universities". (Yolcu, 2011) Therefore, responded questions were classified under 4 main categories based on their characteristics. Those categories are "Information about the University", "Ways of reaching and contacting the University", "Easier and faster access to information relating to the university and to services offered" and "Admissions to the University. Announcements and conditions to join events, services and resources".

Questions used in the previous research were re-evaluated based on the needs of our new research and necessary amendments were made based on our assessment of which questions were responded by those new matters faced during the examination of Twitter accounts in our research but not faced while the websites were examined in the previous research. Questions for each category which will be used in our research are presented in Table 3.

Table 3: Main subjects of tweets and matters responded therein.

Questions within each category used in our research are listed below;

A-Information about the University

	QUESTIONS ANSWERED	MAIN SUBJECTS OF TWEETS
1	Who we are?	Name, logo, history of the university
2	What we produce as a result of works we conduct?	Publications done by researchers, research findings, awards, success stories of graduates...
		Success of academics and students
3	What do we do? What services we give?	-Programs offered, researches being conducted, services offered to the public, works in Public Relations and Social Responsibility
		Conferences and seminars, academic visits, events related with education and science
4	The infrastructure, life on campus, support services?	-Campuses, administrative units and offices, facilities on campuses, laboratories, museums, galleries, collections, botanical gardens, libraries, bookstores, shopping facilities, food services, housing opportunities, security, health services/hospital, day care, -Artistic and athletic activities on campus, student events -Support Services: counselling services, career services, facilities for the disabled...
		Libraries, scholarships
5	Who works at the university? What are their work principles?	Administration, administrative policy, Vision/mission and working principles, personnel policies, job opportunities, Targets retirees...

B- Ways of reaching and contacting the University

	QUESTIONS ANSWERED	MAIN SUBJECTS OF TWEETS
6	What are ways of reaching and contacting the university?	Contact Information (telephone, address, fax, email address), directory, map, getting to the university using public transportation, directions....

C-Easier and faster access to information relating to the university and to services offered

	QUESTIONS ANSWERED	MAIN SUBJECTS OF TWEETS
7	What are the media organs to reach information pertaining to the university	Magazines, Newspapers, Mail, Blog, Podcast, Social Media, Website...
8	What are practices that provide access to services and information from the University?	Being informed about services and events at the university through university’s own e-mail system, SMS and website, to be able to reach desired information and to send information to the related persons, a search engine built into the website, special pages prepared for its target audience (Graduates, business world and entrepreneurs, potential students, academic staff and employees, media, students other than university students, parents and friends, visitors, Media, donators, job seekers, neighbours) Online directory, Online library catalogue …

D- Admissions to the University. Announcements and conditions to join events, services and resources

	QUESTIONS ANSWERED	MAIN SUBJECTS OF TWEETS
9	How are admissions conducted?	Special pages what contain information needed by future students, admissions conditions, Fees and Scholarships, Information for those who might wish to visit the campus, Information for those who might wish to donate to the university, how to rent university facilities, campus tours...
		Informations about student registration**,** university presentation activities

Secondly, to what extent the means such as image, video, link, summary, @, #, e-mail address and phone number which have been used in the content of the tweets were determined. It was also determined if formal jargon was used or if there were tweets posted in languages other than Turkish.

Thirdly, it was identified to what extent the users retweeted, added to their favorites, commented/questioned the messages sent by followers and to what extent the universities responded to comments and questions posted by the followers.

The question to which our research attempts to answer is:
QUESTION: "What are the differences of messages posted on the Twitter accounts of ten most followed state and foundation universities?
Examining the obtained quantitative data by using the content analysis method, above question was attempted to be answered in our research.

3. FINDINGS

A total of 250 tweets on state universities and 224 tweets on foundation universities were detected. Those tweets fall into three categories: "tweets posted by the universities", "tweets posted by the university departments or university staff and retweeted by the university" and "tweets posted by other users and retweeted by the university". Our research covers only first two categories: "tweets posted by the universities", "tweets posted by the university departments or university staff and retweeted by the university". In this context, 242 tweets of state and 199 tweets of foundation universities were compared with each other.

Table 4: Most followed 10 state universities on Twitter and informations about Twitter accounts

University name	**Tweets posted by the universities**	**Tweets posted by the university departments or university staff and retweeted by the university**	**Tweets posted by other users and retweeted by the university**	**Total**
İstanbul University	22	-	-	22
Middle East Technical University	37	2	-	39
Istanbul Technical University	10	-	-	10
Yıldız Technical University	14	7	2	23
Sakarya University	53	-	-	53
Bogazici University	10	-	5	15
Ege University	28	-	-	28
Marmara University	29	-	-	29
Pamukkale University	8	-	-	8
Abdullah Gül University	22	-	1	23
Toplam	233	9	8	250

Table 5: Most followed 10 foundation universities on Twitter and informations about Twitter accounts

University name	**Tweets posted by the universities**	**Tweets posted by the university departments or university staff and retweeted by the university**	**Tweets posted by other users and retweeted by the university**	**Total**
Yeditepe University	32	-	-	32
Bahçeşehir University	12	8	3	23
İstanbul Bilgi University	35	-	-	35
İstanbul Aydın University	9	2	-	11
Bilkent University	6	-	2	8
Beykent University	20	-	3	23
İstanbul Kültür University	20	-	3	23
Nişantaşı University	17	-	2	19
Fatih University	12	8	1	21
TOBB University of Economics and Technology	10	8	11	29
Toplam	173	26	25	224

Messages on Twitter accounts were examined and it was initially determined mainly what questions were attempted to be answered by these messages. It is seen from the results that most tweets provide information about the university. (Table 6) 69% of tweets posted by the state universities and 70.35% of the tweets posted by the foundation universities include information about the university.

1.24 % of the tweets posted by the state universities respond to questions “Who are we?”, whereas 8.68 % of them to “What we produce as a result of works we conduct?”, 24.79% of them to “What do we do? What services we give?”, 31.4% of them to “How are the infrastructural facilities, campus life and support services?”, 2.89% of them to “Who works at the university? What are their work principles?”. Those percentages for the corresponding questions for tweets posted by the foundation universities are 0.5%, 4.52%, % 44.72%, 19.6 % and 1% respectively.

The second matter about which tweets provided information is the ways of participating to the university (Admissions to the University. Announcements and conditions to join events, services and resources). The matter of “Invitation and conditions to joining to activities, services and opportunities” corresponds to 17.77 % of tweets posted by the state universities and 16.08% of tweets posted by the foundation universities.

Another matter, less frequent though, found in the tweets posted by the universities, which provides information is “Easier and faster access to information relating to the university and to services offered”. 3.72 % of tweets posted by the state universities and 1.5% of tweets posted by the foundation universities respond to question of “What are the media organs to reach information pertaining to the university”

One other matter less subjected in the tweets is the ways of reaching and contacting the university. In these tweets, the means of contacting with the university are reminded to users by providing phone number and e-mail address or by reinstating that it is possible to contact via social media. 0.83 % of tweets posted by the state universities and 3.52 % of tweets posted by the foundation universities respond to question of “What are ways of reaching and contacting the university?”

Furthermore, unlike the article “Use of News Articles and Announcements on Official Websites of Universities” further information such as other institutions’ activities relating to the university, scientific data, condolences and commemorations, celebrations for special days and get-well messages were encountered in tweets. 4.55 % of tweets posted by the state universities inform about other institutions’ activities relating to the university and 3.3% of them provide scientific data whereas 0.5% of tweets posted by the foundation universities inform about other institutions’ activities relating to the university, 0.5% of them provide scientific data and 4.02% of them involves condolences and commemorations, celebrations for special days and get-well messages.

Among the examined tweets, furthermore, there are numerous tweets posted aiming at responding a question using Twitter received via Twitter. In 14 tweets (% 5,78) posted by state universities and in 62 tweets (% 31,15) posted by foundation universities various questions received via Twitter were responded.

Table 6: Main subjects and questions responded in tweets posted by most followed 10 state and foundation universities on Twitter

		State Universities	%	Foundation Universities	%
A	**Information about the University**	**167**	**% 69**	**140**	**% 70,35**
A1	Who are we?	3	% 1,24	1	% 0,5
A2	What we produce as a result of works we conduct?	21	% 8,68	9	% 4,52
A3	What do we do? What services we give?	60	% 24,79	89	% 44,72
A4	How are the infrastructural facilities, campus life and support services?	76	% 31,4	39	% 19,60
A5	Who works at the university? What are their work principles?	7	% 2,89	2	% 1
B	**The ways of reaching and contacting the university**	**2**	**% 0,83**	**7**	**% 3,52**
B6	What are ways of reaching and contacting the university?	2	% 0,83	7	% 3,52
C	**Easier and faster access to information relating to the university and to services offered**	**9**	**% 3,72**	**3**	**% 1,5**

C7	What are the media organs to reach information pertaining to the university?	9	% 3,72	3	% 1,5
C8	What are practices that provide access to services and information from the University?	-		-	-
D	**Admissions to the University. Announcements and conditions to join events, services and resources**	**43**	**% 17,77**	**32**	**% 16,08**
D9	How are admissions conducted?	43	% 17,77	32	% 16,08
E	**Other subjects**	**19**	**7,85**	**10**	**5,02**
E10	Other institutions' activities relating to the university	11	% 4,55	1	% 0,5
E11	Scientific datas	8	% 3,3	1	% 0,5
E12	Messages (condolences and commemorations, celebrations for special days and get-well messages)	-	-	8	% 4,02
	Page is not found	**2**	**% 0,83**	**7**	**% 3,52**
	Total	242		199	

Secondly, it was determined which and to what extent tool in the content of Twitter messages were used to identify how the universities deliver their messages on Twitter. (Table 7) Furthermore, it was determined to what extent an informal jargon was used and, if any, tweets posted in other languages than Turkish in Twitter messages.

In the examined tweets, "providing link to another website" turned out to be the mostly used tool among others. There were links provided in 83.8% of tweets posted by the state universities and in 51.2% of tweets posted by the foundation universities. Since there were 2 links provided in some cases, total number of links amounts to 218 for state universities and 104 in foundation universities.

Most links provided by universities belong to their official websites. (Table 8) 48.62% of links provided by the state universities and 43.27 % of links provided by the foundation universities direct the user to university's official website on which the subject is clarified in detail. Official university websites were followed by social media. 39.9% of links provided by the state universities and 47.12 % of links provided by the foundation universities belong to social media. Twitter and Facebook were found as most linked social media. They are followed by YouTube. Third mostly linked website type is the website which publishes on universities. 5.96% of links provided by the state universities and 0.96% of links provided by the foundation universities belong to websites which publish on universities. There are links to mass media in tweets as well. 3.67 % of links provided by the state universities and 0.96% of links provided by the foundation universities belong to mass media.

The second mostly used tool in the examined tweets is citing a Twitter address of other users which typically starts with @ symbol in the body of tweet. It is therefore ensured by that means that the Twitter user, whose address is included in the body of the message, gets the message as well. 9.91% of tweets posted by the state universities and 40.7% of tweets posted by the foundation universities include Twitter addresses which starts with @ symbol.

The third mostly used tool in tweets is using an informal jargon on occasions in writing tweets other than using full formal one. An informal jargon was detected in 9.92 % of tweets posted by the state universities and 25.63% of tweets posted by the foundation universities.

The fourth mostly used tool in tweets is using an image related with the message. 8.26 % of tweets posted by the state universities and 19.59% of tweets posted by the foundation universities included an image.
The fifth mostly used tool in tweets is using a hashtag starting with the symbol #. 2.89 % of tweets posted by the state universities and 2.01% of tweets posted by the foundation universities included # symbol.

The sixth mostly used tool in tweets is adding a video related with the message. 3.71% of tweets posted by the state universities and 1% of tweets posted by the foundation universities included a video as well.

The seventh mostly used tool in tweets is providing university contact phone number. 0.82% of tweets posted by the state universities and 3.01% of tweets posted by the foundation universities included phone number.

The eight mostly used tool in tweets is writing the message in another language in order to reach out people who use a different language other than Turkish. 2.47% of tweets posted by the state universities and 0.5% of tweets posted by the foundation universities included a message written in a different language other than Turkish. All of these messages written in a foreign language were in English.

The ninth mostly used tool in tweets is providing summary information. 2.06% of tweets posted by the state universities and 0.5% of tweets posted by the foundation universities included summary information.

The tenth mostly used tool in tweets is providing e-mail address. While there was no occasion of a tweet including e-mail, in tweets posted by the state universities, 0.5% of tweets posted by the foundation universities included an e-mail address.

Table 7: Tools used by state and foundation universities in their Twitter messages

	State Universities	**%**	**Foundation Universities**	**%**
Number of examined tweets	242	% 100	199	% 100
1- Number of tweets providing link to another website	**203**	**% 83,8**	**102**	**% 51,2**
Total number of links	218		104	
2- Number of tweets including @ symbol	**24**	**% 9,91**	**81**	**% 40,7**
Number of @ symbol	26		84	
3-Using an formal jargon	**218**	**% 90,08**	**148**	**% 74,37**
Using an informal jargon	24	% 9,92	51	% 25, 63
4-Image	**20**	**% 8,26**	**39**	**% 19,59**
5- Hashtag (#)	**7**	**% 2,89**	**4**	**%2,01**
6-Video	**9**	**% 3,71**	**2**	**% 1**
7-Providing university contact phone number	**2**	**% 0,82**	**6**	**% 3,01**
8- Writing the message in another language	**6 (English)**	**% 2,47**	**1 (English)**	**% 0,5**
9- Summary	**5**	**% 2,06**	**1**	**% 0,5**
10- Providing e-mail address	**-**	**-**	**1**	**% 0,5**

Table 8: Link addresses of tweets providing

	State Universities	**%**	**Foundation Universities**	**%**
University's official websites	106	% 48,62	45	% 43,27
Social media (Twitter, Facebook, Youtube, Instagram, Wikipedia, etc.)	87	% 39,9	49	% 47,12
Websites which publish on universities	13	% 5, 96	1	% 0,96
Websites belong to mass media	8	% 3,67	1	% 0,96
Websites belong to a media monitoring agency	-		4	% 3,846
Google	-		3	% 2,88
Official establishment	1	% 0,46	1	% 0,96
Others	1	% 0,46	-	-
Page is not found	2	% 0,92	-	-
Total number of links	218		104	

Thirdly, user reactions to tweets posted by the university were examined. (Table 9) Twitter users mainly react in 3 ways: by retweeting, by adding the tweet to their favorites and by responding. The most preferred way of tweeting by users is retweeting. 135 of total 242 tweets posted by the state universities (55.78%) and 117 of 199 total tweets posted by the foundation universities (58.79) were retweeted by at least one user. Totally, it was found that tweets posted by the state universities were retweeted 565 times and tweets posted by the foundation universities were retweeted 676 times. According to that, there is on average 2.33 retweet for each tweet posted by the state universities. This figure is a little bit higher in foundation universities by 3.39 retweet for each tweet.

Second most preferred way of tweeting by users is adding the tweet to favorites. 52 (21.48%) tweets posted by the state universities and 32 tweets posted by the foundation universities (16.08%) were added to the favorites by at least one user. Totally 104 tweets by the state universities and 48 tweets by the foundation universities (58.79) were found as added to the favorites. According to that, there is on average 0.42 cases of adding of a tweet to favorites for each tweet posted by the state universities. This figure is 0.24 in foundation universities.

Third most preferred way of tweeting by users is starting a conversation by responding to a tweet or joining to an existing conversation. Users may send comments, suggestions, questions and greeting messages. 24 tweets posted by the state universities (9.91%) and 41 tweets posted by the foundation universities (20.6%) were responded by at least one user. Totally 35 tweets for the state universities and 72 tweets for the foundation universities were responded by users. 25 users (71%) positively and 10 (29%) users negatively responded to tweets posted by the state universities whereas 54 users (75%) positively and 18 (25%) users negatively responded to tweets posted by the foundation universities.

University responses to the response tweets of the users were examined as well. (Table 10) It was seen that the state universities responded to 2 of 35 response tweets (5.41%) whereas foundation universities responded to 20 of 72 response tweets (27.77%). One of the response tweets responded by the state universities was positive and the other one was negative. 17 out of 20 response tweets by the foundation universities were positive and remaining 2 were negative. It was not possible to determine whether 1 remaining tweet was positive or not since the tweet was not available on the Twitter page.

Table 9: Numbers of retweets, adding to favorites and responses by users to tweets posted by the state and the foundation universities

	State Universities	%	Foundation Universities	%
Total number of tweets examined	242	100%	199	%100
Number of retweets by at least one user	135	55.78%	117	58.79%
Total retweets to all tweets	565		676	
Number of adding to favorites by at least one user	52	21.48%	32	16.08%
Total number of adding to favorites	104		48	
Number of responses to tweets by at least one user	24	9.91%	41	20.6%
Total number of responses to tweets	35		72	

Table 10: Numbers of response tweets by users to tweets posted by the state and the foundation universities.

	State Universities	%	Foundation Universities	%
Total number of response tweets by users	**35**	**100%**	**72**	**100%**
Total number of positive response tweets by users	25	71%	54	75%
Total number of negative response tweets by users	10	29%	18	25%
Number of response tweets of universities to questions, suggestions and messages posted by users in a conversation.	**2**	**100%**	**20**	**100%**
Number of positive response tweets by universities	1	50%	17	85%
Number of negative response tweets by universities	1	50%	2	10%
Number of response tweets by universities whose content was not clear	-	-	1	5%

4. ARGUMENT AND CONCLUSION

There are 7 main subjects visible in the tweets posted by the most followed ten state and foundation universities on Twitter. These are: Information about the university, the ways of reaching and contacting the university, easier and faster access to information relating to the university and to services offered, admissions to the university/ announcements and conditions to join events, services and resources, other institutions' activities relating to the university, scientific data and messages of condolences, commemorations, greetings for special days and get-well messages. Followers of universities on Twitter thus are able to follow the developments in their university and are able to learn their university's way of thinking by these means even though they are physically far from their university.

When the state and the foundation universities are compared by the subjects of the tweets they posted, it was seen that the state universities mainly attempts to provide information on "infrastructural facilities, campus life and support services" while the foundation universities attempts to provide information on "works and services provided by the university". Second subject which is sought to be answered in the Twitter messages is "works and services provided by the university" for the state universities and "infrastructural facilities, campus life and support services" for the foundation universities. Third and fourth subject included in the tweets of both state and foundation universities are the same. Both have "admissions to the university/ announcements and conditions to join events, services and resources" as their third subject and "What we produce as a result of works we conduct?" as the fourth subject.

Universities do not use Twitter only for promoting the university and providing information for their followers but also for responding to questions received from their followers. Because social media, by facilitating the communication, enable the users rapidly exchange information among them and get responses to their questions. Universities respond to questions received via Twitter by using Twitter so that other users were informed about the subject as well. Questions received via Twitter were responded by using Twitter in 5.78% of tweets posted by the state universities and 31.15% of tweets posted by the foundation universities. Based on these figures, it is seen that the foundation universities are using Twitter in order to respond to questions received via Twitter more than that of the state universities.

It was examined as well which tools were used by the universities on Twitter. Most used tools are as follows: providing link to another website in the body of tweet message, citing a Twitter address of another user in the body of tweet, using an informal jargon in writing the tweets, posting images, using a hashtag constructed by using # symbol, attaching videos, sending tweets in different languages, involving summary information and providing e-mail address.

Mostly used means among others by universities on Twitter is "providing link to another website". There were links provided in 83.8% of tweets posted by state universities and in 51.2% of tweets posted by foundation universities. Most links provided by universities belong to their official websites. Official university websites was followed by social media. Twitter, Facebook and YouTube are most linked social media. Social media content mostly consisted of shared video and image. Websites which publish on universities ranks third while mass media ranks fourth in links. By utilizing links, universities are able to use effectively 140 characters of space provided by Twitter and enable other users get detailed information by simply clicking if needed. Links are not just a means of communication but also may act as a catalyzer to direct users to a desired address when used.

The second most used tools is citing a Twitter address of another user in the body of tweet and therefore, sending the message to this very user as well. By doing so, it is aimed at raising attention of other users which are considered to be related with the subject and with the message. 9.91% of the tweets posted by the state universities and 40.7% of the tweets posted by the foundation universities include a Twitter address of another user. Based on these figures, it is seen that the foundation universities use this means approximately more than state universities do.

The third most used tool in tweets is using an informal jargon when writing the tweets. Social media by itself is far from being formal and distinct from other means of communications by being a convenient communication platform. Thus using an informal jargon instead of a formal one seems more appropriate for Twitter. 9.91% of the tweets posted by the state universities and 25.62% of the tweets posted by the foundation universities use an informal jargon. Based on that, foundation universities use a more appropriate way of expression than state universities do.

The fourth most used tool in tweets is including an image relating to the message. 8.26% of the tweets posted by the state universities and 19.59% of the tweets posted by the foundation universities also include an image. Attaching an image to a message is becoming ever easier since digital cameras as well as cell phones and tablet computers with features of capturing images are becoming available widespread. However, most tweets posted by the universities do not include visual materials such as photographs or images. Figures tell us that foundation universities use this feature more than the state universities do. Images tough may be much more effective than words in delivering a message.

Using a subject title constructed by using # symbol, posting videos, posting tweets in different languages, involving summary information and providing phone number and e-mail address are very occasionally used tools.

Using a hashtag starting with the symbol # encourages the users to think and write tweets on the same subject title. When hashtags are properly and effectively used, they have the potential to play a key role in supporting the sense of belonging and keeping the conscious of being a community member alive. Furthermore, it is possible that the subject may be draw attention of many others with the usage of hashtags by many users at the same time. For this reason, more frequently use of words marked with # by the universities will be helpful to make an effective use of social media.

Shooting, fictionalizing and broadcasting a video with its original sound effect or sometimes with an embedded music piece are more commonly available within minutes with the help of digital cameras, cell phones featuring video cameras and video editing software. YouTube facilitate the broadcasting as well. However, it is seen that the video sharing is not widely used by the universities. Universities which operate in a vivid campus environment and conduct many daily activities use this feature more often and may more effectively communicate the activities and the campus life to users.

Demassification feature of the new media brought about the opportunity to broadcast and publish the content by considering the individual characteristics of different users. This feature provides unique opportunities to reach to scientists who are working in the different parts of the world and speaking different languages, to private and public institutions related with the universities, to mass media, and to prospective students and their families. New Twitter accounts may be opened in order to post tweets in different languages as well as posting tweets in Turkish or in different languages from the existing account. It turned out that universities rarely post tweets in different languages. Limited number of tweets in English posted by the universities on the accomplishments and the vision of the university hints that universities actually grasped the importance of this feature. Using different languages in tweets may indeed help to communicate with different people living in the different places of the world and speaking different languages.

User reaction to tweets posted by the universities was also examined. It is concluded that the user's most common reaction is retweeting the tweets. 55.78% of the tweets posted by the state universities and 58.79% of the tweets posted by the foundation universities were shared by retweeting by at least one user. By retweeting, users are able to share the tweets posted by the universities with their followers and enable the tweets to be circulated more inside the social media network. It is advised that the universities aim to increase the number of retweets in order to reach to more users.

The most preferred second and third means are "adding the tweet to favorites" and "starting a conversation by responding to a tweet or joining to an existing conversation" respectively. Users are able deliver their positive/negative comments, suggestions, questions or greeting messages in their responses. It was also examined to what extent the universities respond to the user responses. State universities responded 2 of 35 tweets (5.41%) whereas the foundation universities responded 20 of 72 tweets (27.77%) posted by the users. Social media indeed is an effective environment to interact, yet, universities seem responding very occasionally to tweets received as a response to tweets posted by them. Based on the figures, foundation universities are much more eager to respond to response tweets than the state universities are. Most of the responded tweets are positive. This means that user's chance of getting a response to their tweets increases when they post a tweet of positive content. Likewise, the universities will also have the chance of correcting a negative idea by responding to a negative tweet even though it carries a risk of encouraging continuously negative tweets. These cases call for an optimum approach structured by the experience and the knowledge of the university. Responding will be especially helpful to inform the users and clarify the subject if tweet in question is thought to be based on a wrong information or miscommunication.

REFERENCES

Alexa, (2013), Top Sites in Turkey, http://www.alexa.com/topsites/countries/TR, (Date: 1.3.2013)

Alexa, (2013), The Top 500 Sites on The web, http://www.alexa.com/topsites/global (Date: 1.3.2013)

Berthon, P.R., Pitt, L.F., Plangger, K., Shapiro, D., (2012) Marketing meets Web 2.0, social media, and creative consumers: Implications for international marketing strategy, *Business Horizons*, 55 (3), 261-271.

Bilgin, N., (2000) *İçerik Analizi*, Ege Üniversitesi Edebiyat Fakültesi Yayınları, İzmir.

Boyd, D.M., Ellison, N. B. (2007) Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, *13*(1), http://jcmc.indiana.edu/vol13/issue1/boyd.ellison.html, (Date: 11.2.2013)

Erkul, R.E., (2009) Sosyal Medya Araçlarının (Web 2.0) Kamu Hizmetleri ve Uygulamalarında Kullanılabilirliği, *Türkiye Bilişim Derneği*, 116, 96-101, http://www.digitaldevlet.org/web2.0.pdf, (Date: 11.2.2013).

Güçdemir, Y., (2010) *Sanal Ortamda Halkla İlişkiler: Bir Halkla İlişkiler Perspektifi*, İstanbul: Derin Yayınları.

Hazar, M., (2011) Sosyal Medya Bağımlılığı-Bir Alan Çalışması, *İletişim Kuram ve Araştırma Dergisi*, 32, 151-176.

İşman, A., (2012) Technology and Technique: An Educational Perspective, *The Turkish Online Journal of Educational Technology- TOJET*, 11 (2), http://www.tojet.net/articles/v11i2/11222.pdf, (Date: 10.02.2013)

Kaplan, A.M., Haenlein, M., (2010) Users of the world, unite! The challenges and opportunities of Social Media", *Business Horizons*, 53 (1), 59-68.

Lasorsa, D.L., Lewis, S.C, Holton, A.E., (2012) Normalizing Twitter, Journalism Practice in an Emerging Communication Space", *Journalism Studies*, 13 (1), 19-36.

Li, Y.-M., Shiu, Y.-L, (2012) A Diffusion Mechanism for Social Advertising Over Microblogs, *Decision Support Systems*, 54 (1), 9-22.

Lovejoy, K., Waters, R.D., Saxton, G.D., (2012) Engaging stakeholders through Twitter: How nonprofit organizations are getting more out of 140 characters or less, *Public Relations Review*, 38 (2), 313-318.

Marwick, A.E, Boyd, D., (2011), I tweet honestly, I tweet passionately: Twitter Users, Context Collapse and The Imagined Audience, *New Media & Society*, 13 (1), 114-133.

Rybalko, S., Seltzer, T., (2010) Dialogic Communication in 140 Characters or Less: How Fortune 500 Companies Engage Stakeholders Using Twitter, *Public Relations Review*, 36 (4), 336–341.

Sayımer, İ., (2008) *Sanal Ortamda Halkla İlişkiler*, İstanbul: Beta Yayınları.

Scott, D.M., (2009). *The New Rules of Marketing and PR*, USA: John Wiley& Sons, Inc.

Türkiye İstatistik Kurumu, (2012) Hanehalkı Bilişim Teknolojileri Kullanım Araştırması, http://www.tuik.gov.tr/PreTablo.do?alt_id=60 (Date: 11.2.2013)

Twitter, (2013) About, https://twitter.com/about, (Date: 1.3.2013)

Twitter, (2013) The Twitter Glossary, http://support.twitter.com/articles/166337-the-twitter-glossary#, (Date: 10.02.2013)

Twitter, (2013) What Are Hashtags ("#" Symbols)?, http://support.twitter.com/articles/49309-what-are-hashtags-symbols#, (Date: 10.02.2013)

Waters, R.D., Jamal, J.Y. (2011) Tweet, tweet, tweet: A Content Analysis of Nonprofit Organizations' Twitter Updates, *Public Relations Review*, 37 (3), 321-324.

Yağmurlu, A. (2011) Kamu Yönetiminde Halkla İlişkiler ve Sosyal Medya, *Selçuk İletişim*, 7(1), 5- 15.

Yolcu, Ö., (2011) Use of News Articles and Announcements on Official Websites of Universities, *Turkish Online Journal of Educational Technology- TOJET*, 10 (2), 287-296, (http://www.tojet.net/articles/10228.pdf), (Date: 5.10.2012)

Yükseköğretim Kurulu (YÖK), (2013) Üniversiteler, https://www.yok.gov.tr/content/view/527/222/lang,tr/, (Date: 31.01.2013)

Yükseköğretim Kurulu (YÖK), (2013) Üniversitelerin Web Sayfaları, https://www.yok.gov.tr/content/view/900/222/lang,tr/, (Date: 31.01.2013)

VOICING ON VIRTUAL AND FACE TO FACE DISCUSSION

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ABSTRACT
This paper presents and discusses findings of a study conducted on pre-service teachers' experiences in virtual and face to face discussions. Technology has brought learning nowadays beyond the classroom context or time zone. The learning context and process no longer rely solely on face to face communications in the presence of a teacher. This study was conducted to understand 30 pre-service teachers' experience in using face-to-face (FTF) and virtual discussion. Data was gathered through observations and reflective journals. The finding showed that FTF discussion is still relevant and suitable to be used in the classroom and act as a complement to virtual discussions.

INTRODUCTION
Communication has evolved with technology as people no longer communicate via face-to face (FTF) only but communication can also take place between 2 people millions of miles away from each other. Similarly, ideas, thoughts, information and issues may be shared and discussed without having physical proximity; i.e. virtual communication or discussion. This is because technology has become indispensable in life and prevalent to all fields including education. Recent years have witnessed the use of technology in the classroom through Information Communication Technology (ICT). ICT has changed the way we communicate. Applications such as SKYPE, Window Messenger, Web-Conference, and social networks such as Facebook, Twitter and MySpace have made communications easier and faster.

No doubt technology has changed the way people communicate. Studies on virtual discussions documented greater benefits particularly in motivating learners and teachers to interact anytime and anywhere. Unfortunately, there are missing elements in virtual communication which can be found in face-to-face communication. The presence of verbal cues such as gesture, eye contact ensures the efficiency and interactivity of communication or discussion. There has been plethora of research studies attempting to address the differences between in-class face to face discussion and off-class online discussion. However, very few studies have ventured into students' experience to gather insights on the use of FTF and virtual discussion modes. Hence, the purpose of this study is to gather students' perspectives on how they experienced FTF and virtual discussions.

FACE TO FACE (FTF) AND VIRTUAL DISCUSSIONS
One significant aspect in learning is discussion between learners and instructors. Most advocates (e.g. Mayo, 2004; Smith, 2005; Hung, Tan & Cheng, 2005) argue that discussion between both learners and instructors would be a determining factor that either accelerates or impedes the whole learning process. Previously, discussions in the classroom took place in synchronous or face to face context, as it only involves a teacher-students interaction in the classroom. Both must be presented simultaneously at one place in the classroom and within a prescribed time. However, the current trend of communication and discussions is now an asynchronous computer-mediated (CMC) in nature. Due to the rapid growth of technology, the discussion between teacher and students and peers to peers has shifted tremendously which can be accessed at anytime and anywhere outside of the normal class environment and hours.

Prior researches suggest that virtual and FTF discussions have different strengths and weaknesses. Several studies have found that students who were involved in virtual discussions thread were more thoughtful in comparison to students involved in FTF discussion settings as they have ample time to read, think and reflect on their responses; hence the discussions are more explicit, substantive and reasoned (Jonassen & Kwon, 2001; Kim et al., 2007). The complexity of ideas can be found via virtual discussion; perhaps due to the luxury of time to prepare and to put forward their ideas as the discussion can be done at anytime and anywhere (Sotillo, 2000). It is therefore not surprising to see that virtual discussions cited more literature than FTF which relied much on own experiences (Card and Horton, 2000). Moreover, the anonymity of one personality in virtual communication makes them less inhibited to put forward their ideas and become more confident (Warschauer, 1995). It also allows more or all students, instead of only a few or several students in FTF discussion, to respond to the topic. Thus, virtual discussions have the potential to improve peers relationship as they have time to collaborate with each other (Powers and Mitchell, 1997).

Virtual discussions also offer great flexibility to those distance learners who may not have opportunity to meet or to interact with their learning counterparts (King, 2001). Studies by Mara, Moore & Klimczack, (2004) argued that virtual discussions promote students' critical thinking, knowledge construction and learning autonomy. Not only that, they are also reported to be more active and contribute more in virtual discussion than in FTF discussion (Cress, Kimmerle & Hesse, 2009). Virtual discussion also can be printed out and reviewed later by the students. Students can evaluate and reflect their own strength and weakness as a way to improve themselves (Asterhan & Eisenmann, 2011).

Despite the arguments above, virtual discussions also have some drawbacks, particularly the absence of non-verbal cues. Non-verbal cues are specifically significant in discussions as they present feelings and messages that cannot be conveyed literally. Visual cues such as eye contact, body language, volume, facial expression etc cannot be represented using emoticons. They are not equivalent to human gestures let alone to emulate the richness of human expressions. Virtual discussion which is merely on text is unable to convey the tone of the conversation (Tiene, 2000), and this may lead to vague ideas or responses. It requires more extra effort to put into texts or words or whatever they have in mind (De Bruyn, 2004; and Ferdig & Roehler, 2003). Furthermore, virtual discussions rely heavily on the linguistic aspect, so it contained more complicated sentences than those in FTF discussions. Consequently, it is even harder to reach a consensus in virtual discussions as students are given the advantage of time and space to think, reflect and respond. In addition, not all students have the convenience of using computer out of school computer access. They might not have the access as the area may be too remote for broadband connection or wireless spot.

In FTF discussions, teacher is physically present so that he or she will be able to monitor, motivate and to provide assistance whenever needed by the students. Students may not lose their focus and interest to participate in the discussion. In fact, some studies have reported that students in FTF discussions displayed higher satisfaction and motivation (Blau & Barak, 2009).

THE STUDY

The design of this study is qualitative in nature as it aimed to gather insights on students' experiences in FTF and virtual discussions. Hence; it involved a combination of teacher's observational notes and journal reflections. For this study, the participants were 32 pre-service teachers who were divided into two groups. One group was engaged in FTF discussions, while the other group participated in an in-class discussion using virtual discussions. The students were randomly grouped into four discussion groups consisting of six members each. For each group, a leader was selected and allowed to choose on how to conduct the discussion session, via virtual or FTF discussion.

As previously mentioned, there were two instruments for data collection method; observational notes and students' reflective journals. Students' behaviour and attitude shown in virtual and FTF discussions were observed and written as fieldnotes. Students were then required to write their experience at the end of the course. This was to know their perceptions and preference in regards to effective discussions in the classroom. These data were then coded and related themes were extracted.

FINDINGS AND DISCUSSION

It was observed that the students in the FTF discussions were more noisy, lively and interactive as they tried to participate and share opinion in an attempt to reach a consensus. In contrast, in the virtual discussion, the students were very quiet as they were concentrating in front of the computers. In one of the tutorial sessions, a student failed to follow the instruction from teacher as he went to a wrong online discussion group and unfortunately it could only be detected at the later part of the discussion as it took longer time to be detected by the teacher.

The discussions in the FTF tutorials were observed and monitored by the teacher. Hence, less misinterpretations occurred as students were observed being able to ask and to clarify things. The discussions usually ended in the prescribed time as they knew that they had been observed by the teacher. In contrast, for virtual discussions, the students were observed taking longer time to complete their tasks and asking for extra time; thus resulted in a five minutes delay every time.

In terms of group leaders' involvement, the leaders in the FTF discussions were observed to be actively assisting their fellow members and became moderators and mediators between their group members and the teacher. This was missing in virtual discussions. The leaders in virtual discussions were observed to play a more relaxed role and were sometimes observed not involved in the discussions even from the beginning of the session.

Meanwhile, 17 key-themes were identified from the constant comparative analysis of the reflective journals identified. In FTF discussions, the advantages denoted in these sub-themes were: *emotion, energy, fluidity, eases of exchanges, ability to read nonverbal sign and immediate feedback.* In their reflective journals, students mentioned that *FTF ensure prompt feedback* and whatever comments and points received from members cited as *memorable*. Students felt *confidence to defend [their] own stance* and *change perspectives based from the feedback received even by looking at frowned face*. On the other hand, for virtual discussions, the sub-themes were *ability to take the time to respond and reflect, provide more information* and *deeper analysis* and *opportunity to quieter students to participate.*

There were top five identified themes related to this study; *atmosphere, responses, efficiency, interactivity* and *communication*. Only atmosphere scored a positive value towards virtual discussion and the rest to FTF discussions.

4.1 Atmosphere
This theme revolves around authenticity, comfort, aggression, equal access and dominance. In virtual discussions the atmosphere was less aggressive, offered equal opportunities to all members to voice out opinion and more comfortable. Thus, online discussion is more appropriate to group members who are shy and introvert. This in parallel with study by Belcher (1999) that mentioned virtual discussions would most likely benefit students who are shy, introvert and reticent.

4.2 Responses
The finding has shown that FTF discussions guarantee prompt reply than in virtual discussions. Students prefer to receive immediate feedback, response or comments for them to react or act upon. Virtual discussions might frustrate students who in need of instant response as the ability to post simultaneous response by group members could not be assured due to differences in ability to project ideas and also the typing ability.

4.3 Efficiency
One of the strength of FTF discussions and confirmed by numerous studies is its efficiency. In certain tasks or activities in the classroom which require prompt decision by all group members, FTF discussion is the best option. This finding is parallel to other studies found in Meyer (2003) and Jonassen and Kwon (2001). Those studies have highlighted that virtual discussions needed more time in reaching consensus in certain matter instantly as group members spend more time to articulate ideas and writing in words.

4.4 Interactivity
The other focal point of FTF discussions as highlighted by this study is the element of interactivity. Few might have the notions that discussion via virtual involves more interaction as shown by popular trend of Facebook and Twitter. Nevertheless, participants in this study regarded FTF discussions was more multidirectional. The discussion process was more dynamic and interactive in the situation whenever one of the group members expressed his or her ideas; the others promptly made complementary remarks, comments or clarification. This unfortunately could not be found much in virtual discussions, the discussions tend to be restricted and tended to be one way. This argument is consistent with a study by Card and Horton (2000) who claimed that technologies do not necessarily promote two ways interaction.

4.5 Communication
Communication in FTF discussions is much easier to comprehend and natural as compared to virtual discussions. It is easier in the sense that FTF interactions usually supported by non-verbal cues such as tone, gesture, facial expression, body language, eye contact and many more. Thus, the explanation, ideas and discussion could be put forward naturally without much concern in paying attention to grammar or sentence structure. Thus, non-verbal cues would help each group members to comprehend the message vividly. Although in virtual discussions, a member might use emoticon to represent how they feel in saying certain things, it was not enough to make discussion clearer and natural.

CONCLUSIONS

The findings from this study show that FTF discussion is significant and relevant in learning process though numerous literatures are in support of virtual discussion. This means that FTF should not be disregarded in learning and to claim one superior than another is inappropriate. Each discussion mode has its weakness(es) and strength(s) and a combination of those two can be seen as complementing each other. In certain subjects which require short span of discussion, FTF may be more suitable but if certain topics need to be divulged more with evidence and research, perhaps virtual discussion is appropriate. Some students in this study had voiced out the necessity to blend FTF and virtual discussions. This can be found in Tiene's (2000) study that undergraduate students reported they did not want FTF discussions format to be replaced by virtual discussions and demanded for a blended approach.

Hence, it is significant to teacher to remember that FTF discussion is not an obsolete approach despite the growing popularity of virtual tools such as messenger or Facebook chats and must not regard virtual as the only best format for learning process. It could be considered as a feasible alternative to other form of classroom communication (Asterhan & Eisenmann, 2011).

Discussions are the heart of learning process either it is conducted FTF or virtually. Both modes have with them advantages and disadvantages. Based from this study, we can conclude that FTF is still relevant and suitable to be used as classroom mode of discussions and complementing on what can be offered by virtual discussions.

REFERENCES

Asterhan, C. S. C. & Eisenmann, T. (2011). Introducing synchronous e-discussion tools in co-located classroom: A study on the experiences of 'active' and 'silent' secondary school students. *Computers in Human Behaviour*, Elsevier, 27, (pp.2169 – 2177).

Belcher, D. (1999). *Authentic interaction in a virtual classroom: leveling the playing field in a graduate seminar. Computers and Composition*, Elsevier, 16, 2, (pp.253-267).

Blau, I., & Barak, A. (2009). Synchronous online discussion: Participation in a group audio conferencing and textual chat as affected by communicator's personality characteristics and discussion topics. In *Proceedings of the International Conference on Computer Supported Education – CSEDU'09* (pp. 19-24). Lisbon, Portugal. Available at www.openu.ac.il

Card, K. A. & Horton, L. (2000). *Providing access to graduate education using computer mediated communication. International Journal of Instructional Media,* ERIC, 27, 3, (pp.235 – 245).

Cress, U., Kimmerle, J., & Hesse, F.W. (2009). Impact of temporal extension, synchronicity, and group size on computer-supported information exchange. *Computers in Human Behaviour*, Elsevier, 25, (pp.731-737).

De Bruyn, L. L. (2004). Monitoring online communication: Can the development of convergence and social presence indicate an interactive learning environment? *Distance Education*, Taylor & Francis, 25(1), (pp.67-81).

Ferdig, R. E., & Roehler, L. R. (2003). Student uptake in electronic discussions: Examining online discourse in literacy preservice classrooms. *Journal of Research on Technology in Education*, International Society for Technology in Education, USA, 36(2), (pp.119 – 136).

Hung, D., Tan, S. C & Chen, D. T. (2005) *How the Internet facilitates learning as dialog: design consideration for online discussions. International Journal of Instructional Media*, ERIC, 32, 1, (p.37-46).

Jonassen, D. H & Kwon, H. (2001). *Communication patterns in computer mediated versus face-to-face group problem solving. Educational Technology Research and Development*, Springer, 49, 1, (pp.35-51).

Kim, I.H., Anderson, R.C., Nguyen-Jahiel, K., & Archodidou, A. (2007). Discourse patterns during children's collaborative online discussions. *The Journal of the Learning Science*, Taylor & Francis, 16(3), (pp.333-370).

King, K. P. (2001). Educators revitalize the classroom 'bulletin board': a case study of the influence of online dialogue on face to face classes from an adult learning perspective. *Journal of Research on Computing in Education*, 33, 4, ERIC, (pp. 337-354).

Marra, R. M., Moore, J. L. & Klimczak, A. K. (2004). *Content analysis of online discussion forums: A comparative analysis of protocol. Educational Technology Research and Development*, Springer, 52, 2, (pp.23-40).

Mayo, J. A. (2004). Using case-based instruction to bridge the gap between theory and practice in psychology of adjustment. *Journal of Constructivist Psychology,* Taylor & Francis, 17, (pp.137 – 146).

Meyer, K. A. (2003). *Face-to-face versus threaded discussions: the role of time and higher-order thinking. Journal of Asynchronous Learning Networks*, 7, 3, (pp.55-65). Available at sloanconsortium.org

Powers, S. & Mitchell, J. (1997). Student perceptions and performance in a virtual classroom environment. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL. Education Resources Information Centre (ERIC)

Smith, J.S., Malkani, J., & Dai, D. Y. (2005). Student perceptions of the case method in educational psychology and its impact on teaching and learning. *Teaching Educational Psychology*, ERIC, 1(1), (pp1-11).

Sotillo, S. M. (2000). Discourse functions and syntactic complexity in synchronous and asynchronous communication. *Language Learning & Technology*, ERIC, 4, 1, (pp.82-119).

Tiene, D. (2000). Online discussions: A Survey of Advantages and Disadvantages Compared to Face-to-Face Discussions. *Journal of Educational Multimedia and Hypermedia*, Association for the Advancement of Computing in Education (AACE) Charlottesville, VA, *9*, *4*, *(*pp.371-384).

Warschauer, M. (1995). Comparing face to face and electronic discussion in the second language classroom. *CALICO Journal*, 13, 2, (pp.7-26).

IMPACT OF E-AV BIOLOGY WEBSITE FOR LEARNING ABOUT RENEWABLE ENERGY

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ABSTRACT
This paper considers the design and development of a Website for Biology in senior high schools in Indonesia. The teaching media, namely e-AV Biology, was developed with the main features of video lessons and other features in supporting the students' learning process. Some video lessons describe the production process of Biofuel or Renewable Energy on the field of Biotechnology Industrial, which is one of the subjects that students and teachers find it difficult to learn and explain. The process of it is very complex. It needs longer time. There is a need of aiding the explanation of biofuel production process in the classroom. One of the alternative aids to clarify this subject is e-AV Biology Website, so the atmosphere for learning Biology more attractive to students. This study examined the impact of e-AV Biology towards the concerned students' reception of knowledge and interest of high and low achievers. A total of 256 high school students participated in quasi-experiment of year 2011 with the intervention of two different ways of teaching, one with fully media instruction using e-AV Biology and another one the traditional manner of teaching. The last part of this paper presents the evaluation of the impact of the teaching media, which indicates that students' knowledge reception and interest of high and low achievers were improved after using e-AV Biology, with special mention of the fact that their interest have shown an obvious improvement.
Keywords: e-Audio Visual, Biology, Renewable Energy, Learning Impact

INTRODUCTION

Many students in Indonesia have difficulties in learning Biology. They think that learning Biology simply involves memorizing the contents of the subject and regurgitate them during their examinations. According to Tekkaya, Ozkan and Sungur (2001), students have difficulties in learning Biology and have no interest in the lesson due to the irrelevancy of the subject with the daily experiences. Students' motivation to learn this subject was low; because their Biology marks often did not achieve the school standard score for Biology which should be 75 percentages for international schools (Setiawan, 2008).

Teachers must have the ability to induce a more conducive learning atmosphere for Biology, making them more motivated and eager to learn. The teaching aids have been considered an urgent necessity for teachers to explain crucial concepts of Biology in the classroom. Sudjana et al. (2005) stated that the role of teaching media intrigues the students, and have been found able to improve students' motivation and interest. Many researches on teaching media have claimed that the media usage improves the students' learning capacity, especially the Audio Visual media. According to the research which was carried out by Prinou et al. (2003), it reveals that most of students reported that the moving image clarified or enhanced their understanding and managed to pique their interest. It seems that through video, they are able to understand abstract processes. The use of educational technology in teaching of science increased the students' interest to be high achievers in the experimental group (Suleman et al., 2011). According to the research which was carried out by Ossai-Ugbah et al. (2012, p.220), it reveals that "Majority of the respondents (37%, 74 out of 200) confirmed that Audio-Visuals made learning easier and more interesting".

In line with the advancement of computer technology, Audio Visual production has emerged with practical offers and features. This matter is in line with How (2000, p.57), which stated that "The mushroom growth of computer technology in the aspect of vast data processing, large data storage, availability of CD-ROM drive and camcorder renders producing audiovisual content more easier and faster" (can be uploaded on YouTube and other site, even the regional video site).

PURPOSE

This study is carried out to examine the impact of e-AV Biology teaching media on students' knowledge and interest at Senior High Schools In Indonesia.

The researcher had designed and developed Biology teaching media, especially e-Audio Visual media as one of the alternatives in teaching innovation. e-Audio Visual teaching media is chosen because of the strength of Audio Visual media in stimulating motion effects as well as modifying sound and colour. We do not need any special prerequisites to operate them. With a combination of various elements in teaching and learning process, the teacher can realize an engaging learning atmosphere by using Audio Visual media. It can attract the students' interest in learning and brace up student learning (How, 2000).

Based on these reasons, the design and development of e-AV Biology teaching media for Senior High School students in Indonesia is needed. The first author had cooperated with teachers to make the Biology Instructional Design and to create e-AV Biology teaching media. This medium is appropriate with Indonesian science curriculum, supported by multimedia learning theory and an instructional design framework, especially on Biofuel or Renewable Energy, in which case teachers can teach this subject effectively and also enhance students' interest and learning outcomes.

Renewable energy is a current topic of Biology education in Indonesia, which has gained much attention among environment-conscious scientists. This area of content should be implicated students in order to improve their understanding and awareness of bio-energy such as biomass, biodiesel and biofuel.

RESEARCH QUESTIONS

This study addresses the following research questions, mainly concerning the impact of teaching media on learning outcomes such as knowledge, attitude changed and interest improved.

1. Does e-AV Biology able to affect the Students' Biology Knowledge of high achievers if compared with conventional teaching approach?
2. Does e-AV Biology able to affect the Students' Biology Knowledge of low achievers if compared with conventional teaching approach?
3. Does e-AV Biology able to improve the Students' Interest towards Biology of high achievers if compared with conventional teaching approach?
4. Does e-AV Biology able to improve the Students' Interest towards Biology of low achievers if compared with conventional teaching approach?

IMPACT OF TEACHING MEDIA

ICT can be used in education to improve the quality of teaching and learning processes (Balanskat et al., 2007). The impact of ICT is highly dependent on how it is used. The impact of a specific ICT application or device depends on the capacity of the teacher to exploit it efficiently for pedagogical purposes.

There are many learning approaches that can be explored through ICT, such as project-based learning, object-orientated learning, self-directed learning, online collaborative learning, online discussion, multimedia-based learning, etc. In the case of Biology, multimedia-based learning can be used to transform abstract concepts to more concrete ones, such as the blood circulatory system; to replace rare and dangerous objects which should be brought to the classrooms; to display objects which can hardly be seen by our senses, such as micro-organisms; to cope with limitations on space, time and energy such as the process of production biofuel, and many more. Through multimedia, this subject will be made easier for teachers to teach and for students to learn.

The advantages of the media used in this research as an instrument in teaching activities are emphasized (Eisner, 1994; Thomson et al., 1996):

1. To enhance the message while being less verbal.
2. To cope with limitations on space, time and energy.
3. To enable the students to learn independently based on visual, auditory and kina esthetical aptitude and ability.
4. To provide experience and generate similar perception.

ISSUES OF THE USE OF MEDIA AIDS IN SCIENCE EDUCATION

In the education of science in Indonesia, the awareness of the importance of teaching media in enhancing teaching has been growing vastly. The management and provision of teaching aids has been considered an urgent necessity. Along with the development of communication technology, education and teaching processes demand diversity in teaching media. However, in the current science education, the teaching media is not used optimally; it is caused by many factors such as: teachers' difficulties in choosing what media are suitable for the class, the low competency and knowledge among teachers to employ media. Many teachers thought that teaching media can substitute teachers, as a replacement for traditional instruction (Perdana, 2008); however, Richard et al. (2000) argued that teaching media, such as computers, is a tool to support learning but not as a replacement for traditional instruction.

The teachers' ability and competency are necessary in teaching the Biology more effectively to students. Often the teacher explains the course verbally and writes it on the whiteboard. The students' activities include listening, taking notes and doing assignments. The teacher gives them some assignments to memorize the lesson. This situation causes many students in Indonesia to be less interested in learning Biology. Hence, their interest and motivation are low and their marks of Biology subject do not achieve the school's standard Biology marks (Setiawan, 2008). In enhancing students' motivation and students' interest in Biology, the use of teaching media is one of the alternatives to raise students' interest. According to the research carried out by Prinou et al. (2003), it reveals that most of students reported that the moving image clarified or enhanced their understanding and attracted their interest. Through video, they understood abstract processes. Today, the internet makes the delivery of video easier, and accessible to many students.

MULTIMEDIA WITH INTERACTIVITY

The Audio Visual is one of the popular multimedia components in education. Didactical video or Audio Visual is able to give a multisensory aspect to the learning experience to students than textual information. On the other hand, paper based pedagogical materials, such as books or articles, could allow students to think and analyse the content provided. Multimedia materials in this study presented in a Website can bring the two kinds of material together. Firstly, it allows the inclusion of Audio-Visual content into the array of educational materials. Secondly, it also allows the inclusion of textual information (Amatller & Simo, 2007).

Multimedia material has another distinctive characteristic: it allows interaction. Students can interact with the information in different ways. The access to information could be done in multiple ways, different items could be connected according to students' interest and the practice and simulation of complex processes such as the processes of production biofuel is made possible. All the characteristics are not only the result of technological possibilities; they are also opportunities for constructivism based pedagogic materials (Amatller and Simo, 2007).

Gardner (1993) and Eisner (1994) found out that there are many ways for students in processing unique information. Some of them can easily process visual information, some of them can be helped with voice or sound (auditorial), and the rest using body movement and practice (kina-esthetical). Learning activity is influenced mostly by the learning style and procedure. Confucious was cited by De Porter et al. (2007) explain that 10 % information is absorbed from what we read, 20% from what we hear, 30% from what we see, 50% from what we see and hear, 70% from what we say, 90% from what we do and say. In line with this, the computer fulfils the requirements of being an efficient teaching tool due to its technical aspects pertaining to (1) video, (2) audio, (3) text, (4) graphic and (5) animation like what has been stated by the researchers above. Nowadays, Audio Visual Media is easily produced and published on the web and CD (Romero et al., 2008).

DESIGN AND DEVELOPMENT OF E-AV BIOLOGY WEBSITE

The teaching and learning process of Biology in Senior High Schools of Indonesia was tested using the e-AV Biology instructional design framework adapted from Armani's Integrated Framework (2004). Armani proposed three levels of design consideration, namely The Educational Context Level, The Requirements Level and The Design Level. We adapted from Armani's Framework and developed four main levels of guiding the design and development, namely The Educational Context Level, the Requirements Level, the Design Level, and the Learning Outcomes Level. The Learning Outcome Level emphasizes on knowledge, attitude changed and interest improved in the subject matter, in this case Biology.

A Website was used as the Multimedia technology to support the framework. The website includes the interactive video about Biology contents, such as Biotechnology. e-AV Biology had been developed with integrated and comprehensive video lessons, and other features supporting the student learning process. The use of animations, motion images, and videos was intended to render a scientific phenomenon and process to be easily comprehended by students.

There are some features to aid teaching and learning, available in e-AV Biology Website, as follows:

- **Home Page of e-AV Biology**

This part aims to introduce students to the e-AV Biology Website. It starts with a description of how-to-use and register to become users of the e-AV Biology, followed by a short description of e-AV Biology menu and other e-AV Biology features.

- **Video Lessons**

This part contains various videos concerning biofuel sources, biofuel production and biofuel usage (in Indonesian and English). Students were provided with content in the form of audios, videos and animation that enables them to explore e-AV Biology Website more enthusiastically. The integration of various media elements such as diagrams, audio, video and animation in this part adds more value to the website.

Fig 1.e-AV Biology Videos

- **The Main Lessons**

This part contains articles and textual information related to Biology for the benefit of all students in Indonesia. It provides the materials for students needed to understand core concepts of the subject more easily.

Fig 2. Sample of e-AV Biology Lesson for Indonesian Students

Video of Renewable Energy on Biosolar, length: 2.33 minutes

Video of Renewable Energy of Jatropa Oil, length: 2.33 minutes

Video of Renewable Energy of Sunflower Oil, length: 2.03 minutes

Video of Renewable Energy Source of Palm, length: 05.05 minutes

Fig 3. Some Sample Videos of Renewable Energy within the Geographical Context for Indonesian Students

- **Other Features**

This part facilitates students to share the knowledge in the relevant context, for example assignments, quizzes and discussion board.

METHODS

The study was carried out at three International schools by the government in Semarang, a district in Indonesia which has connections to Jardiknas (The Educational Network had developed by Indonesian Government). One school had been selected as a pilot study, and two schools have been selected for the main research. A quasi-experimental design research was applied in two selective International schools of year 2011. Those schools were selected because they were equipped with computer laboratory and Internet access. The first step of the experiment was to seek approval from school science teachers and the headmaster. The next step was to provide lessons to the intended group of students in two ways of teaching strategies, normal teaching and learning through the e-AV Biology Website. The students have done their activities individually in the Teaching and Learning through the e-AV Biology Website. The students were required to view some videos about Industrial Biotechnology especially Renewable Energy such as ‘Video of Renewable Energy on Biosolar’, ‘Video of Renewable Energy source of Jatropa Curcas L’, ‘Video of Renewable Energy of Jatropa Oil Production’ and ‘Video of Renewable Energy of Sunflower Oil Production’, etc. The conventional teaching approach was the normal teaching using textbook, charts with a teacher in front of the class. Both ways of teaching covered the same area of content and lesson objectives.

A total of 256 students were involved in this study, aged 14-16, and the majority of them were Tenth Grade students. They were selected from 2 schools, 2 classes for experiment group and another two classes for control group in each school. The students had been divided into 2 groups based on their Biology marks from the teacher database. The high achievers of students have Biology marks ≥ 75, while low achievers have Biology marks < 75. Two phases of data collection were conducted by using Instrument A (Student Attitude, Interest towards Biology, Perception and Perceived Effectiveness toward Biology Teaching Media), Instrument B which is Test of Knowledge and Instrument C (Overall Feedback of e-AV Biology Website). All of the instruments have been pilot tested and improved based on the feedback given by students, teachers and research methodology experts, in terms of its clarity of words, and accuracy of content scope, especially for the internal and external validity of the instruments to measure the dimensions of the experiment (knowledge and interest) by the Biology Content expert, the educational and instructional media experts.

Social science software package SPSS ver. 17.0 was used to analyse data, and t-Test was used for comparing mean scores of two groups. Since level of achievement prior to the experiment is believed to be a factor to influence the results of experiment, students with high achievement in their Biology marks were separated from the low achievement group for the main analysis.

FINDINGS AND DISCUSSIONS

The dimensions of Knowledge and Interest were tested of normality, which indicated normal and its graph were normally distributed. The findings of the impact of e-AV Biology Website for knowledge and interest in Renewable Energy were presented and explained in the following sections:

IMPACT OF KNOWLEDGE FOR HIGH ACHIEVERS

e-AV Biology with individual learning strategy in Teaching and Learning Biology was able to considerably enhance students' Biology knowledge compared to the conventional teaching approach. e-AV Biology with individual learning strategy in Teaching and Learning Biology. It was able to affects students' knowledge in experiment group, and it was able to help students in the class experiments reach the standard Biology marks of teachers. The overall score of test on knowledge of Biology for experiment group (post- test) was able to reach the standard of Biology marks which is 75. Puspita et al. (2008, p.442) stated that "The illustration animation (dynamic) with audio in Teaching and Learning Biology was effective and efficient to improve the concept control of student, and it was able to help students in the class experiments to reach the standard of Biology marks".

Table 1 shows the mean scores of the high achievers in Biology knowledge for the experiment group and the control group in the pre-test. Their mean scores were 28.43 and 25.41 respectively. Descriptively, the experiment group obtain a higher mean score pre-test compared to the control group; however, there is no significant difference in the mean score pre-test between the two groups at the p-value = .141 ($p > .05$).

Table 1 also shows the mean scores of the high achievers in Biology knowledge for the experiment group and the control group in the post-test. Their mean scores were 77.46 and 72.96 respectively. Descriptively, the experiment group obtain a higher mean score post-test compared to the control group. The result shows that there is a significant difference on Biology knowledge post-test between the two groups at p-value = .005 ($p < .05$). Thus, there is an indication that the e-AV Biology teaching strategy benefits the high achievers.

Table 1: Independent Samples t-Test of Biology knowledge for High Achievers

	Group	Mean	SD	Std. Error Mean	t-Test for Equality of Means			
					t	df	Sig.(2-tailed)	Mean Difference
Knowledge pretest	experiment high[a]	28.43	14.228	1.409	1.479	203	.141	3.024
	control high[b]	25.41	15.019	1.480				
Knowledge posttest	experiment high[a]	77.46	10.910	1.080	2.859	203	.005*	4.500
	control high[b]	72.96	11.608	1.144				

Note :[a]n = 102, [b]n = 103, * Significant at $p < .05$

Fig. 4 shows the graph of interaction for the mean scores of the high achievers between the experiment group and the control group. It shows the control group with a lower score of Biology knowledge pre-test, also obtain a lower score of Biology knowledge post-test compared to the experimental group; however, the lower score in pre-test of the control group is not significantly different from the experiment group as shown in Table 1. Thus, the results interpret that the significant difference is contributed from the higher score post-test of the experiment group.

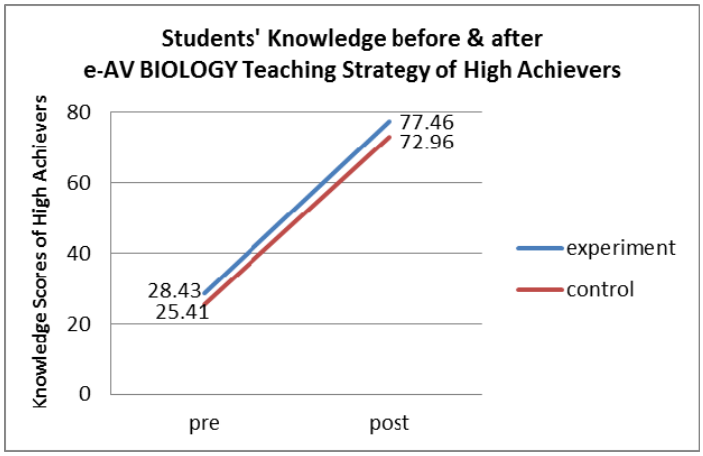

Fig. 4 High Achievers' Knowledge Before & After Teaching Strategy

Impact of Knowledge for Low Achievers

The use of e-AV Biology Website in Teaching and Learning Biology can affect students' knowledge in experiment group of students' academic low achievement, and it is able to reach the standard marks in experiment low group of 77.00.

Table 2: Independent Samples t-Test of Knowledge for Low Achievers

	Group	Mean	SD	Std. Error Mean	t-Test for Equality of Means			
					T	df	Sig.(2-tailed)	Mean Difference
Knowledge pretest	experiment low[a]	20.35	9.851	1.932	1.739	49	.088	5.746
	control low[b]	14.60	13.528	2.706				
Knowledge posttest	experiment low[a]	77.00	10.830	2.124	2.298	49	.026*	7.480
	control low[b]	69.52	12.393	2.479				

Note : an = 26, bn = 25, * Significant at $p < .05$

Table 2. shows the mean scores of the low achievers in Biology knowledge for the experiment group and the control group in the pre-test. Their mean scores were 20.35 and 14.60 respectively. Descriptively, the experiment group obtained a higher mean score in the pre-test compared to the control group; however, there is no significant difference in the mean score pre-test between the two groups at the p-value = .088 (p> .05). Table 2. also shows the mean scores of the low achievers in Biology knowledge for the experiment group and the control group in the post-test. Their mean scores were 77.00 and 69.52 respectively. Descriptively, the experiment group obtained a higher mean score post-test compare to the control group. The result shows that there is a significant difference on Biology knowledge post-test between the two groups at p-value = .026 (p< .05). Thus, there is an indication that the e-AV Biology teaching strategy benefits the low achievers. Figure 6. Shows Low Achievers' of Knowledge Before and After e-AV Biology Teaching Strategy. Fig. 5. Shows Low Achievers' of Students' Knowledge towards Biology.

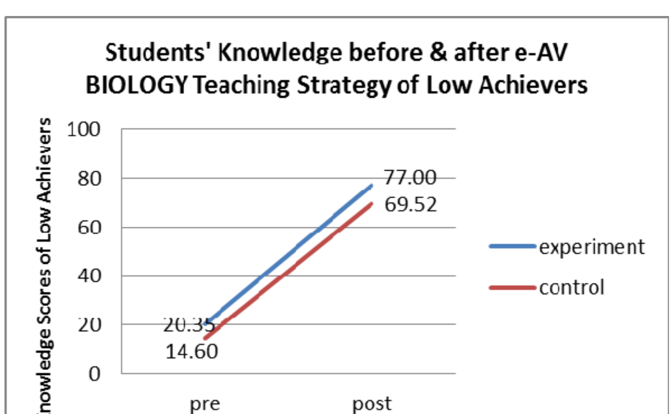

Fig. 5 Low Achievers' of Knowledge Before and After e-AV Biology Teaching Strategy

IMPACT OF STUDENTS' INTEREST TOWARDS BIOLOGY CONTENTS OF HIGH ACHIEVERS'

e-AV Biology with individual learning strategy in Teaching and Learning Biology was able to improve the students' interest towards Biology in high achievers of experiment group more significantly in comparison to conventional teaching approach. This is in line with Sudjana et al. (2005) stating that the role of media in the teaching and learning process is rendering the learning process to be more appealing to the students in order to raise significantly their motivation to learn. The research carried out by Prinou et al. (2003), it reveals that most of the students reported that moving images clarified or enhanced their understanding and piqued their interest. It seems that through video, they are able to understand abstract processes. Table 3. shows the mean scores of high achievers in students' interest for experiment group and control group in the pre-test. Their mean scores were 3.41 and 3.44 respectively. Descriptively, the control group obtain a higher mean scores in the pre-test compare to the experiment group, however, there is no significant difference on the mean scores in the pre-test between the two groups at p-value = .512 (p > .05).

Table 3: Independent Samples t-Test of High Achievers Students' Interest towards Biology

	Group	Mean	SD	Std. Error Mean	t-Test for Equality of Means			
					t	df	Sig.(2-tailed)	Mean Diff.
Interest pretest	experiment high [a]	3.41	.36587	.03382	-.657	230	.512	-.03320
	control high [b]	3.44	.40347	.03762				
Interest posttest	experiment high [a]	4.06	.36519	.03376	4.374	230	.000*	.21780
	control high [b]	3.84	39295	.03664				

Note :an = 117, bn = 115, * Significant at p < .05

Table 3. also shows the mean scores of high achievers of students' interest for experiment and control group in the post-test. Their mean scores were 4.06 and 3.84 respectively. Descriptively, the experiment group obtains a higher mean score in the post-test compare to the control group. The result shows that there is a significant difference on students' interest in the post-test between the two groups at p-value = .000 (p< .05). Thus, there is an indication that the e-AV Biology teaching strategy has benefits to interest of the experiment group of high achievers. Fig. 6. Shows High Achievers' of Students' Interest towards Biology.

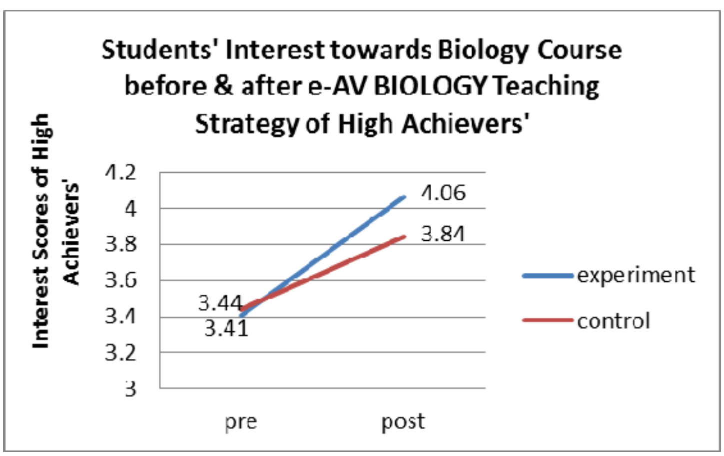

Fig. 6. High Achievers' of Students' Interest towards Biology

Impact of Students' Interest towards Biology Contents of Low Achievers'

Table 4. shows the mean scores of low achievers in students' interest for experiment group and control group in the pre-test. Their mean scores were 3.33 and 3.24 respectively. Descriptively, the experiment group obtain a higher mean scores in the pre-test compare to the control group, however, there is no significant difference on the mean scores in the pre-test between the two groups at p-value = .336 (p > .05).

Table 4: Independent Samples t-Test of Low Achievers Students' Interest towards Biology

	Group	Mean	SD	Std. Error Mean	t-Test for Equality of Means t	Df	Sig.(2-tailed)	Mean Diff.
Interest pretest	experiment low [a]	3.33	.22361	.06742	.984	22	.336	.08974
	control low [b]	3.24	.22169	.06149				
Interest posttest	experiment low [a]	4.23	.18668	.05629	2.993	19.649	.007*	.31702
	control low [b]	3.91	.32358	.08974				

Note : an = 11, bn = 13
Likert Scale 1: Strongly Disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly Agree
* Significant at p < .05

Table 4. also shows the mean scores of low achievers of students' interest for experiment and control group in the post-test. Their mean scores were 4.23 and 3.91 respectively. Descriptively, the experiment group obtains a higher mean score in the post-test compare to the control group. The result shows that there is a significant difference on students' interest in the post-test between the two groups at p-value = .007 (p< .05). Thus, there is an indication that the e-AV Biology teaching strategy has benefits to interest of the experiment group of low achievers. Fig. 7. Shows Low Achievers' of Students' Interest towards Biology.

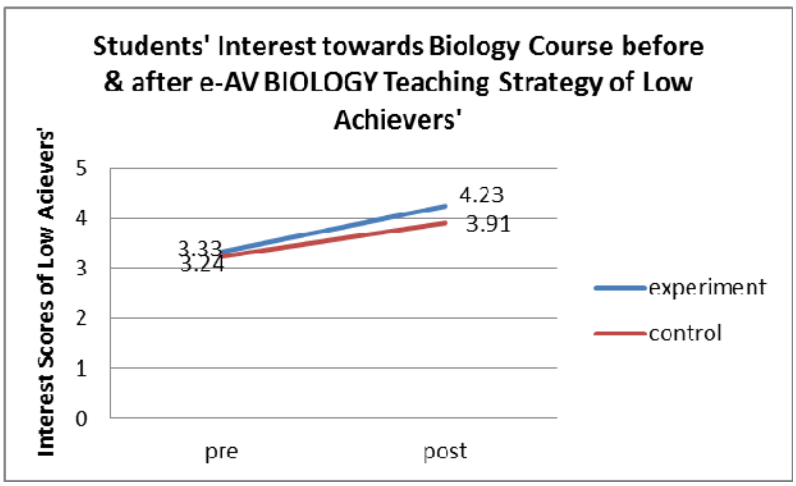

Fig. 7. Low Achievers' of Students' Interest towards Biology

DISCUSSIONS

This work presents a study of the impact of Audio Visual teaching media through e-AV Biology. This study was conducted due to the increasing challenge of teaching an abstract subject, and the importance of the topic of renewable energy. Audio and Visual media was incorporated as the key component in e-learning website based on Instructional Design.

The results of the change of Attitude and Interest are more obvious compared to the change of Knowledge. This could be due to a more reinforced acceptance of students toward teaching media based on Interest, which subsequently brings an impact on their Attitude as well. They have more interest in media for their learning experience, and have changed their attitude toward the subject itself after using it. Mainly, this could be due to the scarce usage of video media delivered through a website, and they felt it useful and interesting. Having said that,the students' knowledge level has also increased with a small significance result.

Students' Knowledge

The students' knowledge especially in the bioenergy was low. It was able to improve due to the use of e-AV Biology Website, this is in line with the increase in students' interest. Students' knowledge level has also increased with a small significance result. Figure 6 shows the graph of interaction for the mean scores of the low achievers between the experiment group and the control group. It shows the control group with a lower score of Biology knowledge pre-test, also obtain a lower score of Biology knowledge post-test compare to the experimental group, however, the lower score in pre-test of the control group is not significant different from the experiment group as shown in Table 3. Thus, the results interpret that the significant difference is contributed from the higher score in the post-test from the experiment group. More importantly, the low achievers were able to score the targeted score at 77.00 after using e-AV Biology teaching strategy. This indicates that teaching and learning using e-AV Biology Website with individual teaching strategy was useful for the students to improve their Biology marks better than the standard Biology marks of schools, not only for high achievers but also for low achievers.

Students' Interest

While students' interest was initially low, after the implementation of e-AV Biology Website their interest to the Biology subjects was improved. Actually, students like Biology subjects, but specifically on the particular matter Biotechnology such as Biotechnology Industrial or Renewable Energy students find it difficult to understand. Hence, students' interest was decreased. After the e-learning model using e-AV Biology Website individually, the result was positive. It indicates that the media has influenced the students to have positive interest in Biology.

CONCLUSION

The study of the impact of e-AV Biology Website indicated that students of experiment group of high and low achievers show significantly better knowledge and interest as compare to the control group on post-test.

The e-AV Biology with individual learning strategy in Teaching and Learning Biology can affects students' knowledge if compared with conventional teaching approach, and it is able to help students in the class experiments to reach the standard Biology marks of schools.

Students' knowledge level has also increased with a small significance result. Teaching and learning using e-AV Biology Website with individual teaching strategy was useful for the students to improve their Biology marks better than the standard Biology marks of schools, not only for high achievers but also for low achievers in experiment group.

LIMITATIONS AND FUTURE RESEARCH

The limitation of this study is mainly due to: (1) a short time frame of conducting the study and the impact on knowledge gain has not shown much significance. (2) The research is only conducted in one of the major cities in Indonesia, (3) the research sample is limited to International Schools by the Indonesian Government.

The contribution of the study is to propose the e-Learning Website design and development for Indonesia Senior High Schools to address the problem faced in Biology education. e-AV Biology website will be further developed to include more videos related to different topics of Biology since generally students are able to accept it as perceived it as useful to improve their interest and attitude toward Biology.

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REFERENCES

Amatller, A.M., and Simó, L. P.(2007). Audiovisual and Multimedia Resources in e-Learning. *First Video Funet Conference*, 10-11 May. Tampere, Finland.

Armani, J., and Botturi, L., and Cantoni, I., and Di Benedetto, M., and Garzotto, F. (2004). Integrating Instructional Design and Hypermedia Design. In L. Cantoni & C. McLoughlin (Eds.). *Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications.* (pp. 1713-1719). Chesapeake, VA: AACE.

Balanskat, A., and Roger, B., and Stella K, (2007), *The ICT Impact Report.* http://insight.eun.org/ww/en/pub/insight/misc/specialreports/impact_study.htm. Accessed 10th July 2008.

De Porter, B., and Mike H. (2007). *Quantum Learning*. Bandung : Kaifa.

Eisner, E. (1994). *Cognition and curriculum reconsidered (2nd Ed.).* New York: Teachers College Press.

Gardner, H. (1993). *Multiple intelligences: The theory in practice.* New York: Basic.

How, G. K. (2000). *Journal of Education TIGAENF 1999/2000* (in Indonesian), 57- 63.

Ossai-Ughbah N.B., and Ogunrombi S.A., and Ameh I.O. (2012). Motivating use of Audio-Visuals in a Nigerian Technological University Library. *Journal of Educational and Social Research.* 2(1), p. 217-233.

Perdana, S.C. (2008). *The Method of Learning VCD Usage* (in Indonesian). http://vcdpembelajaran.com. Accessed 12th Sept 2008.

Prinou, L., Halkia, K. (2003*). Images Of ‘Cell Division’ On The Internet*. http://cblis.uniza.sk/cblis-cd-old/2003/4.PartC/Papers/Visualization_of_ science_ideas/Prinou.pdf. Accessed 10th Dec 2009.

Puspita, G.N., Widodo, A., Hidayat, T.(2008). *The Use of Interactive Multimedia in Learning of Animal Reproduction to Improve Concept Mastery and Critical Thinking of 9 the Grade Student.* Proceeding of The Second International Seminar on Science Education. “Current Issues on Research and Teaching in Science Education”. UPI. Bandung. p. 440-446.

Richard, P.V., and Teresa, A.S. (2000). Computer technology in the College of Agriculture classroom at Lousiana State University. *Journal of Campus-Wide Information Systems*, 17, p. 81-85.

Romero, N.L., and Centellas, F.C. (2008). New stages, new narrative forms: The Web 2.0 and audiovisual language [on line], Number 6, May 2008, http://www.hipertext.net/english/pag1030.htm. Accessed 12th Sept 2008.

Setiawan, I.G.A.N. (2008). Application of Problem Based Contextual Instruction to Increase Biology Learning Outcome of The Grade X Students in “Laboratory” Senior High School at Singaraja. *Research and Development Education Journal*, 2(1), p. 42-59.

Sudjana, N., and Ahmad, R. (2005). *The Teaching Media* (in Indonesian). Bandung: Sinar Baru Algensindo.

Suleman, Q., Aslam, H.D., Sarwar, S., Shakir, M.M.N., Hussain, I. (2011). Effectiveness of Educational Technology in Teaching Chemistry to Secondary School Students in Khyber Pukhtunkhwa (Pakistan). *American Journal of Scientific Research*. Issue 41. 2011, pp. 115-131. Euro Journals Publishing, Inc 2011.

Tekkaya, C., Ozkan, O., Sungur, S. (2001). *Biology Concepts Perceived as Difficult by Turkish High School Students.* Hacettepe Universitesi Egitim Fakultesi Dergisi Ed. 21, p. 145-150.

Thomson, J. & Volker, J. (1996). *AustraliansVisual Art : Libraries and The New Technologies.* Inspel 30, pp. 237 – 244.