THE TURKISH ONLINE JOURNAL OF EDUCATIONAL TECHNOLOGY

JULY 2012
Volume 11 - Issue 3

ISSN: 2146 - 7242

Indexed by
Scocial Science Citation Index - **SSCI**
Education Resources Information Center - **ERIC**

Published in TURKEY

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Message from the Editor-in-Chief

Dear Readers,

TOJET is the leader in the entire field of educational technology in the world because TOJET has been published global research papers about educational technology. Today, people from more than one hundred countries have been follow and read TOJET's articles for ten years. TOJET is a change agent at the new innovation in the field of educational technology. That is why many people trust TOJET.

TOJET is always ready to diffuse a new innovation into educational technology. The innovation, communication channels, time, and a social system have affect to the diffuse of a new idea. During the diffusion process, an innovation is affected by certain channels over time among the members of a social system. In this process, there is a individuals progress. In this progress, there are five stages. These are knowledge, persuasion, decision, implementation, and confirmation. When people are adapted to an innovation, the certain communication channels spread new idea. TOJET is interested in academic articles on the adoption and abandonment of educational technology in education. The articles should be touched on why teachers and school districts resist technology and give some solutions for the diffusion of educational technology. These articles will aid teachers and school districts to diffuse technology in education.

I am always honored to be the editor in chief of TOJET. I am always proud of TOJET for its valuable contributions to the field of educational technology.

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.

The guest editors of this issue were Prof.Dr. Shi-Jer Lou - National Pingtung University of Science and Technology, Taiwan and Assist. Prof. Dr. Vincent Ru-Chu Shih - National Pingtung University of Science and Technology, Taiwan. TOJET thanks and appreciate the guest editors and the editorial board who have acted as reviewers for one or more submissions of this issue for their valuable contributions. TOJET's reviewers are drawn quite widely from all over the world.

TOJET, Sakarya University-Turkey, Istanbul University-Turkey and National Central University-Taiwan will organize the 12th International Educational Technology Conference (IETC 2012) between July 11-13, 2012 in Taoyuan, Taiwan. The web page of IETC is "www.iet-c.net".

We are pleased to announce that TOJET has commissioned two special issues (October, 2012 and January, 2013) for the presented papers at the International Educational Technology Conference 2012.

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.

July 01, 2012

Prof. Dr. Aytekin İŞMAN
Editor-in-Chief of TOJET

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A COMPLETE UNDERSTANDING OF DISORIENTATION PROBLEMS IN WEB-BASED LEARNING

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ABSTRACT
Disorientation problems influence student learning. To address this issue, this study uses an integrative approach to investigate the causes and consequences of disorientation problems so that a complete understanding can be obtained. Unlike previous empirical studies, which use statistical techniques, this study attempts to expose unexpected relationships with a data mining approach. The results indicate that the causes of disorientation problems are associated with learners' computer experience, the frequencies and time of using each navigation tool. On the other hand, the consequences of disorientation problems are concerned with learning effort and learning performance. Based on the findings, a framework is proposed to provide guidelines for the development of Web-based learning systems that are able to reduce learners' disorientation problems.
Keywords: disorientation, data mining, learning performance, computer experience, navigation behavior.

1. INTRODUCTION

The Internet is presently being used as an information source for educational purposes (Tutkun, 2011). Thus, Web-based learning systems have become increasingly popular in past several years (Liu, Kantarcioglu and Thuraisingham, 2008). The major advantage of Web-based learning systems lies within their flexibility. Due to this flexibility, many learning platforms have been moved to the Web. This is possibly because Web-based learning systems utilize hypermedia structure, which provides a nonlinear way to help each individual develop his/her own paths (Deursen and Dijk, 2010).

However, the nonlinear way may increase complexity so learners may feel confused to interact with the Web-based learning systems. One of the major reasons is that the nonlinear ways provide learners with multiple directions to reach their learning objectives. Nevertheless, not all of learners can identify a right direction so they may feel difficult to choose a right direction and experience disorientation problems (Amadieu et al., 2010).

Disorientation problems negatively affect student learning in various ways. One of the negative effects is that learners cannot identify where they have been, where they are, and where they can go (Zhang and Wang, 2010). In other words, learners may feel uncomfortable finding right directions for themselves (Saadé and Otrakji, 2007). In addition, disorientation problems may hinder learners in reaching their desired learning objectives. Thus, good performance cannot be achieved which may, in turn, cause learners to lose their motivation and confidence while using Web-based learning systems. In the end, learners may also reject the use of Web-based learning systems in the future because of these losses (Demirbilek, 2009).

Due to the importance of these problems, research into this issue has mushroomed lately. A number of studies have investigated why learners encounter disorientation problems. For example, some studies claimed that

human factors, such as prior knowledge (Mishra and Yadav, 2006) and gender differences (Van Oostendorp and Juvina, 2007), may greatly influence the levels of learners' disorientation problems. Moreover, their navigation behavior may be yet another influential factor (Otter and Johnson, 2000). Other studies have indicated that learners' disorientation problems may also have great effects on their learning performance (Ahuja and Webster, 2001). For instance, Zhang and Wang (2010) indicated that learners who are confused while using such systems cannot achieve learning objectives effectively and demonstrate low performance.

In summary, learners' disorientation problems are a complex topic related to multiple issues. Therefore, there is a need to conduct further investigation to clarify these issues. To this end, the study presented in this paper aims to provide a complete understanding of learners' disorientation problems. To effectively reach our aim, a data mining approach is adopted in this study. This is because data mining can discover hidden relationships (Hand et al., 2001). In brief, this study employs a data mining approach to investigate why students have disorientation problems and how disorientation problems affect their learning.

This paper is organized as follows. In Section 2, theoretical background is described. Section 3 then moves to describe methodology used to achieve our aims. Subsequently, the results related to the causes and consequences of disorientation problems are presented in Section 4. The paper then proceeds to Section 5, which proposes a framework based on our results. Finally, conclusions are drawn and future work is identified in Section 6.

2. THEORETICAL BACKGROUND

2.1. Disorientation Problems

Previous studies indicate that learners may get lost or become disorientated when using the Web-based learning systems (Nielsen and Tahir, 2002). To face this problem, recently, a number of studies investigate why learners experience disorientation problems. Their findings include navigation behavior, prior knowledge and gender differences. With respect to navigation behavior, Otter and Johnson (2000) found that learners' disorientation problems might become severe when they feel confused with which links they should choose and which navigation tools can help them locate relevant information. Moreover, an earlier study by Smith (1996) indicated that learners felt confused because the links they selected could not help them locate relevant information. Moreover, the search tool they used could not help them find information they want. These findings echoes a claim made by Liang and Sedig (2009), which indicated that the investigation of disorientation problems should take into account the design of navigation tools.

With respect to prior knowledge, Mishra and Yadav (2006) found that different levels of learners' prior knowledge can cause different levels of disorientation problems. As shown in their work, learners with the low level of prior knowledge can frequently experience disorientation problems while those with the high level of prior knowledge can easily avoid disorientation problems. An earlier study by Last et al. (2001) found that students with high prior knowledge were better able to navigate easily, remember where they had been, and decide how to get to where they wanted to go. Conversely, the students with low prior knowledge often suffered from disorientation, not knowing where they had been, or where they could go to find the information that they needed. With respect to gender differences, previous research shows that females and males experience different levels of disorientation problems. Ford and Miller (1996) found that males were less disoriented than females and females showed fewer understandings of how to use navigation tools. The other study by Ford, Miller and Moss (2001) indicated that females had difficulties in finding their ways effectively around the Internet and they were more likely to get lost and did not feel in control.

The aforementioned studies indicated that several issues cause the disorientation problems. In addition, recent research also examined the consequences of disorientation problems. Some studies investigated the impacts of disorientation problems on learning performance. For instance, Amadieu et al. (2010) found that learners' disorientation problems may influence their learning performance. More specifically, learners with serious disorientation problems demonstrate low performance while those without disorientation problems show high performance. This may be due to the fact that the former can easily lose the path of the subject content while the latter can freely locate information to follow the path of the subject contents. Likewise, the other study proposed by Ahuja and Webster (2001) indicated that learners with disorientation problems demonstrated low performance because they felt difficult to reflect what they had learnt and to locate relevant information they wanted. To this end, they failed to integrate the concepts they learned so it was difficult for them to improve their learning performance.

The aforesaid studies explored the causes and consequences of learners' disorientation problems independently. In other words, there is a lack of integrative studies that do comprehensive investigation to examine the causes and consequences of disorientation problems together. To this end, this study addresses this issue. Such

investigation includes multiple aspects. Thus, there is a need to use intelligent techniques, such as data mining, to conduct data analyses so that a global understanding of disorientation problems can be obtained.

2.2. Data Mining

Data mining, also known as knowledge discovery (Fayyad and Uthurusamy, 1996), is an interdisciplinary area that encompasses techniques from a number of fields, including information technology, statistical analyses, and mathematic science (Bohen et al. 2003). A major function of data mining is the search for valuable information within large volumes of data (Hand et al., 2001). It can then be used to predict, model or identify interrelationships within a set of data (Urtubia et al., 2007) without a need to predefine underlying relationships between dependent and independent variables (Chang and Chen, 2005) as some of traditional statistical methods require.

As opposed to the traditional statistical methods, data mining uses the data itself to uncover relationships and patterns. In doing so, hidden relationships, patterns, and interdependencies can be discovered, predictive rules can be generated, and interesting hypotheses can be found. These are the advantages of data mining (Hedberg, 1995; Gargano and Ragged, 1999). Due to such advantages, Data mining has been successfully applied in various fields, such as image retrieval (Park, Seo, and Jang, 2005), personalized applications (Chang, Chen, Chiu, and Chen, 2009), and electronic commerce (Liao, Ho, and Yang, 2009).

These fields use a variety of data mining techniques, but they may be divided into two major categories: supervized learning and unsupervized learning. The former, which is also known as classification, refers to assigning objects to predefined categories or classes (Hastie, Tibshirani and Friedman, 2001). On the contrary, the latter, which is also known as clustering, is concerned with the division of data into groups of similar objects (Chen and Liu, 2008; Nolan, 2002).

Classification refers to the data mining problem of attempting to discover predictive patterns where a predicted attribute is nominal or categorical. The predicted attribute is called the class. Subsequently, a data item is assigned to one of a predefined set of classes by examining its attributes (Changchien and Lu, 2001). In other words, the objective of classification is not to explore the data to discover interesting segments, but rather to decide how new items should be classified. For example, Esposito, Licchelli, and Semeraro (2004) built student models for an e-learning system based on the students' level of performance: good, sufficient or insufficient.

Clustering is concerned with the division of data into groups of similar objects. Each group, called a cluster, consists of objects that are similar between themselves and dissimilar to objects of other groups. For example, a study by Kim (2007) adopted a clustering algorithm to extract sequences with similar behavioral patterns. Their results indicated that learners' navigation patterns are distinctive among different clusters. It implies that clustering can provide structural properties to identify dissimilarities between each group.

Both clustering and classification are useful techniques but a problem of using classification is that there is a need to have a predicted attributes. If the predicted attribute was not properly selected, the accuracy of the results might be affected. Therefore, we choose to use clustering in our study because disorientation problems are affected by multiple aspects and also have multiple effects.

3. METHODOLOGY DESIGN

To investigate the causes and consequences of learners' disorientation problems, an empirical study was conducted at a university in Taiwan. This section describes the methodology design of the empirical study, including participants, the design of a Web-based learning system, procedures and data analyses.

3.1. Participants

50 students voluntarily took part in our study. To recruit these participants, a request was issued to students in lectures and further by email, making clear the nature of the study and their participation. Participants had diverse levels of Internet skills, background knowledge and computer experience so that we can identify the causes of disorientation problems from the perspective of human factors.

3.2. Web-based learning system

To be able to measure students' attitudes to web-based learning, they should have experience in using it (Usta, 2011). Thus, we developed a Web-based learning system, which introduces the principles of "Interaction design" and includes eight sections. The user interface consists of (a) a title bar used to present the subject of the Web-based learning system, (b) a navigation-tool panel used to help learners locate information from the Web-based learning system, and (c) the main body of the Web-based learning system, which provides the details

of the subject content. Figure 1 shows the layout of this Web-based learning system.

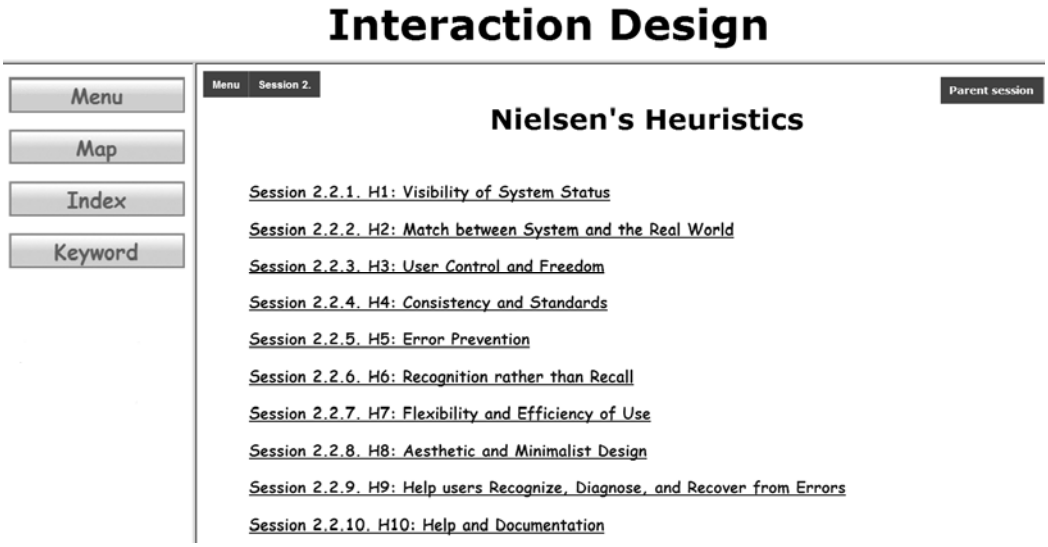

Figure 1. The Web-based learning system.

The Web-based learning system provides multiple navigation tools, which include a main menu, keyword search, hierarchical map and alphabetical index. The keyword search is to allow learners to locate information for particular concepts with a search box. The hierarchical map uses a graphic to represent relationships among various topics. The alphabetic index is to list all of topics in an alphabetic order (Khalifa and Kwok, 1999; Nilsson and Mayer, 2002; Chen and Macredie, 2004). In other words, these navigation tools serve different purposes so learners are allowed to have freedom to develop their own navigation strategies. By doing so, the relationships between learners' disorientation problems and their navigation strategies can be discovered.

3.3. Procedure

The procedure consists of five steps (Figure 2). The details of each step are shown below.

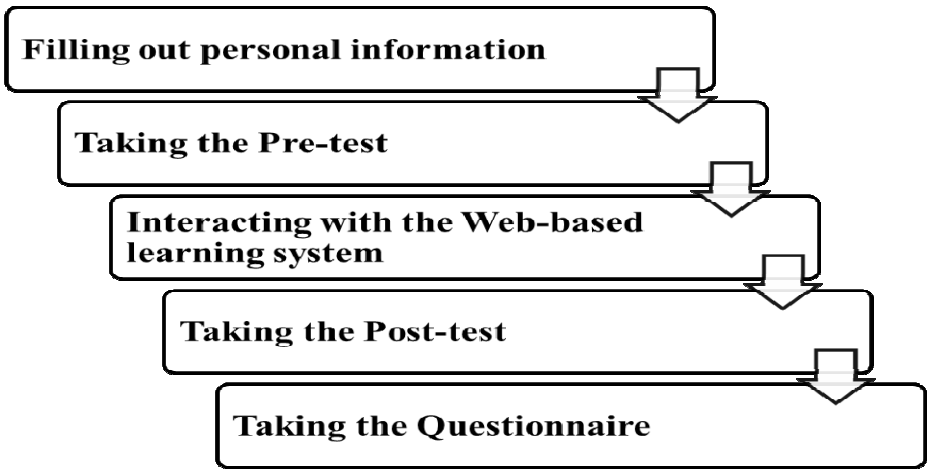

Figure 2. Experimental procedure.

(1) All of the participants were required to fill out their personal information, e.g., the levels of participants' subject knowledge and system experience. Such personal information was stored in a log file so that the relationships between human factors and disorientation problems can be analyzed.

(2) The participants were required to take a pre-test, which aims to objectively assess their prior knowledge of the subject content. The pre-test included 20 multiple-choice questions, each of which includes four possible responses: three different answers and an "I don't know" option.

(3) The participants were required to interact with the Web-based learning system. During this period, their

interaction with the Web-based learning system was recorded in a log file, including their choices of navigation tools and the time spent for the Web-based learning system. At the same time, the participants were also required to complete practical tasks, which could maintain learners' motivation (Scanlon, 2000). Furthermore, performing these tasks is to offer the opportunities of experiencing interface features provided by the Web-based learning system. Thus, we were able to identify how learners perceived the Web-based learning system.

(4) After finishing interacting with the Web-based learning system, the participants were required to take the post-test to identify how much they had learnt from the Web-based learning system. The post-test was as same as the pre-test, which includes 20 multiple-choice questions, each with three different answers and an "I don't know" option. The questions were matched on the pre-test and post-test so that each question on the pre-test had a corresponding similar (but not the same) question on the post-test. Creating similar questions was achieved by re-writing the question

(5) A questionnaire has the potential to collect cognitive and affective data quickly and easily (Kinshuk, 1996). At last, the participants, thus, needed to fill out a questionnaire to identify disorientation problems that learners experienced. The questionnaire was developed by an analysis of previous studies on disorientation problems (e.g., Saadé and Otrakji, 2007; Ahuja and Webster, 2001). There were 16 questions and each one used a five-point Likert scale ranging very much, quite a lot, average, not much, and not at all.

3.4. Data Analysis

The aim of this study is to investigate the causes and consequences of learners' disorientation problems. In order to reach our aim, learners' responses obtained from the questionnaire are worked as attributes to create clusters. Among a variety of clustering techniques, K-means algorithm is widely used to partition the data into several clusters according to their similarities (Han and Kamber, 2001). In particular, it is frequently applied to analyze Web usage data. For example, a study by Wiwattanacharoenchai and Srivihok (2003) used K-means to create customer clusters from Web logs of various Internet banking Web sites. Their results showed that there was a clear distinction between the clusters, in terms of customer behavior.

The major principle of the K-means algorithm uses k initial centers, each of which is assigned to each cluster, to partition data into k clusters. Each pattern in the cluster is decided based on the nearest distance between the pattern and each cluster center. However, a major limitation of using the K-means algorithm is that the number of clusters needs to be predefined. In other words, there is a need to identify the most suitable number of clusters to perform the K-means algorithm. Such an issue can be treated as parameter exploration (De Jong, 1975), which is used to decide the suitable value of parameters. The parameter exploration is useful when a dataset is not large. Thus, the K-means algorithm is suitable for this study because the dataset was not large. Therefore, the parameter exploration was applied to decide the parameters of the K-means algorithm in this study. Subsequently, the number of clusters is set for the large range of value to investigate the robustness of the clustering results. The suitable number of clusters is determined based on not only the smallest distance between the features in a same cluster, but also the largest distance between the features in different clusters. After doing so, we found that the K-means algorithm produces more efficient outcomes for three clusters.

Subsequently, we select features to examine the corresponding characteristics of each cluster based on a comprehensive review by Chen and Macredie (2010). The details of these features are described in Table 1. The detailed differences among the three clusters were illustrated with the mean and standard deviation of each feature. In addition, the correlation analysis is also conducted to provide additional evidence as to the relationships among computer experience, disorientation problem, and learning performance.

Table 1. The features used to examine each cluster.

Features	Explanation
Human Factors	• Computer experience • Gender Differences
Navigation Behavior	• Frequencies of using navigation tools: the total number of times each navigational tool used • Time of using each navigation tool: the total amount of time each navigational tool used
Learning Effort	• Total Time spent for reading pages in the Web-based learning system

Learning performance	• Post test score: the score obtained from the post-test • Gain Score: the difference between the post-test score and pre-test score

4. RESULTS AND DISCUSSION

Three clusters were created with a K-means algorithm. As shown in Table 2, the percentage of learners within each cluster is satisfactory because the number of the members in each cluster is reasonably balanced. The mean and standard deviation (STD) of the responses to the questionnaire for each cluster are shown in Table 2. The high mean value represents the high level of disorientation problems that learners experience and vice versa. The tendency of each cluster is shown below.

Table 2. Score from questionnaire for Each Cluster.

Cluster (C)	Reponses to the questionnaire		Instances
	Mean	STD	
C1	2.33	0.46	21(42%)
C2	3.35	0.36	17(34%)
C3	5.23	0.47	12(24%)

- Cluster 1 (C1, N=21): Learners do not experience any difficulties while using the Web-based learning system. In other words, the learners in Cluster 1 clearly understand the meanings of buttons and icons. However, it would be helpful for them if a suggested route could be given through the Web-based learning system.
- Cluster 2 (C2, N=17): Learners are somewhat confused while using the Web-based learning system. Because the uses of the back/forward buttons are unclear to them. Consequently, it is difficult for these learners to keep track of topics which have been learnt.
- Cluster 3 (C3, N=12): Learners may be easily confused while using the Web-based learning system. The learners in Cluster 3 do not fully understand the meaning of buttons and icons and it is difficult to keep track of topics which they have learnt. Moreover, they also think that too many options are provided so they do not know how to choose a proper navigation tool to help them locate information.

The aforementioned results indicate that learners encounter different levels of disorientation problems. Some may feel comfortable with the Web-based learning system while others may feel very confused with the system. Thus, there is a need to further develop a complete understanding for this issue. To this end, it is necessary to investigate why they have disorientation problems and how disorientation problems influence their learning. In other words, we need to identify the causes and consequences of learners' disorientation problems, which are presented in subsections below.

4.1. Causes of disorientation problems

The results indicate that disorientation problems are caused by the levels of computer experience, the use of navigation tools, and time spent reading pages. The details are shown below.

4.1.1 Computer experience

The levels of learners' computer experience in each cluster are illustrated in Figure 3, which shows there is an inverse relationship between learners' computer experience and their disorientation problems ($r=-.275$; $p<.05$). More specifically, the learners with a high level of computer experience may never feel confused while the learners with a low level of computer experience may easily feel confused. A possible reason is that learners who have sufficient computer experience can easily understand each function provided by the Web-based learning system so they have less confusion. Thus, learners in Cluster 1, who have the higher level of computer experience, never feel confused. On the other hand, learners in Cluster 2 and Cluster 3, who have the lower level of computer experience, may easily feel confused with using the Web-based Learning system. Our finding echoes a claim made by Mishra and Yadav (2006), which indicated that learners' prior computer experience greatly affects the levels of disorientation problems that learners experience.

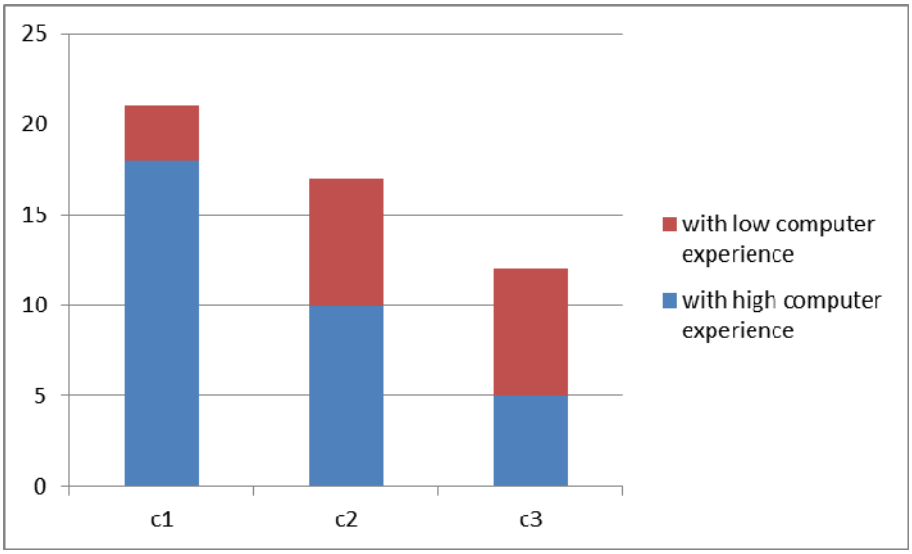

Figure 3. Relationships between learners' computer experience and their disorientation problems.

4.1.2. Frequencies of using each navigation tool

Another influential factor is related to the frequencies of using various navigation tools. Table 3 describes how learners in each cluster use each navigation tool. This table shows several interesting tendencies. The first tendency is related to the use of the hierarchical map. As showed in this table, learners in Cluster 1 made the most use of the hierarchical map while those in Cluster 3 made the fewest use of the hierarchical map. Such a difference may be another reason to explain why learners in Cluster 1 experienced fewer disorientation problems while those in Cluster 3 experienced more disorientation problems. More specifically, there is an inverse relationship between the frequencies of the use of the hierarchical map and the levels of disorientation problems that learners experience ($r=-.337$; $p<.01$). In other words, learners who frequently use the hierarchical map feel less confused than those who rarely use the hierarchical map. These findings are in line with those of the study by Amadieu et al., (2010), which found that the hierarchical map is useful to reduce learners' disorientation problems. This is due to the fact that the hierarchical map presents an overall picture, which shows the relationship between each topic. Such an approach can help learners find a right direction for their learning paths so that learners can avoid disorientation problems.

Table 3. Frequency of using each navigation tool.

Cluster (C)	Frequency of each navigation tool used							
	Keyword		Menu		Index		Map	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD
C1	2.33	0.06	1.62	0.2	0.48	0.11	0.86	0.06
C2	2.18	0.33	1.76	0.15	0.18	0.09	0.59	0.8
C3	2.42	0.08	1.33	0.89	0.17	0.09	0.33	0.89

The other tendency is concerned with the balanced use of each navigation tool. As showed in Figure 4, learners in Cluster 1 tend to evenly use each navigation tool while those in Cluster 3 tend to rely on a particular navigation tool. Such a difference may be the other reason to explain why learners in Cluster 1 experienced fewer disorientation problems while those in Cluster 3 experienced more disorientation problems (Gwizdka and Spence, 2007). Each navigation tool shows different ways to help learners construct their knowledge. Thus, learners in Cluster 1, who use multiple tools, can organize information in a more effective way. In contrast, learners in Cluster 3, who mainly focus on using the keyword search, may have difficulties in developing effective learning strategies. In particular, the keyword search can only present a single concept, instead of illustrating relationships between each topic so they may fail to see logical relationships between each topic and can experience more disorientation problems.

In summary, the aforementioned tendencies indicate that learners, who tend to use multiple tools to locate information, can avoid experiencing disorientation problems while the learners, who tend to rely on a single tool, such as the keyword search, can easily encounter disorientation problems. Furthermore, the learners, who frequently use the hierarchical map, feel less confused than those who rarely use the hierarchical map. In other words, the hierarchical map may be beneficial to reduce learners' disorientation problems.

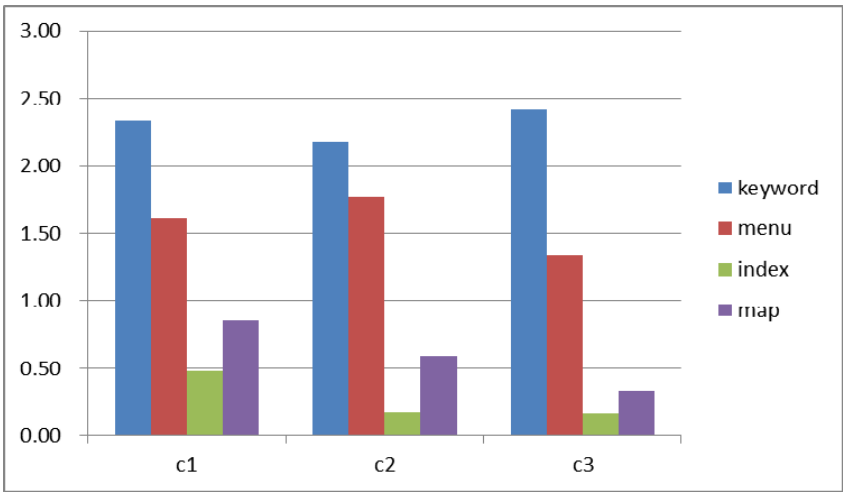

Figure 4. Frequency of using each navigation tool.

4.1.3. Time of using each navigation tool

The other critical factor is concerned with the time spent for each navigation tool. As shown in Figure 5, most of the learners tend to spend more time using the keyword search and main menu than the other two tools. Unlike other clusters, learners in Cluster 3 tend to spend more time for using the keyword search than the main menu. As indicated in the previous section, the keyword search mainly emphasizes on a single topic, instead of giving the whole picture of the subject content. Therefore, it is difficult for them to logically connect each topic with the keyword search. Moreover, they spend little time for using the main menu, which can help learners construct logical relationships between each topic. Such a reason may explain why learners in Cluster 3 may experience more disorientation problems than those in Cluster 1.

In addition to the keyword search and the main menu, the learners in Cluster 3 also spend less time for using the hierarchical map than those in other clusters. This may be another reason to explain why learners in Cluster 3 experienced more disorientation problems than those in other clusters. These results are in agreement with those presented in Section 4.1.2, which indicate that the hierarchical map may be beneficial to reduce learners' disorientation problems.

On the other hand, learners in Cluster 3 never spend time for using the alphabetical index (Table 4). As mentioned in the result of Section 4.1.2, the unbalanced use of their navigation tools can cause disorientation problems because each navigation tool serves different purposes.

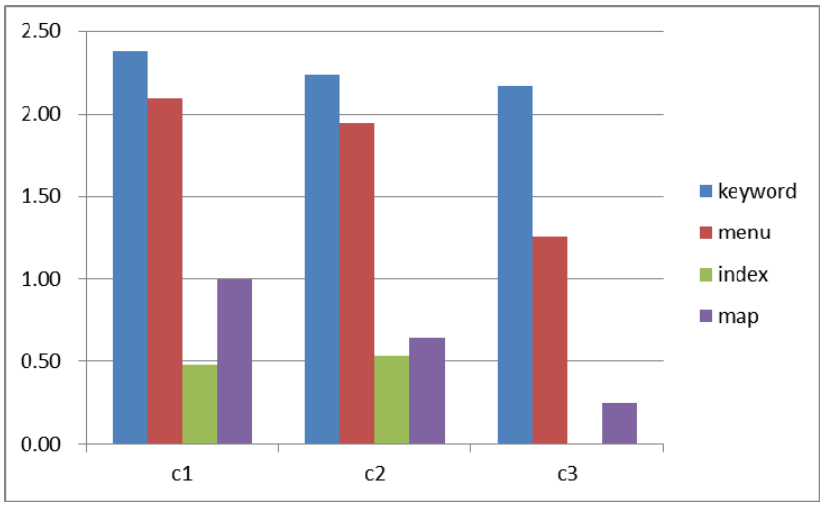

Figure 5. Times using each navigation tool.

In summary, this section demonstrates that the level of computer experience, the choices of navigation tools and time spent for each navigation tool may affect the levels of disorientation problems that learners experience. Although those findings provide a deep understanding of the causes of disorientation problems, there is also a need to discover the consequences of disorientation problems, which are presented in the following section.

Table 4. Time of using each navigation tool.

Cluster (C)	Time of each navigation tool used							
	Keyword		Menu		Index		Map	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD
C1	2.38	0.02	2.1	0.3	0.48	0.98	1.00	0.22
C2	2.24	0.31	1.94	0.25	0.53	0.18	0.65	0.17
C3	2.17	0.11	1.25	0.14	0	0	0.25	0.87

4.2. Consequences of disorientation problems

The results indicated that disorientation problems can influence the learners' effectiveness and their performance. The details are shown below.

4.2.1. Learning Effort

As shown in Table 5, learners in Cluster 3, who have a high level of disorientation problems, spend the least time reading pages in the Web-based learning system. Conversely, learners in Cluster 1, who have a low level of disorientation problems, spend the most time reading pages in the Web-based learning system. More specifically, the learners who meet serious disorientation problems may feel confused with how to use the Web-based learning system so it is difficult for them to concentrate on the content. This is the reason why they spent the least time for reading pages. In contrast, the learners who do not meet serious disorientation problems can easily concentrate on the content so they spent the most time for reading the pages. Such a difference suggests that the former put more effort to read pages presented in the Web-based learning system than the latter.

Table 5. Total time spent for reading pages.

Cluster (C)	**Mean**	**STD**
C1	15.95	1.53
C2	15.35	1.91
C3	13.67	1.12

4.2.2. Learning Performance

This Section describes how learners' disorientation problems affect their learning performance based on their post-test scores and gain scores. The former is concerned with their performance in the post-test while the latter emphasizes on the improvement that the learners have made. As shown in Table 6, learners in Cluster 3 obtain the lowest post-test score while those in Cluster 1 demonstrate the highest post-test score. Likewise, learners in Cluster 1 have the highest gain score whereas those in Cluster 3 have the lowest gain score (Table 7). It suggests that the results from the post-test are consistent with those from the gain score.

Table 6. Post-test Score for Each Cluster.

Cluster (C)	Post-test Score		Instances
	Mean	STD	
C1	14.95	2.77	21(42%)
C2	12.65	2.64	17(34%)
C3	10.92	3.26	12(24%)

Table 7. Gain score from Performance for Each Cluster.

Cluster (C)	Gain Score		Instances
	Mean	STD	
C1	5.29	1.24	21(42%)
C2	4.82	1.83	17(34%)
C3	3.25	3.57	12(24%)

In summary, learners in Cluster 3 show worse learning performance than those in the other two clusters. As mentioned in the above section, learners in Cluster 3 also experienced more disorientation problems than those in the other two clusters. It implies that the learners with more disorientation problems do not perform as well as those without disorientation problems. The finding echoes a claim made by Last et al., (2001), which indicated that disorientation problems have greatly effects on students' learning performance. In other words, there are inverse relationships between disorientation problems and students' learning performance, regardless the post-test score ($r=-.337$, $p<.01$) or gain score ($r=-.227$, $p<.05$). A possible reason is that learners with less confusion can properly choose navigation tools to locate relevant information from the Web-based learning system. As showed in Section 4.1.2, learners in Cluster 3 rarely use the main menu and hierarchical map, which are helpful to build logical relationships between each topic. Thus, they may fail to see the logical relationships between each topic, which, in turn, their performance is not as good as those in other clusters.

In addition to showing the lowest learning performance, the performance of learners in Cluster 3 also reveals high variation because the standard deviation of the gain score in Cluster 3 is very high. It implies that disorientation problems have great effects on student learning because they cannot only negatively affect learning performance but also increase their diversities.

5. THE DEVELOPMENT OF A FRAMEWORK

This study contributes to give a deep understanding of the causes and consequences of learners' disorientation problems. According to our results, learners' computer experience, the frequencies and time of using each navigation tool may be the major causes of disorientation problems. On the other hand, disorientation problems also have great effects on learning effort and learning performance. To this end, there is a need to remove the causes of disorientation problems so that the consequence can also be avoided. The following guidelines are proposed to address this issue.

5.1. To provide annotation for each navigation tool

As showed in our results, the learners with less computer experience may easily encounter disorientation problems. It may be because they lack sufficient computer experience to identify the functions of each navigation tool. Thus, they have difficulties to find useful tools for themselves (e.g., Jenkins, Corritore, and Wiedenbeck, 2003; McDonald and Stevenson, 1998) and need to spend much time on trying various navigation tools. This is the reason why they cannot concentrate on reading pages in the Web-based learning system. To address this problem, the Web-based learning system should provide clear description for each navigation tool so that learners can know the function of each navigation tool. For example, Annotations, which can work as a label to support local orientation by providing additional description, can be used to describe the function of each navigation tool (Chen and Macredie, 2002). In particular, the annotations can be used together with the hierarchical map, which can help learners easily see relationships between each topic and avoid disorientation problems.

5.2. To provide direct guidance for suitable tools

The learners, who tend to focus on using particular navigation tools, may easily encounter disorientation problems. In particular, only using the keyword search may make the learners obtain the fragment information of subject content and fail to build logical relationships between each concept and to get the overall picture of the subject content. To address this problem, the Web-based learning system should suggest suitable navigation tools for learners. For example, Direct Guidance, which guides the learners to the next "best" item (Brusilovsky, 1998), can be used to recommend suitable navigation tools. In particular, the main menu and hierarchical map should be recommended to learners with disorientation problems because these two navigation tools can illustrate the logical relationships between each concept.

A framework (Figure 6) is proposed based on the above listed two guidelines.

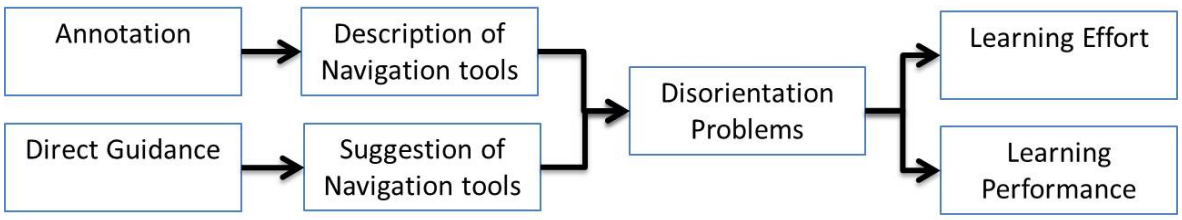

Figure 6. The proposed framework.

6. CONCLUDING REMARKS

This study aimed to use an integrative way to investigate learners' disorientation problems. The causes and consequences of disorientation problems are examined by using the K-mean clustering method. This study demonstrates some interesting findings related to these two issues. Regarding the causes of disorientation, learners' computer experience, the frequencies and time of using each navigation tool greatly affect their disorientation problems. Regarding the consequences of disorientation problems, the disorientation problems have major impacts on learning effort and learning performance. According to our findings, the framework is proposed to support the designers to build a Web-based learning system which can not only reduce the causes of learners' disorientation problems but also avoid their consequences.

Although this study makes significant contributions, there are still some limitations. Firstly, this is a small-scaled study. There is a need to consider a larger sample to provide additional evidence as to the use of navigation tools in future research. Moreover, this study only uses K-mean clustering method to discover the causes and consequences of learners' disorientation problems so further works can consider other clustering algorithms, e.g., fuzzy C mean (Liu and Xu, 2008). In addition, we can further apply other data mining methods to analyze learners' disorientation problems, e.g., association rules or classification. Such results can be integrated into the framework presented in Section 5 so the robustness can be enhanced.

ACKNOWLEDGEMENTS

This work is funded by National Science Council, ROC (NSC 98-2511-S-008 -012 -MY3 and NSC 99-2511-S-008 -003 -MY2). Additionally, thanks to Aubrey Neil Leveridge for the support of writing this paper.

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A NEW ADDICTION FOR TEACHER CANDIDATES: SOCIAL NETWORKS

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ABSTRACT
With the transition to being a knowledge-based society, the internet usage has become an irreplaceable part of life. As socials networks have come into our lives, the internet usage has taken a different dimension. People can affiliate to social networks in order to make friends, exchange information, find partners, and to play games. The process that starts with membership then turns into an addiction. The internet addiction is along with the addiction to social networks, which is one of the today's matters. The study used quantitative model. Facebook Addiction Scale was used to collect data and t-Test and ANOVA analyses were used to determine whether there is a difference between gender and classes according to the Facebook addiction. The findings of this study revealed that there is a significant difference between gender and classes according to the Facebook addiction. It was found that Facebook addiction levels of males were higher than those of females. Besides it was found that Facebook addiction levels of seniors were higher than those juniors, sophomores and freshmen.
Key Words: Internet**,** Social Networks, Social Network Addiction, Internet Addiction, Facebook

INTRODUCTION

Some users have lost their control over their internet usage and begun having problems with their functionality in social, vocational and personal circles as the Internet, which has been developed to enhance communication and to ease the exchange of information, has unexpectedly become widespread over time. However, social networks gain great importance following the development of web 2.0 technologies. Today, many individuals communicate with others using social networks in environments where face-to-face communications are not fully provided (Isbulan, 2011). The increase in the internet usage and the rapid advancement of social networks can, for these people, become a problematical use and even an 'addiction'.

Morahan-Martin and Schumacher (2000) explain the internet addiction as the excessive use of the internet and the failure to control this usage which seriously harms a person's life. Beard and Wolf (2001), on the other hand, define it as the extreme use that inclines a person to have difficulties in his domestic, social, professional, educational and/or psychological life. In addition to these descriptions, Young (2007) sees the internet addiction as a new and generally an unrecognized disorder which can effect a user's online usage and his ability to control to the extent that it may cause communicational, vocational and social problems. Besides, according to Sahin (2011) internet addiction is described as the use of internet in increasing amounts of time in order to achieve satisfaction. And also Iskender and Akin (2011) stated that students high in self-judgment, isolation, and over-identification are more likely to vulnerability to internet addiction than are people high in self-kindness and mindfulness.

Excessive mental preoccupation with the internet usage, repetitive thoughts about limiting or controlling the use, failure to prevent the desire for access, continuation of using the internet though functionality being ruined at various levels, spending more and more time on the internet, craving for using the net when no access is available are the remarkable problems with the internet usage.

Social networks are among the most popular applications of the internet–which today rapidly advances on the way to being one of the most important means of communication. The frequency of participating in social networks increases as the internet usage becomes widespread. It is argued that a considerable proportion of the internet usage will be provided by social networks in the near future. Social network applications now provide communication only and intend to meet almost all the requirements of the users by use of many branches such as games, knowledge acquisition and searching. Thus, people who can find almost everything they look for on a social network will not need another tool.

Social Networks

Social networks appear to be the most ideal environments in that they are constantly updateable, open to multithreading and give an opportunity to virtual sharing. According to Downes (2005), social networks are the conjunction of personal ties which are combined by the set of relations. People can express their daily thoughts,

discuss over these thoughts and come up with new ideas on social networks. Also, they can share various photographs and videos in addition to their personal details, look for job –even, they can find one–, and they experience the real world within the virtual environment. This, day by day, draws all the attention to this field and forms a new conceptual frame for the renewed virtual world. A good number of social communication networks have nowadays emerged. These are as follows:

Table 1. Social Networks

Facebook	Twitter
Plaxo	Netlog
Xing	Badoo
Jhoos	Orkut
Myspace	Youtube
Hi5	Linkedin
CyWorld	Friendster
Google+	Wikipedia

Numerous social communication networks have today arisen as is seen in Table 1. The reason as to why these networks have come into being is due to the fact that the internet users have been in search of new things. This search, during the time when social networks have become widespread, becomes a social habit which will day by day turn into a social network addiction.

Social Network Addiction

Many social networks have nowadays emerged and they reshape people's communication, interaction, cooperation and even their learning process. Murray (2008) argued that social networks and softwares in today's societies have changed both the way people communicate with each other and knowledge-sharing. To give an example of the issue, the time that the users spend on social networks has now been two or three times more than that when such networks emerged. A large number of people of all ages participate in social networks with different aims and the number of the users who attend on-line social networks still increases day by day. Researches on addictions now place special emphasis on social network addiction as well as smoking, alcohol and drugs. Spending many hours on the internet to share notifications is viewed as "socialization". Psychologists describe this as social-notification-addiction. Such users, even though they think that they will socialize by sharing notifications, become unsocial and prone to avoiding real social relations because they are prevented from the time that the brain has made for socialization: Because the brain is sated with socialization by the effect of the notifications. The fact that an addict who does not keep in touch with his own relatives says "hello" to those on his friend-list every morning and converses with them, trying to solve their problems points to a serious contradiction.

The scientists from Gothernburg University of Sweden, who conducted a Facebook survey on 100 students, showed that %85 of the surveyed log in Facebook at least one time every day. According to the survey, the half of the participators mentioned that they feel they drop behind something in social sense (Denti et al., 2012).
The survey by Oxygen Media and Lightspeed Research Center which was conducted on girls whose ages ranged from 18 to 34 and all of whom were social media users revealed striking consequences. %34 of them confessed that they log in Facebook before they go to the toilet when they wake up every morning whereas %39 identify themselves as Facebook addicts. %49 of them take hacking and controlling their boyfriends' accounts as a normal behavior (Abhijit, 2011).

A research made by Chicago Booth School of Business University on subjects who were between 18 and 35 and were the members of Facebook and Twitter showed that social network addiction precedes smoking and drug addictions. Specialists remarked that the desire for being on social networks is superior to the desires for sleep and rest, pointing to a social disaster, and, they discussed social media addiction is more harmful than smoking- and drug-addiction (The Telegraph, 2012).

RESEARCH METHOD

The purpose of this study is to determine Facebook addiction of teacher candidates who are enrolled in Sakarya University, College of Education. In this study, the collection and analysis of quantitative data is used. In a descriptive method, the aim is to describe systematically the facts and characteristics of a given population or area of interest, factually and accurately. It involves collecting data to test the validity of the hypotheses concerning the current status of the subjects of the study (Ekmekçi, 1991).

Participants

The subjects for this study were 1257 students who were at Sakarya University in Turkey. Demographic information of the participants follows. The participants consisted of 739 female, 518 male and 536 of them are freshman, 303 of them are sophomore, 336 of them are junior, 82 of them are senior students. The demographic characteristics of the participants are given table 2.

Table 2. Data About the Sampling

Variables	N	%
Gender		
Female	739	58,8
Male	518	41,2
Classes		
Freshman	535	42,6
Sophomore	303	24,1
Junior	336	26,7
Senior	83	6,5
Total	**1257**	**100**

Data Classification and Analysis

In the research, to identify teacher candidates' demographic characteristics, frequencies and percentages were calculated. T- test and ANOVA were used to examine differences among groups in terms of independent variables. For statistical analysis, SPSS 19 Statistical Data Analysis Program was used.

Instrument

Internet Addiction Test by Dr. Kimberly Young, director of Netaddiction.com and the Center for Internet Addiction, was reorganized for Facebook with her permission. In Facebook Addiction Scale 20 items are about determining of the Facebook Addiction and 2 items are about personal information. For determining these items, items were assessed in terms of theoretical consistency, conception clarity and ease of interpretation. The items are evaluated with the opinions of "totally measuring", "somewhat measuring" and "not measuring" by 7 faculty members from the programs of Computer Education and Instructional Technology, Psychological Counseling and Turkish Language Education. The survey items are answered by means of a Likert-type Scale with six response choices, including "Does not apply", "Rarely", "Occasionally", "Frequently", "Often" and "Always".

Validity and reliability studies of the survey are conducted with 1257 (58.8% Female, 41.2% Male) teacher candidates. Exploratory factor analysis (EFA) was used for validity of the 20 items. The Kaiser-Meyer-Olkin (KMA) measure of sampling adequacy and Bartlett's Test of Sphericity (BTS) are applied to the data prior of factor extraction to ensure the characteristics of the data set are suitable for EFA. Since the KMO and BTS results indicate the data satisfy the psychometric criteria for factor analysis, the EFA is performed. Furthermore, Cronbach's alpha internal consistency coefficient is calculated.

According to finding of exploratory factor analysis, similar to original scale, adapting scale was resulted in one dimension with 40.93% explained variance. Also, Kaiser-Meyer-Olkin (KMO) and Bartlett test confirm the appropriateness sample size with .95 value (χ^2= 9688.18, p=,000). Although the original scale had 20 items, in adapting scale, 19 item numbers were obtained by exploratory factor analysis. The reliability of the scale was calculated with Cronbach's alpha and it was found to be .92.

Table 3. Exploratory Factor Analysis Results

Items	Extraction	Factor Loadings
m2	0,59	0,63
m3	0,48	0,55
m4	0,35	0,55
m5	0,52	0,58
m6	0,64	0,73
m7	0,43	0,60

m8	0,68	0,69
m9	0,53	0,64
m10	0,47	0,63
m11	0,49	0,60
m12	0,52	0,68
m13	0,49	0,66
m14	0,57	0,65
m15	0,62	0,66
m16	0,51	0,63
m17	0,59	0,69
m18	0,65	0,65
m19	0,51	0,62
m20	0,58	0,68

Eigenvalue (Sum.= 7.78)
Total Variance Explained %= 40.93

According to finding of exploratory factor analysis the scree-plot that shows one subscale is given below:

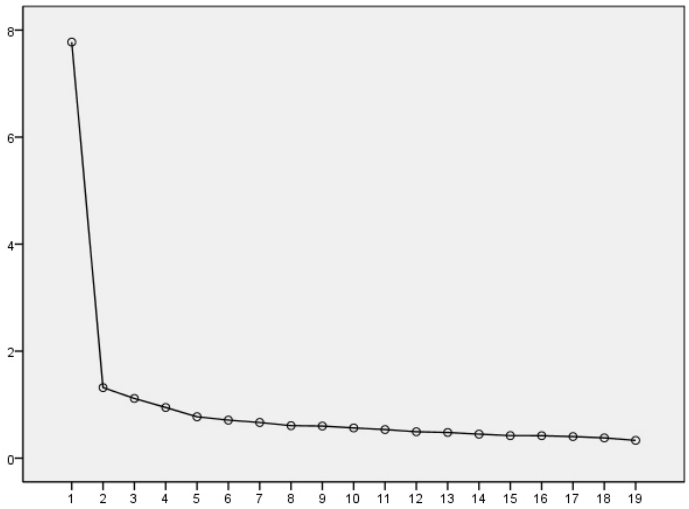

Figure 1. Scree-plot Chart

FINDINGS

This study examines Facebook addiction of teacher candidates who study in college of education. t-Test and ANOVA were used to examine differences among groups in terms of independent variables.

Gender Differences

As a result of the t-Test that was applied to see whether there is a significant difference among female and male teacher candidates related to the answers given to the Facebook Addiction Scale.

Table 4. t-Test for Differences between Genders

Factor	Gender	N	$\bar{X}$	S	sd	T	P
Facebook Addiction	Female	739	35,94	15,47	1269	-6,103	,000
	Male	518	41,36	15,72			

As a result of the t-Test applied, there is a significant difference between "Facebook Addiction" related to the answers given. The result showed that male teacher candidates are significantly (t= -6,103, p< .05) more addicted to Facebook than female teacher candidates.

Class Differences

As a result of the ANOVA that was applied to see whether there is a significant difference among between teacher candidates' classes related to the answers given to the Facebook Addiction Scale.

Table 5. ANOVA for Differences between Classes

	Class	N	$\bar{X}$	SD	Source of Variance	Sum Of Squares	Df	F	p
Facebook Addiction	Freshman	535	36,25	14,59	Between Groups	8054,59	3	11,00	,000
	Sophomore	303	38,48	16,16					
	Junior	336	38,93	17,12	Within Groups	305477,93	1252		
	Senior	83	46,62	13,54					

When Table 5 was analyzed, it was seen that the total addiction scores towards Facebook is the highest ($\bar{X}$ = 46.62) for the teacher candidates, who are seniors. There is a significant difference between type of classes and the total addiction scores ($F_{(3,\ 1252)} = 11.00$; $p < .05$). In order to find out among which group this difference results from, Bonferroni analysis in ANOVA was applied. It was understood that the total addiction scores for seniors ($\bar{X}$ = 46.62) is significantly different from juniors ($\bar{X}$ = 38.93), sophomores ($\bar{X}$ =38.48) and freshmen ($\bar{X}$ =36.25). The teacher candidates who are seniors are more significantly (p< .05) addicted to the Facebook than juniors, sophomores and freshmen.

CONCLUSION

Social networks of such popularity effect today's societies and they are now and will be changing some of their habits. Many people who feel lonely try to open instant conversations and to extend their circle of friends through social networks. By this way, people become detached from social life as social network addiction ascends. Social life, considerably limited by television, has come to a more complicated state through virtual world. This study aims to investigate how teacher candidates are addicted to the Facebook the obtained results can be summarized.

It was found that there is significantly difference between genders and classes. Male teacher candidates are significantly more addicted to Facebook than female teacher candidates. However seniors are more significantly addicted to the Facebook than juniors, sophomores and freshmen.

In this study, male teacher candidates more significantly expressed than female teacher candidates that they prefer the excitement of the Facebook to intimacy with your partner, they form new relationships with fellow Facebook users, others in their life complain to them about the amount of time they spend on Facebook, their grades or school work suffer because of the amount of time they spend on Facebook, they check their Facebook messages before something else that they need to do, their job performance or productivity suffer because of the Facebook, they become defensive or secretive when anyone asks them what they do on Facebook, they find themselves anticipating when they will go on Facebook again, they snap, yell, or act annoyed if someone bothers them while they are on Facebook, they feel preoccupied with the Facebook when off-line, or fantasize about being on Facebook, they try to cut down the amount of time they spend on Facebook and fail, they try to hide how long they've been on Facebook, they choose to spend more time on Facebook over going out with others and they feel depressed, moody, or nervous when they are off-line, which goes away once they are back on Facebook.

Beside all this results, it was thought that males and seniors can be investigated about their addiction to the Facebook. And also developed scale can be used in different studies and lead to other studies.

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A PRELIMINARY EVALUATION OF SHORT BLENDED ONLINE TRAINING WORKSHOP FOR TPACK DEVELOPMENT USING TECHNOLOGY ACCEPTANCE MODEL

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ABSTRACT
The use of Short Blended Online Training (SBOT) for the development of Technological Pedagogical and Content Knowledge (TPACK) is a promising approach to facilitate the use of e-learning by academics. Adult learners prefer the blend of pedagogies such as the presentation, demonstration, practice and feedback if they are structured and instructor-led with an efficient training length. In this paper, we suggest that SBOT has the potential to create a highly preferred environment for training if adult learning principles are considered. The study explores the evaluation of this mode of training by using Technology Acceptance Model (TAM). The results show a great acceptance for this mode of training. Moreover, in practice, dual training modes can be offered for TPACK development programs, which may consist of face-to-face training and SBOT.
Keywords: Short Blended Online Training, SBOT, TPACK development, Faculty development, Higher education

1. INTRODUCTION

The integration of online learning as an effective teaching method in Higher Education Institutions (HEIs) has been well received. HEIs have embraced this trend which allows them to provide a flexible environment for learning, to utilise different learning resources on the Internet, and to increase the interaction with learners (Ellis *et al.*, 2009).

Various domains of HEIs are inevitably influenced by the integration of instructional technology and must be redesigned and updated to take full advantage of the new digital tools in HEIs (Williams, 2002). One of these domains that should be updated in order to provide a successful implementation of instructional technology is the faculty knowledge. According to Bates (1997), one of the twelve organisational strategies for preparing HEIs for technology integration is training faculty members on how to use the technology and informing them of the need to integrate instructional technology into learning. Technological, Pedagogical and Content Knowledge (TPACK) constitutes the main required knowledge for faculty members to conduct online classes successfully (Mishra and Koehler, 2006). Faculty members may prefer this model of training because it includes elements of pedagogies (Friel *et al.*, 2009). In addition, the factors mentioned by Bates (1997) are covered by the TPACK model, as faculty members can identify easily the rationale of using e-learning tools according to the content they teach and the pedagogies they use. Thus, using the TPACK model is expected to facilitate faculty members' development and including the main related elements that are needed to conduct successful online instruction.

As the TPACK model was built on the Pedagogical Content Knowledge (PCK) model (Mishra and Koehler, 2006), similar issues are raised related to the theories that underpin these models and boundaries that govern the relationship between TPACK sub domains. According to E. Lee, Brown, Luft, & Roehrig (2007), identifying the theories that support PCK is a complex task. To address this issue, a learning theory must be selected according to the context in which the TPACK model is used. For example, because the context of the current study is HEIs, the principles of adult learning theories were used to design the SBOT training through the lens of the TPACK model (as will be further elaborated). Moreover, there are seven domains within the TPACK model namely Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge

(PCK) and TPACK. The definitions of these elements and the boundaries between the sub-models were unclear. For example, Cox (2008) found 10 definitions for TPK, 13 definitions for TCK and 89 definitions for TPACK. Cox and Graham (2009) specified the boundaries that differentiated each sub-model and clarified their results with real case studies. Today, many instructional technologists utilise the TPACK model in faculty development programs (Chen *et al.*, 2009; Koehler *et al.*, 2004; Koehler *et al.*, 2007; Mishra and Koehler, 2006; Pryor and Bitter, 2008; Shin *et al.*, 2009; Voogt *et al.*, 2005; Yang and Liu, 2004).

The practicality of the TPACK development programs in HEIs should be considered since joining the development programs by faculties is challenging (Chick, 2002; Zelin and Baird, 2007). One of these challenges is the length of the training programs (B.Merriam *et al.*, 2001; Bingimlas, 2009; Chick, 2002; Owston *et al.*, 2008). In TPACK literature, using long-term training workshop is a dominant approach for TPACK development. Positive results have been reported in most of the studies (Chen *et al.*, 2009; Koehler *et al.*, 2004; Koehler *et al.*, 2007; Mishra and Koehler, 2006; Voogt *et al.*, 2005; Yang and Liu, 2004). These long-term training workshop continued mainly for one semester (Chen *et al.*, 2009; Koehler *et al.*, 2004; Koehler *et al.*, 2007; Mishra and Koehler, 2006; Pryor and Bitter, 2008; Shin *et al.*, 2009; Yang and Liu, 2004) or extended to nine months (Voogt *et al.*, 2005). The positive results of these studies are encouraging and can make TPACK development an actual reality. But unfortunately, the length for these studies is an obstacle from implementing long-term training in some of the HEIs contexts since faculties have a wide range of responsibilities. Therefore, providing instructor-led (Georgina and Hosford, 2009) and structured (Bailey and Card, 2009; Ke and Xie, 2009) training have the potential to create a sufficient training length. Also, addressing the social and job responsibilities is critical during the process of TPACK development. Therefore, using full online training as a training mode for TPACK development is promising because faculties are physically independent in this mode of training. Lastly, utilizing the Adult learning principles during the design of the TPACK development programs may contribute positively to the TPACK development programs. Addressing these elements can achieve a high acceptable environment for TPACK development. This in turn can facilitate process of TPACK development in HEIs.

Using full online training for faculty development is promising (Wolf, 2006). This type of training can improve faculty members' attitude towards utilising online learning in their classes (Carr, 2000). In addition, it can be a helpful mean for instructional technology training because faculty members who teach online should be trained using the LMS of their institutions to achieve a useful training (Wolf, 2006). Moreover, overcoming the constraints of time and place can provide a flexible form of online support, which is considered a critical element of resource support (Khan, 2001). Finally, online training can facilitate the recruitment of international experts for distance training. Using experts to conduct training programs can increase the quality of the training because instructional technology certified experts are conducting the training. All of these merits help to create a practical and quality training environment for TPACK development, especially in providing efficient training length in short online training forms (Team, 2004). For example, Marreo et al. (2010) explored the evaluation of a Short Blended Online Training workshop (SBOT) that was structured, limited the number of participants, and allowed participants to study on their own time. SBOT was used in the form of presentation sessions and online materials for in-service instructors' development. A positive acceptance of this mode of training was reported. Thus, SBOT is likely to be accepted by faculty, as it is aligned with the principles of adult learning theory and faculty members' preferences (as will be elaborated in the training design section).

In the current study, instructor-led (Georgina and Hosford, 2009) and structured (Bailey and Card, 2009; Ke and Xie, 2009) SBOT was used to explore its potential for creating a high accepted environment for TPACK development. The acceptance level of SBOT as a training mode for TPACK development was evaluated by using the Technology Acceptance Model (TAM). The focus was directed towards the field of social science because the analysis phase in the context of the study demonstrated the need to begin the TPACK training in this field. Although TPACK model comprises of seven elements, the core element is related to knowledge of the content's instruction using pedagogy that integrates technology effectively (Cox and Graham, 2009; Mishra and Koehler, 2006). The development of this element of the TPACK model is considered the main concern for faculty who wish to teach online (Lukaweski, 2006). Thus, the topic of this training covered blended online course design (BOCD) and blended online course development (BOCDE). The remainder of this paper is organised into the following six main sections: the training design, participants, data collection, findings, discussion and conclusion.

2. TRAINING DESIGN

2.1 Adult learning theories and faculty preferences

Understanding how adults learn in online professional development sessions is considered one of the best practice elements to design pedagogically sound training for faculty (Wolf, 2006). It is recommended by

McQuiggan (2007) to use adult learning theories when designing training programs for faculty. In the literature, various characteristics of adult learners have been reported (Bailey and Card, 2009; Knowles, 1973; Vanderbilt, 2008). Table 1 shows the Adult learning principles and how they were addressed during the design of the SBOT.

Table 1: Addressing adult learning principles during the design of SBOT

Online programs for adults should provide	How the training addressed the Adult learning principles
An interactive process of extending adults' previous knowledge and transferring their new knowledge and skills to the workplace (Knowles, 1973; Vanderbilt, 2008);	Previous experience of faculty in face-to-face classes was extended to cover blended classes
Useful, relevant and practical training (Knowles, 1973; Vanderbilt, 2008);	Selecting a training topic related to design and development of blended online course to create a useful training Using TPACK to design the training for social science faculty to create a relevant training Using short training to enhance the practicality
Rich training experiences (Knowles, 1973; Vanderbilt, 2008);	Using presentation-demonstration-practice and feedback to provide rich training experiences
Safe environment to facilitate interaction and communication between learners and instructors as well as among learners (Bailey and Card, 2009; Vanderbilt, 2008);	Using SBOT to create a safe environment
Support, guidance (Bailey and Card, 2009) and encouragement (Knowles, 1973; Vanderbilt, 2008);	Instructor-led training, presentation slides, demonstration, design-based template and WIM to provide support and guidance
Feedback that confirms, corrects or informs participants (Bailey and Card, 2009; Knowles, 1973; Vanderbilt, 2008).	Providing constructive feedback at the end of each training session to confirm, correct or inform participants

Faculty members have shown a preference for features such as instructor-led training (Georgina and Hosford, 2009), structured training materials and activities (Ke and Xie, 2009) and efficient training length (B.Merriam *et al.*, 2001; Bingimlas, 2009; Chick, 2002; Owston *et al.*, 2008). Instructor-led training and structured training materials can be considered as the support and guidance of the training in the fifth principle. Furthermore, providing efficient training length can be considered as the practicality of the training in the second principle. The successful implementation of the abovementioned principles can create an ideal environment for TPACK development.

2.2 Material design

Three types of training materials, presentation slides, the TPACK development template and the web-based interactive module (WIM), were designed and developed for the training. The presentation slides were used in the first session, the TPACK template was implemented in the second session and WIM was utilised in the third session.

The presentation slides included the theoretical and pedagogical foundation of e-learning, as this knowledge is considered crucial for faculty development (Bailey and Card, 2009). The presentation was divided into three parts and covered topics related to BOCD and BOCDE. In the first part of the presentation, an introduction to the training session was presented by describing the context of learning in HEIs today and how improving the quality of the graduates can help them to gain employment in the future. To capture the participants' attention (Morrison *et al.*, 2007), the trainer provided two real examples about how low-quality graduates could embarrass the department, the faculty, and the university. Furthermore, the training objectives were introduced to the participants (Ke and Xie, 2009; Morrison *et al.*, 2007). The second part of the presentation included an overview of some critical topics that should be considered when designing online courses such as principles of adult learning theory (Knowles, 1973), Bloom taxonomy (Moreno, 2010), TPACK concept (Mishra and Koehler, 2006) and online activities (Harris and Hofer, 2009). This knowledge was effective for creating a mutual understanding during the following training sessions about these concepts. The third part of the presentation

included an overview of BOCD using the TPACK template and the development of blended online courses in Jusur using WIM.

In order to reduce the time of blended online courses' design, providing faculties with a design template is expected to structure, facilitate and guide the design process. Also, producing a quality design by beginners can be achieved by using design templates (Boot, 2007). Thus, a design template that includes TPACK is designed for this training. It covers three forms of activities. They are pre-activities, main activities and post-activities. Pre-activities include three forms of activities. First form is gaining attention of learners (Bailey and Card, 2009; Chickering, 1987). This activity can be achieved online by using some forms of Multimedia such as video, pictures, or sounds (Moreno, 2010). Since it depends on the topic being taught and learners, no best practice technique for every faculty can be suggested. Thus, faculties are free to decide upon which type of gaining attention activity is suitable. Second form is communicating the objective of the topic with the learners (Bailey and Card, 2009; Chickering, 1987). This technique is effective to direct learners towards the most crucial elements of the topic and what they will be required to achieve as well. Last activity is the attempt to connect learners' previous knowledge with the new topic (Knowles, 1973). When succeeding to achieve that, acquiring the knowledge of the new topic is most likely to happened (Moreno, 2010).

The main activities are the activities by which a new topic will be presented to the learners. Harris et al.(2009) identified the social science activities that are used in the field of education and tried to suggest the compatible technology for them. For example, read text, view presentation and complete a review activity are some of the social science pedagogy that were identified. The authors recommended a compatible technology such as presentation software, note taking tools, audio/video recorders, whiteboards, and concept mapping software to apply view presentation activity online. More than one activity is recommended to be used to fulfil learners' diversity and provide informative feedback (Chickering, 1987). Therefore, the main activities can be used for content presentation and practice and feedback. A new column activity types were added to allow faculties to a blend of expository, active and interactive activities (Means *et al.*, 2009).

Lastly, post activities include some forms of activities such as summary and reviews (Morrison *et al.*, 2007). In summary activities, most critical points of the topics are highlighted while in the reviews activities we conduct a quick review for the whole topic. The template is attached in Appendix (1). The TPACK template includes the main elements of TPACK model as appeared in TPACK definitions (Cox and Graham, 2009; Mishra and Koehler, 2006) and the TPACK assessment instruments (Harris *et al.*, 2010; Schmidt *et al.*, 2009). These elements are:

- Selecting the suitable instructional methods or pedagogies according to the objectives of the topic being taught
- Selecting the suitable technology according to the selected pedagogies
- Having the ability to teach lessons that appropriately combine pedagogy and technology

The WIM was organised in a tree-structured representation, and it could be easily accessed through the instructional content icon in Jusur LMS. The trainer took screen shots from Jusur for every step of developing a new course, writing a description of the blended online course, and developing an online quiz. Every screen shot was marked with a red circle to show where to click. If there were multiple red circles in the screen shot, the circles were numbered.

2.3 Training description

The trainer led the presentation, demonstration and feedback sessions. On the first day of the training, the presentation covered the topics mentioned in Table 1. Illuminate software was used to share the Microsoft PowerPoint application with the participants. During the presentation session, participants were asked to freely use text to comment on the topics being presented or to use the "Raised hand" icon to obtain the microphone and provide spoken comments. Different topics were discussed related to the design and development of blended online course such as principles of adult learning theory, Bloom taxonomy and TPACK concept. These elements were highlighted during the presentation session although TPACK template was designed to provide the support to select the suitable instructional methods, the suitable technology according to the selected pedagogies and having the ability to teach when TPACK elements are implemented.

On the second day of the training, the trainer provided step-by-step instructions for the BOCD using the TPACK template. Since the learning topics are usually organized into modules and courses, the required task that should be completed by the participants was the design of one learning topic. Each faculty has the freedom to choose which topic is going to be designed by using the TPACK template. Copies of the template were emailed to the

participants and they were asked to begin the design process during the training session. If the participants faced any difficulties, they were able to contact the trainer directly. By the end of the training session, participants were required to return the TPACK templates. The trainer checked the returned templates and identified the most common mistakes. Through the desktop sharing service in the Illuminate software, the trainer presented several of the common mistakes that the participants committed during the design process and corrected them directly. This provision of informative feedback is critical for successful trainings.

On the third day of the training, the trainer demonstrated how to develop a blended online course using Jusur LMS, write a quality description for the blended online course, as described by Alamri (2010), and develop an online quiz. The trainer used WIM during the structured training and the demonstration session. Then, the participants utilised WIM for BOCDE. Participants were given a time to begin BOCDE. The participants were again able to contact the trainer directly if any difficulties arose. After completing the development process, three participants volunteered to present what they had developed to the group. During this time, the trainer provided feedback to the participants regarding BOCDE. The researcher conducted the training sessions and was supported by dedicated personnel from the technical support department at the National Centre of E-learning and Distance Learning (NCEL) in a Middle Eastern country. Participants were asked to direct their technical inquires to the technical support personnel who joined the training sessions.

The presentation slides, TPACK template and WIM facilitated the presentation and demonstration of the training materials. To increase the practicality of the training, the TPACK template and WIM were used to provide structured training for faculty to apply the information from the presentation and demonstration portions of the training. Table 2 provides a comprehensive description of the training.

Table 2: Training outcome, pedagogies and technologies used

Day 1 First session (180 min)	Theoretical background	Pedagogy used **Presentation** Technology used **Microsoft PowerPoint** **LMS JUSUR** **Illuminate software**	**Main topics that were presented:** **Training outcomes** **Principles of adult learning theory** **Bloom taxonomy** **TPACK concept** **Principles of effective instruction (e.g., formative evaluation and group work)** **online activities (types and styles)**
Day 2 Second session (180 min)	**Training outcomes (1/2): By the end of the training, the participants will be able to:**		
	Design blended online courses using the TPACK template. Utilise at least one pre-activity. Utilise at least two activity types. Utilise one activity type for practice and feedback. Utilise at least two activity styles (expository, active or interactive). Utilise face-to-face instruction and online instruction. Utilise individual and group work. Utilise at least one post-activity.	**Pedagogy used** Demonstration (30 min) Practice (100 min) Feedback (50 min) **Technology used** Microsoft Word LMS JUSUR Illuminate software	Blended Online Course Design (BOCD)
Day 3 Third session (180 min)	**Training outcomes (2/2): By the end of the training, the participants will be able to:**		
	Develop blended online courses in LMS Jusur using WIM. Develop a new course. Develop a description for the new course.	**Pedagogy used** Demonstration (30 min) Practice (100 min)	Blended Online Course Development (BOCDE)

	Develop a new quiz with a question and three distracters.	Feedback (50 min) **Technology used** LMS JUSUR Illuminate software	

3. PARTICIPANTS

As the advertisement technique for informing faculty about the training was used, the sample was not randomly selected (Creswell, 2005) but a convenience sample (Johnson and Christensen, 2004). According to Johnson and Christensen (2004), if participants are chosen as a result of the their ability to volunteer or for monetary goals, this sampling technique is called convenience sampling. Therefore, non-random sampling and convenience sampling were used for this research. The researcher promoted the training workshop on the NCEL website, and the online registration was open to faculty from different universities.

More than 100 participants were registered in the training workshop. The first 30 registered participants were selected to join the training, as this is the standard number of participants in NCEL training workshops. However, four faculty members did not join the training. No clear explanation for their drop out could be identified because inquiry emails received no response. Table 3 shows the participants' demographic data.

Table 3: Participants' demography data

Participants' Details		Number
Gender	Male	**17** (62.9%)
	Female	**9** (33.3%)
Age	22-26	**1** (3.7%)
	27-33	**8** (29.6%)
	34-39	**13** (48.1%)
	+40	**4** (14.8%)
	Unknown	0
Teaching experience	1-4	**6** (22.2%)
	5-9	**8** (29.6%)
	10-15	**7** (25.9%)
	+16	**4** (14.8%)
	Unknown	**1** (3.7%)
Academic degree	BA	**4** (14.8%)
	MSC	**10** (37.0%)
	PhD	**10** (37.0%)
	Unknown	**2** (7.4%)
N		**26**

4. DATA COLLECTION AND ANALYSIS

According to Zawacki-Richter, Bäcker, & Vogt (2009), training programs effectiveness is primarily evaluated quantitatively in online learning research. Thus, the Technology Acceptance Model (TAM) questionnaire was used to evaluate the acceptance of the SBOT because TAM can be used to evaluate the participants' satisfaction with the online training as a medium of instruction (Arbaugh, 2000). There are three versions of TAM, as follows: TAM1 (Davis, 1989), TAM2 (Venkatesh and Davis, 2000) and TAM (or TAM3) (Lee *et al.*, 2011). In TAM1, two variables, perceived usefulness and perceived ease of use, are used to predict the acceptance of technology. Venkatesh & Davis (2000) updated TAM2 by adding the following seven variables: the intention to use, subjective norm, voluntariness, image, job relevance, output quality and result demonstrability. Lastly, Lee et al. (2011) included the following variables to use TAM for e-learning technology evaluation: task interdependence, computer self-efficacy, individuals' experience, task equivocality, management support and organisational support. The three versions of TAM build on each other and, therefore, there is no contradiction

between the variables. All of the variables were included in the current TAM questionnaire, except task equivocality and task interdependence because they do not contribute to SBOT evaluation.

The TAM instrument was translated into the Arabic language by the researcher and validated by five instructional technology experts. The pilot testing for the instrument was conducted during a pilot testing workshop and analysed using SPSS 19. Cronbach's alpha reliability result for the TAM questionnaire was .853. Reliability scores ranging from .75 to .92 are considered satisfactory to outstanding (George and Mallery, 2001). At the end of the training workshop, the training was evaluated. Data analysis technique that used with TAM questionnaire is the report of frequencies and the average scores of the participants' evaluation.

5. FINDINGS

The quantitative data that were collected using TAM questionnaire shows high acceptance of SBOT. Table 3 shows that SBOT was greatly accepted by faculty for TPACK development. The highest items in the SBOT evaluation were related to the training Usefulness (4.3), Ease of use (4.3) and the Behavioural Intention to join SBOT in the future (4.7). Additionally, an interesting result related to the need for Organisation Support to join SBOT was reported. Lastly, the technical knowledge of participants was high, as they evaluated the items of Computer Experience and Lacking Computer Self-efficacy as 4.0 and 1.1, respectively. Appendix (2) shows the detailed results for every item in the TAM.

Table 4: Acceptance of SBOT

Item	SD	%	D	%	N	%	A	%	SA	%	Mean
Behavioural intention	**0.0**	0.0	**0.0**	0.0	**0.5**	2.2	**5.5**	23.9	**17**	73.9	**4.7**
Result demonstrability	**0.0**	0.0	**0.0**	0.0	**0.7**	2.9	**9.3**	40.6	**13**	56.5	**4.5**
Perceived usefulness	**0.0**	0.0	**0.0**	0.0	**1.7**	7.2	**11.2**	48.6	**10**	43.5	**4.3**
Perceived ease of use	**0.0**	0.0	**0.1**	0.6	**1.7**	7.5	**10**	43.5	**10.9**	47.2	**4.3**
Organizational support	**0.0**	0.0	**1.3**	5.8	**0.0**	0.0	**4.3**	18.8	**16**	69.6	**4.3**
Output quality	**0.0**	0.0	**0.5**	2.2	**4.0**	17.4	**11**	47.8	**7.5**	32.6	**4.1**
Individuals' experience with computers	**0.2**	0.9	**0.4**	1.7	**3.6**	15.7	**11.8**	51.3	**6.6**	28.7	**4.0**
Voluntariness	**2.0**	8.7	**1.5**	6.5	**2.5**	10.9	**7.0**	30.4	**9.0**	39.1	**3.7**
Image	**0.0**	0.0	**1.5**	6.5	**6.0**	26.1	**8.0**	34.8	**6.5**	28.3	**3.7**
Subjective norm	**1.0**	4.3	**0.0**	0.0	**12.5**	54.3	**6.0**	26.1	**2.0**	8.7	**3.1**
Management support	**4.7**	20.3	**2.0**	8.7	**7.7**	33.3	**6.7**	29	**1.0**	4.3	**2.7**
Job relevance	**5.5**	23.9	**5.5**	23.9	**4.5**	19.6	**4.5**	19.6	**2.0**	8.7	**2.5**
Lacking computer self-efficacy	**21**	91.3	**1.5**	6.5	**0.3**	1.1	**0.0**	0.0	**0.3**	1.1	**1.1**

DISCUSSION

Using SBOT in HEIs can be considered an effective approach for TPACK development. The educational value of this training was high. Although it was not tested directly because this type of training is performed remotely, the reported acceptance can be used to predict the educational value (Joo *et al.*, 2012; Liao and Jen, 2011; Stephan *et al.*, 2009). The online training pedagogy that was used in the current study was useful and easy to use. As a result, participants intended to join future workshops that use this mode, as demonstrated by the behavioural intention item in the TAM. These results confirmed previous results that reported a positive effect of using online training for TPACK development (Marreo *et al.*, 2010; Pryor and Bitter, 2008; Schrum *et al.*, 2005). Faculty positively evaluated this mode of training, although encouragement and management support was low, as reported in the TAM. Thus, if universities encouraged faculty members to participate in online training workshops, it is expected that most faculty members in HEIs would prefer to use this mode of training for job-related development. The preference of online training, in turn, can accelerate and facilitate the implementation of development plans for technology integration in HEIs.

The positive impact of this study was a result of using adult learning principles and the TPACK model to guide the process of the SBOT workshop design. Faculty members' previous knowledge was extended (Knowles, 1973; Vanderbilt, 2008) by specifying why and how to incorporate instructional technology elements into their traditional methods of teaching. The training practicality, relevance and usefulness (Knowles, 1973; Vanderbilt, 2008) were appreciated. Using the TPACK model helped including practical training elements, BOCD and BOCDE. Furthermore, SBOT as a mode of training (Wolf, 2006) created a practical training environment. The practicality of the training was enhanced by the use of structured training (Ke and Xie, 2009). Structured training and the use of SBOT aided in creating a practical environment for TPACK development. In addition to using the TPACK to identify practical elements, it was used to include the pedagogy and technology elements that are relevant to the social science field. As a result of this process, the participants noted the usefulness of the training. Although it is reasonable for faculties to appreciate checklists and templates against which they can check their own pedagogical designs, the proposed training model is a complete package that includes presentation, demonstration, practice (blended online course design and development) and feedback. This blend of online pedagogies is the training style that was highly appreciated by the faculties. Considering only the use of checklists and templates does not grant the usefulness and the quality of the training.

Guidance and support (Vanderbilt, 2008) for training was accomplished through structured training materials, trainer support and technical support personnel. The trainer led (Georgina and Hosford, 2009) the presentation, demonstration and feedback sessions, and the faculty participated (Bailey and Card, 2009) through text or oral chats, which aided in creating a guided and supportive environment.

The rich training experiences (Knowles, 1973; Vanderbilt, 2008) through the presentation, demonstration, practice and feedback aided in the acceptance of SBOT. Furthermore, the SBOT provided a safe environment, which facilitated interaction and communication (Bailey and Card, 2009; Vanderbilt, 2008). The informative feedback (Bailey and Card, 2009; Knowles, 1973; Vanderbilt, 2008) also contributed to the acceptance of SBOT. The authentic comments that were provided at the end of the design and the development sessions corrected and informed participants about the quality of BOCD and BOCDE.

SBOT can produce quality training and sustain the time of faculty in HEIs. Considering adult learning theories and principles in the design of faculty training programs can create an ideal environment for TPACK development. Specifically, the use of presentations, demonstrations, practice and feedback (as described in this study) is a successful training strategy for TPACK development that can be added to other TPACK development techniques. These other techniques include design-based learning (Chen *et al.*, 2009; Koehler *et al.*, 2004; Koehler *et al.*, 2007; Mishra and Koehler, 2006), exemplary-curriculum materials (Voogt *et al.*, 2005), video modelling and reflections (Pryor and Bitter, 2008), and discussions (Shin *et al.*, 2009; Yang and Liu, 2004). The current study can be considered one of the first studies that utilize the principles of adult learning theories in the design of online training workshops for TPACK development and evaluating this design. The research area of faculties' development is one of the of the most neglected area of the research although it can be considered one of the most important research area in distance training as reported by 19 international experts in distance learning (Zawacki-Richter, 2009). Therefore, this study is considered a significant contribution to the literature of distance training in general and TPACK development in particular.

CONCLUSION

Although the management support for faculty to join SBOT was limited, faculty highly evaluated their intention to join a future SBOT. The positive evaluation of SBOT for TPACK development is a remarkable expression for the effectiveness of the pedagogies and approaches that were applied in the training sessions. Moreover, communicating a clear expectation for the outcome of the course through the behavioural objectives of the training helped the participants focus on the requirements of the training. Furthermore, the instant technical support and the quality of the training led to the high acceptance of online training. This acceptance may, in turn, accelerate and facilitate the integration of instructional technology in HEIs. HEIs can offer dual modes of training (face-to-face and SBOT) for every training workshop. Providing SBOT is an attractive choice for HEIs because faculty with sufficient technological knowledge will prefer this mode of training, as found in the present study. In addition, this technique of training can increase the coverage of TPACK development programs to the entire faculty and can easily support faculty experience and exploration of online learning. The limited amount of time and effort required may increase participation in the training programs. Moreover, as recruiting professional instructional experts remotely is less expensive, the quality of the training programs can be increased significantly. The efficiency of this mode of training can provide a monetary resource to mix training with enjoyment activities on or off the university campus. Lastly, the large number of registered participants in the training and the reported positive experience with SBOT indicate that faculty accept this mode of training.

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Appendix (1): TPACK Template

Objectives of the Class:

(1)……
(2)……...
(3)……...
(4)……

Pre: □ ***Gaining attention*** □***Objectives of the topic*** □***Eliciting previous knowledge***

Activity name	**Activity**		**Activity type**			Mode	
	Activity 1 ***Content presentation***	**Activity 2** ***Practice and feedback***	**Expository**	**Active**	**Interactive**	**Face-to-Face**	Online
Read Text							
View Presentation							
Listen to Audio							
Group Discussion							
Field Trip							
Simulation							
Debate							
Conduct an Interview							
Artefact-Based Inquiry							
Data-Based Inquiry							
Historical Chain							
Historical Weaving							
Historical Prism							
Answer Questions							
Create a Timeline							
Create a Map							
Complete Charts/Tables							
Complete a Review Activity							
Take a Test							
Written Knowledge Expression							
Visual Knowledge Expression							
Conceptual Knowledge Expression							
Product-Oriented Knowledge Expression							
Participatory Knowledge Expression							

Post: □ ***Summary*** □***Review***

Appendix (2): TAM

Perceived Usefulness	
Using online training in my job would enable me to accomplish tasks more quickly.	4.31
Using online training would improve my job performance.	4.43
Using online training in my job would increase my productivity.	4.17
Using online training would enhance my effectiveness on the job.	4.26
Using online training would make it easier to do my job.	4.26
I would find online training useful in my job.	4.57

Perceived Ease of Use	
Learning to use online training systems would be easy for me.	4.26
I would find it easy to join online training to learn what I want to learn.	4.26
My interaction with online training system would be clear and understandable.	4.48
My interaction with other trainees would be clear and understandable.	4.26
I would find online training system to be flexible to interact with.	4.39
It would be easy for me to become skilful at using online training system.	4.39
I would find online training system easy to use.	4.31

Output Quality	
The quality of the output I get from online training is high.	4.13
I have no problem with the quality of online training output.	4.09

Behavioural intention	
Given the opportunity, I would join online training.	4.74
I will strongly recommend others to use online training.	4.78
I intend to join online training in the future.	4.83
I intend to join online training as an autonomous learning tool.	4.52

Result Demonstrability	
I have no difficulty telling others about the results of joining online training.	4.57
I believe I could communicate to others the consequences of joining online training.	4.43
The results of joining online training are apparent to me.	4.61

Individuals' experience with computers	
I am confident of using online training even if I have only the system manuals for reference.	3.13
I am confident of using different online training systems to learn other subjects.	4.09
I am confident of using online training, even if I have never used such a system before.	4.26
I am confident of using online training system: As long as I have just observed someone using it before trying it myself.	3.83
I am confident of using online training system: As long as I have a lot of time to complete the job for which the training is provided.	4.7

Computer self-efficacy	
I dislike using computers.	1.30
Working with a computer would make me very nervous.	1.04
I get a sinking feeling when I think of trying to use a computer.	1.09
Computers make me feel uneasy and confused.	1.09

Subjective norm	
My friends would think that I should join online training.	3.17
My colleagues would think that I should join online training.	3.13

Voluntariness	
Joining online training is voluntary.	3.91
My supervisor does not require me to join online training.	3.52

Image	
People in my organisation who join online training have more prestige than those who do not.	3.83
People in my organisation who use online training have a high profile.	3.61

Job Relevance	
In my job, joining online training is important.	2.61
In my job, joining online training is relevant.	2.43

Organisational support	
It is important for me to encourage joining online training within the organisation.	4.22
It is important for me to provide useful online training within the organisation.	4.52
When I am using online training, the provision of technical assistance from the organisation is very important.	4.30

Management support	
I am always supported and encouraged by my boss to join online training to perform my job.	2.70
My boss has a high interest in online training.	2.83
I am always supported and encouraged by my administrators to join online training to enhance the performance of my job.	2.74

(1=strongly disagree, 5= strongly agree)

A RANDOMIZED ROUNDING APPROACH FOR OPTIMIZATION OF TEST SHEET COMPOSING AND EXPOSURE RATE CONTROL IN COMPUTER-ASSISTED TESTING

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ABSTRACT
Testing is an important stage of teaching as it can assist teachers in auditing students' learning results. A good test is able to accurately reflect the capability of a learner. Nowadays, Computer-Assisted Testing (CAT) is greatly improving traditional testing, since computers can automatically and quickly compose a proper test sheet to meet user requirements. For example, the users can specify the number of test items to be selected in the test sheet, the average difficulty with respect to the test sheet can be restricted within a lower bound and an upper bound, and the generated test sheet is able to cover each basic concept in the scope of the testing subject. In order to design an algorithm for test sheet composing in a CAT system to meet the above objectives, we model it as a 0-1 integer optimization problem and then transform it to a dominating set selection problem of graph theory. A Multi-stage Test Sheet Composing Algorithm (MTSCA) is proposed to give a near optimal solution to this optimization problem. Due to the fact that exposure rate control is also an important issue in test sheet composing, our proposed MTSCA adopts a randomized rounding technique to reduce the average item exposure rate. The simulation results show that the performance of the MTSCA can not only achieve high average discrimination in the generated test sheet, but the item exposure rate can be properly controlled as well.
Keywords: Computer-assisted testing, test sheet composing, randomized rounding, dominating set

INTRODUCTION

As information technology evolves, it gives fresh impetus to the educational field. For instance, the development of a computer-assisted testing (CAT) system can replace paper-and-pencil tests in many situations and provide the benefits of time and cost saving. A proper test can help teachers diagnose students' learning problems in a school setting. In addition, when applied to a company setting, a well-designed test will assist supervisors in better understanding the performance of their new employees'. Due to the broad range of applications for the CAT system, it has received much attention from researchers. Several new theories and tools for testing have been proposed in recent decades to enhance the capabilities of the system. For example, the Item Response Theory (IRT) can accurately assess the examinee's trait level using fewer test items and less time than the traditional approach. On the other hand, the test sheet composing techniques have also been enhanced in recent years.

Traditionally, a test sheet is composed by selecting the test items from the item bank in a random fashion. Although this method can be used to compose a test sheet quickly, the quality of randomly generated test sheets is generally poor. Moreover, if the users issue demands on the generated results, this method will fail to meet their requirements. These requirements may include specification of the number of test items, the range of the average difficulty of a test sheet having to fall within given upper and lower bounds, the test sheet having to cover each basic concept in the scope of the testing subject, and the average discrimination of the generated test sheet needing to be as high as possible. However, due to the fact that there are usually thousands of test items in an item bank, to automatically compose the best (such as the greatest average discrimination) test sheet among every possible test sheet combination that meets the user's requirements is usually time consuming. Thus the algorithms designed to meet the objectives discussed above are not easy to design.

As artificial intelligence (AI) techniques and computer algorithms are being brought into CAT systems, the intelligence of the developed systems has been dramatically enhanced. Now, a CAT system can not only

automatically organize a test sheet to satisfy users' requirements efficiently, but can also help assess the examinee's trait level more accurately than traditional methods (Hwang et al., 2006; Yin et al., 2006; Hwang et al., 2005). Among the related research, Hwang et al. (Hwang et al., 2006) and Yin et al. (Yin et al., 2006) adopted artificial intelligence techniques to optimize test sheet selection according to different criteria, which can efficiently compose a near-optimal test sheet from large item banks. These research results provide a good approach for test sheet composition, though one of the key issues, the test items' exposure rate control, remains unconsidered. The main objective for developing computer algorithms to optimize test sheet composition is to find a solution (a test sheet) as close to the optimum as possible. However, this has the drawback that some test items will be selected into the test sheet more frequently than others if the same composition demand is invoked several times. In the worst case, the algorithms may output almost the same test sheet each time if the specified user requirements are the same, resulting in the average exposure rate of an item bank being too high. Therefore exposure rate control (Sympson & Hetter, 1985; Barrada et al., 2007; Chang & Ying, 1999; Chang et al., 2001) is another important issue worth considering when developing test sheet composing algorithms.

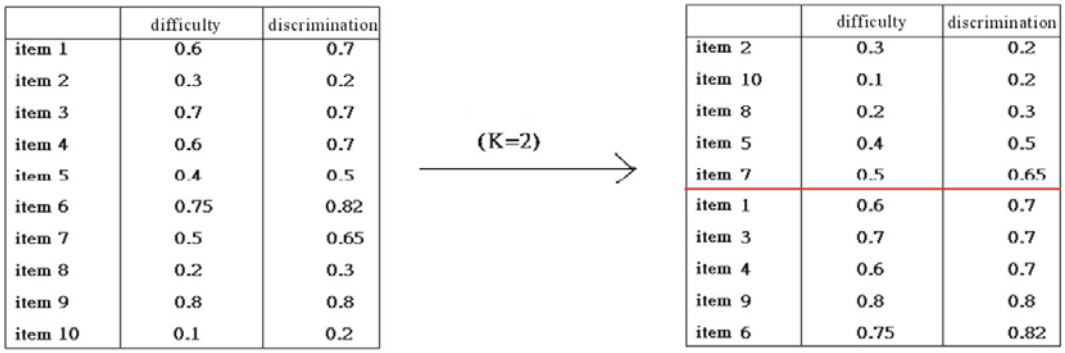
In this study, we consider a test sheet composing optimization problem and take exposure rate control into consideration. In the considered problem, we aim to compose a test sheet with the greatest average discrimination among every possible test sheet that satisfies the following requirements. The first requirement is that the number of test items is equal to a given specified value k. Secondly, the average difficulty of the test sheet must be greater than a given lower bound (p_l) and also less than a given upper bound (p_u). The third requirement is to force the generated test sheet to cover each basic concept in the range of the testing subject. First, we give a mathematical formulation of the above test sheet composing optimization problem. Then the considered problem is transformed to a *dominating set problem* (Haynes et al., 1998), of the graph theory, which is an older branch of discrete mathematics and has plenty of excellent results. In addition, a randomized rounding technique is adopted in our algorithm design to limit the average exposure rate of the item bank. A Multi-stage Test Sheet Composing Algorithm (MTSCA) with randomized rounding is proposed to give a near-optimal test sheet solution to the optimization problem.

The organization of this paper is as follows. First, we describe some relevant research about the existing test sheet composing algorithms and the exposure rate control techniques developed so far. Second, the formal problem description and the problem transformation are specified. Then the proposed algorithm MTSCA and the simulation results are shown. The concluding remarks are stated in the last section.

Relevant research

Recent published research work related to test sheet composing is twofold. The first category of research aims to design efficient algorithms to generate proper test sheets to meet the user's specified requirements, while the second category aims to design techniques to limit the item exposure rate of an item bank. However, these two areas of research fail to consider the above two issues jointly, though both are important for test sheet composition. In the following, we describe each of the two categories of relevant research in detail.

In a CAT system, composing a test sheet using a comprehensive computer algorithm is a more proper approach than manually or randomly selecting test items from an item bank. In (Hwang et al., 2006), they used a tabu-based algorithm to generate test sheets for multiple assessment criteria. Their work aimed at optimizing the average discrimination of the generated test sheets. The constraints of their considered model include the following two criteria: (1) the selected test items must have a total expected relevance of each concept to be learned which is greater than a given lower bound; (2) the selected test items must also have a total expected assessment time for answering the selected items which is bounded by a specified range of assessment times. A tabu search is one of the efficient heuristic algorithms for finding near-optimal solutions for optimization problems, such as the traveling salesman problem, the network planning problem, the job-shop scheduling problem, etc. Generally, these problems are NP-hard, and no polynomial time algorithms exist to solve them to optimally. The tabu search consists of the following features: configuration, a move function, neighborhood definition, tabu restriction, aspiration level, and stopping criteria. It starts with a randomly generated configuration (that is, a test sheet in the considered test sheet composing problem). And then it will iterativelymake the best move from the current configuration to a new configuration whose objective function value is the greatest among the current configuration’s neighbor set according to the designed move function.



	difficulty	discrimination
item 1	0.6	0.7
item 2	0.3	0.2
item 3	0.7	0.7
item 4	0.6	0.7
item 5	0.4	0.5
item 6	0.75	0.82
item 7	0.5	0.65
item 8	0.2	0.3
item 9	0.8	0.8
item 10	0.1	0.2

	difficulty	discrimination
item 2	0.3	0.2
item 10	0.1	0.2
item 8	0.2	0.3
item 5	0.4	0.5
item 7	0.5	0.65
item 1	0.6	0.7
item 3	0.7	0.7
item 4	0.6	0.7
item 9	0.8	0.8
item 6	0.75	0.82

Figure 1. A numerical example illustrating the a-STR method (N=10, K=2)

During the iterative configuration refinement movement, in order not to revisit recently visited configurations, the tabu search design includes a feature called the tabu restriction, which records recently visited configurations into a tabu list when each move is taken. The method also uses an aspiration level to relax the tabu restriction by accepting a refinement move that violates the tabu restriction in order to attain a better solution. The authors designed a tabu-search method to solve the test sheet composing optimization problem taking into consideration the above criteria.

In (Yin et al., 2006), they used a newly developed heuristic approach called *particle swarm* (Kennedy & Eberhart, 1995) to compose near-optimal serial k test sheets. Particle swarm is also an efficient heuristic algorithm to deal with the NP-hard problem by iteratively refining an initial solution to achieve a near-optimal solution. It is a biologically inspired algorithm which models the flocking behavior of bird. Initially, the method generates a set of solutions (test sheets) called swarms. In each iteration step, the algorithm will update the set of swarms according to the flying velocities and the fitness function until a stopping condition is met. For more details of the procedure, one can refer to the study of (Kennedy & Eberhart, 1995). Yin et al. proposed test sheets composing optimization problem called the STSC (Serial Test Sheet Composition) problem. This problem aims to minimize the difference between the average difficulty of each test sheet and a user specified difficulty value. The constraints are the same as for the research work in (Hwang et al., 2006) (i.e., the specified range of assessment time and the relevant concept constraint), plus a new constraint to limit the number of test items in common between any two generated test sheets being no more than a user specified value.

The above research used comprehensive computer algorithms (such as tabu search and particle swarm) to develop test sheet composition methods. Their simulation results showed that these developed algorithms can efficiently generate good-quality near-optimal test sheets under different considered problem models. For more details, one may refer to these two research works (Hwang et al., 2006; Yin et al., 2006). There are many other modern heuristic techniques (Bertsimas et al., 1999; Kennedy & Eberhart, 1995; Michalewicz & Fogel, 2002; Aart & Lenstra, 1997) which can be applied to solve the test sheet composing optimization problem, including, the genetic algorithm, simulated annealing, the ant colony optimization algorithm, neural networks, fuzzy systems, etc. The readers may refer to (Linden, 2005) for a discussion of more modern heuristic techniques which are being applied in the test sheet design field. As discussed earlier, however, these do not take exposure rate control into consideration; thus, the average exposure rate of the item bank may be too high, which could consequently endanger the accuracy of the test items used in the future.

In the following we describe some existing exposure rate control techniques for testing. Due to the fact that exposure rate control is an important security issue for testing theory, many researchers have developed methods to prevent a test item from being selected too frequently (Sympson & Hetter, 1985; Barrada et al., 2007; Chang & Ying, 1999; Chang et al., 2001; Revuelta & Ponsoda, 1998; Wang & Chang, 2011) to prevent a test item from being selected too frequently. The simplest approach is to associate each test item with an exposure value. Each time a test item is selected for testing, its exposure value will be increased. Thus the current exposure value with respect to each test item can be an important parameter for considering the test items being selected into the test sheet for examinees' assessment. For more comprehensive methods,

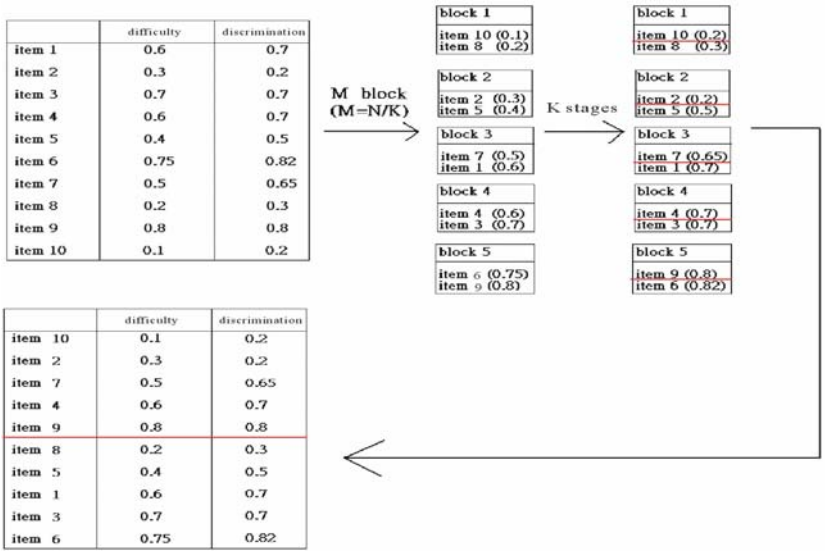


Figure 2. A numerical example illustrating the ba-STR method (N=10, K=2)

Chang and Yin (Chang & Ying, 1999) proposed a multi-staged approach called the *a-stratified selection method* (a-STR) for a Computer Adaptive System, where a denotes the value of discrimination. Let the test length be L; that is, the Computer Adaptive System will select L test items from the item bank for serial testing. The testing chooses the test items with higher discrimination value and a difficulty value (or the examinee's estimate trait $\hat{\theta}$) as close as possible to the examinee's true score θ. In order to meet this objective, the a-STR method firstly partitions the test items into K levels (stages) according to the discrimination value. Then the system will select n_i test items according to the user's requirement from the i-th ($1 \le i \le K$) level, respectively, such that $n_1 + n_2 + ... + n_K = L$.

For example, as shown in Figure 1, there are 10 (N=10) test items in the item bank, and the difficulty and discrimination values with respect to each test item are shown in the left part of Figure 1. Assume the number of stages is 2 (K=2) and the test length is 4 (L=4). Then firstly, the a-STR method will partition the test items into 2 groups (the upper and lower groups) according to the discrimination value in non-decreasing order (see the right part of Figure 1). Note that the lower (higher) group is the test item group with higher (lower) discrimination values, respectively. Then n_i ($1 \le i \le K$) test items in group i will be selected, for which their difficulty values are close to the specified difficulty. For instance, if $n_1 = 3, n_2 = 1$ and the specified difficulty is 0.4, then $Item_5$, $Item_7$, and $Item_2$ are selected from the first group, and test $Item_1$ is selected from the second group. Though the a-STR method can control the exposure rate, there still remain many drawbacks with such an approach.

In (Chang et al., 2001), Chang et al. refined the a-STR method and proposed an a-Stratified with b blocking method (ba-STR) to improve the quality of item exposure rate control and to reduce the mean squared errors. In general, the discrimination value and the difficulty value of a test item are positively correlated. Based on this result, the ba-STR method firstly partitions the item bank according to the difficulty value instead of the discrimination value, which the a-STR method does. The detailed method can be illustrated using the numerical example in Figure 2. Assume that there are 10 (N=10) test items in an item bank, which is shown in the upper-left part of Figure 2. We also assume that ba-STR uses 2 (K=2) stages and the testing length is equal to 4 (L=4). Firstly, sort the test items according to the difficulty values in non-decreasing order and then partition these test items into M blocks, where M=N/K=5. In each block, the ba-STR again sorts the test items according to the discrimination value in non-decreasing order, and forms each block into 2 (K=2) subgroups, as shown in the far-right part of Figure 2. Finally, collect the test items in the i-th ($1 \le i \le K$) subgroup of each block to form a group (the i-th group), as shown in the bottom-left part of Figure 2. The rest of the operation to select L test items for adaptive testing is the same as the method that is described in a-STR.

The other approach to suppressing overexposed items is the progressive strategy (Revuelta & Ponsoda, 1998; Wang & Chang, 2011). The primary idea of this approach is to add a stochastic component into the item selection method to avoid frequently choosing the highest information items in an IRT-based CAT. Recently,

Wang and Chang (Wang & Chang, 2011) proposed two item selection methods, the restrictive progressive method and the restrictive threshold method, to include additional stochastic components in the item selection method so as to increase the usage of underexposed items in the item bank. In the restrictive threshold method, a threshold value (δ) is given to extend the candidate set of selection items instead of the highest information item only. A larger (lower) value of δ will result in a larger (smaller) size of the candidate item set. The candidate item set (S_c) is the collection of items such that the respective information falls within the information interval $[\max_{\inf o} - \delta, \max_{\inf o}]$, where $\max_{\inf o}$ denotes the maximum information value among all items. That is, set S_c collects the items with an information value close to the maximum such that the information difference between them is less than or equal to δ. Then the method will randomly select one of the items in the candidate item set S_c to be the chosen item, and put it into the test sheet. In this way, the exposure rates of the items may tend to be uniform. For the restrictive progressive method and a detailed description of the method, one can refer to the literature (Wang & Chang, 2011). The above research works for controlling the exposure rate fit into Computer Adaptive Testing, but most of them are not suitable for single test sheet composition. Besides, the aims of these approaches are not to optimize some parameters; thus, they may not be directly applied to our considered problem model.

PROBLEM DESCRIPTION AND FORMULATION

In this paper, a test sheet optimization problem is considered. Assume a user specifies the following parameters: (1) the number of test items in a test sheet is m; (2) the average difficulty of the test sheet is greater than alower bound p_l and is less than an upper bound p_u; (3) the number of basic concepts to be learned in the testing scope is k. Then our considered problem aims to optimize the average discrimination of the test sheet, such that the number of test items in the test sheet is equal to m, the average difficulty of the test sheet is bounded within the interval (p_l, p_u), and all the k basic concepts have to be covered by the generated test sheet. In the following, we firstly describe the notations and parameters that are discussed throughout this paper. Then, a special structure called the *Item Relationship Graph* (IRG) is introduced for transforming the considered problem into a graph theory optimization problem. Some preliminary results of IRG are also given. Finally, a mathematical formulation for our considered problem is provided.

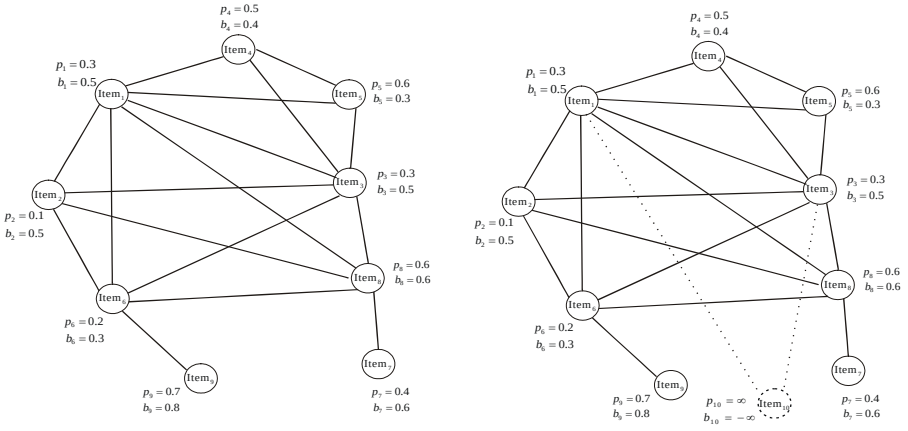
The characteristic vector of a test item

Let Item_1, Item_2, …, Item_n be the test items in the scope of testing and the number of these test items be n. Let $e_1, e_2, \ldots, e_k$ be the basic concepts to be learned in the testing scope. Set C, called the *basic concept set* is the collection of these k basic concepts; that is, $C = \{e_1, e_2, ..., e_k\}$. For each test item Item_i $(1 \le i \le n)$, there are three associated parameters namely, the discrimination value b_i, the difficulty value p_i, and $C_i = \{e_{i1}, e_{i2}, ..., e_{it}\} \subseteq C$, called the *basic concept subset* of C to denote the basic concepts being covered by test item Item_i. That is, if the test item Item_i is placed in the test sheet, then the t basic concepts $e_{i1}, e_{i2}, \ldots,$ and e_{it} can be used to assess whether or not the examinees have learned these concepts. Thus, a three-tuple vector (b_i, p_i, C_i) called the *test item characteristic vector* is associated with each test item Item_i $(1 \le i \le n)$, and is given in advance. Note that the discrimination value and the difficulty value can be obtained by using some existing item analysis techniques.

The Item Relationship Graph (IRG)

An Item Relationship Graph (IRG) $G = (V, E)$ with respect to the testing is defined as follows. The vertex set V is the collection of all test items within the testing scope, thus V={Item_1, Item_2, …, Item_n}. For any two test items Item_i and Item_j in V, let the corresponding basic concept subsets be $C_i = \{e_{i1}, e_{i2}, ..., e_{it1}\}$ and $C_j = \{e_{j1}, e_{j2}, ..., e_{jt2}\}$, respectively. If the vertices Item_i and Item_j in V are said to have an edge between them, if $C_i \cap C_j \neq \phi$, this means the two test items have basic concepts in common. Thus the edge set E is defined $E = \{(\text{Item}_i, \text{Item}_j) \mid \text{if } C_i \cap C_j \neq \phi \text{ and } i \neq j, \forall \text{Item}_i, \text{Item}_j \in V\}$. As shown in Figure 3(a), there are 9 test items in the testing scope. Assume that the basic concept set in the testing scope is $C = \{e_1, e_2, e_3, e_4, e_5\}$. The discrimination value and the difficulty value with respect to each test item are also shown in the figure. Suppose the basic concept subset C_i with respect to Item_i $(1 \le i \le 9)$ is as follows: $C_1 = \{e_1, e_2, e_3\}$, $C_2 = \{e_3\}, C_3 = \{e_1, e_2, e_3\}, C_4 = \{e_1\}, C_5 = \{e_1\}, C_6 = \{e_3, e_5\}, C_7 = \{e_4\}, C_8 = \{e_3, e_4\}$, and $C_9 = \{e_5\}$. Since $C_4 \cap C_1 \neq \phi$, $C_4 \cap C_3 \neq \phi$, and $C_4 \cap C_5 \neq \phi$, then $(\text{Item}_4, \text{Item}_1) \in E$, $(\text{Item}_4, \text{Item}_3) \in E$, and $(\text{Item}_4, \text{Item}_5) \in E$.

Now we define an augmented graph of IRG, called the A-IRG ($G_A = (V_A, E_A)$) as follows. A test item Item$_i$, whose basic concept subset C_i only contains a single basic concept, is called an *identity test item*. That is, Item$_i$ is an identity test item, if $|C_i| = 1$. For the example in Figure 3, the test items Item$_2$, Item$_4$, Item$_5$, Item$_7$,



(a) the IRG (b) the A - IRG

Figure 3. An example of an IRG

and Item$_9$ are all identity test items. In the case of a basic concept $e_t \in C$ not being contained by any identity test item Item$_l$ such that $C_l = \{e_t\}$, then e_t is called a *missing basic concept*. Let C_M be the collection of all missing basic concepts. Then, for each missing basic concept $e_t \in C_M$, a pseudo vertex Item$_t$ is added to V_A, and the characteristics vector with respect to Item$_t$ is let to be $(-\infty, \infty, \{e_t\})$. The edge set E_A of the A-IRG is then obtained by the same definition of the edge set in the IRG. For the example in Figure 3, since C_2, C_4, C_5, C_7, and C_9 are all identity basic concept subsets and $C_2 \cup C_4 \cup C_5 \cup C_7 \cup C_9 = \{e_1, e_3, e_4, e_5\}$, then e_2 is a missing basic concept. We then add a pseudo vertex Item$_{10}$ in G_A and let the test item characteristic vector with respect to Item$_{10}$ be $(b_{10}, p_{10}, C_{10}) = (-\infty, \infty, \{e_2\})$. The resulting A-IRG with respect to the IRG in Figure 3(a) is shown in Figure 3(b). In the following we give some preliminary results related to the augmented IRG, and describe the relationship between the basic concepts covering constraint and the *dominating set* of graph theory. A vertex subset $D \subseteq V_A$ of the A-IRG is called a dominating set, if for each vertex Item$_i \in V_A$, either Item$_i \in D$ or a vertex Item$_t \in D$ exists, such that (Item$_i$, Item$_t$) $\in E_A$ (or simply, Item$_i \in N(D)$, where $N(D)$ denotes the collection of all neighboring vertices of D). For the example in Figure 3(b), subsets {Item$_1$, Item$_6$, Item$_8$}and {Item$_3$, Item$_8$, Item$_9$} are two dominating sets of the A-IRG G_A. The following theorem gives the relationship between the basic concept covering constraint of our considered problem with the dominating set in G_A.

Theorem 1. For any dominating set in an A-IRG, the corresponding test sheet meets the basic concept covering constraint and vice versa.

Proof.

Let D be a dominating set in the A-IRG and C be the basic concept set in the testing. For each basic concept $e_t \in C$, there exists an identity test item Item$_t \in V_A$ such that $C_t = \{e_t\}$. According to the definition of the A-IRG and the dominating set, the Item$_t$ is dominated by D. Thus, $e_t \in \bigcup_{\text{Item}_i \in D} C_l, \forall e_t \in C$. That is, the set D meets the basic concept covering constraint.

Conversely, we will show that given any vertex subset $S \subseteq V_A$ that satisfies the basic concept covering constraint, then S must be a dominating set in G_A. Suppose not, then there exists a vertex $v \in V_A$, but $v \notin S$ and $v \notin N(S)$. Suppose that $C_v = \{e_{i1}, e_{i2}, ..., e_{il}\}$. Since $e_{it} \in C_v$, $(1 \le t \le l)$, according to the definition of edge

in the A-IRG, we have $e_{it} \notin \bigcup_{\text{Item}_t \in S} C_t$. Since S does not cover any one of the l basic concepts e_{it} $(1 \le t \le l)$, then it does not meet the basic concept covering constraint, which violates the assumption. Thus set S is a dominating set. Q.E.D.

Note that the above theorem gives the fact that the basic concepts covering the constraints of our problem model can be completely eliminated by finding a dominating set in the A-IRG instead. Thus we have transformed the test sheet composing optimization problem into a dominating set finding optimization problem in graph theory. Due to graph theory being a field with fertile theoretical results, this transformation builds a bridge from the test sheet composing problem to graph theory.

Mathematical formulation

Let $V = \{\text{Item}_1, \text{Item}_2, \ldots, \text{Item}_n\}$ be the collection of test items in the testing scope. And let $C = \{e_1, e_2, \ldots, e_k\}$ be the basic concept set. For each test item Item_i $(1 \le i \le n)$, a test item characteristic vector (b_i, p_i, C_i) is associated with it, where b_i denotes the discrimination value, p_i denotes the difficulty value, and C_i denotes the basic concept subset. Let graph $G_A = (V_A, E_A)$ be the augmented item relationship graph with respect to the above test items. Suppose a user issues a demand for test sheet composition and specifies that the test sheet size be m and the upper (lower) bound of the average difficulty of the test sheet be p_u (p_l). The considered problem aims to determine a vertex subset $S^* \subseteq V_A$ and its average discrimination value maximizes every possible vertex subset that meets the following three constraints.

1. The set S^* satisfies the difficulty constraint; that is, $p_l \le \frac{\sum_{\text{Item}_i \in S^*} p_i}{|S^*|} \le p_u$.

2. $|S^*| = k$.

3. S^* is a dominating set.

As discussed above, we give a formal mathematical formulation of our considered problem, called the Test Sheet Composing Optimization Problem (TSCOP) as follows.

$$\text{Max.} \frac{\sum_{1 \le i \le n} x_i \cdot b_i}{\sum_{1 \le i \le n} x_i} \qquad (1)$$

s.t.

$$p_l \le \frac{\sum_{1 \le i \le n} x_i \cdot p_i}{\sum_{1 \le i \le n} x_i} \le p_u \qquad (2)$$

$$\sum_{1 \le i \le n} x_i = m \qquad (3)$$

$$\sum_{\{j | \text{Item}_j \in N(\text{Item}_i)\}} x_j > 0, \forall \text{Item}_i \in V_A \qquad (4)$$

$$x_i \in \{0,1\}, \forall \text{Item}_i \in V_A \qquad (5)$$

In the above mathematical programming model, each test item Item_i $(1 \le i \le n)$ corresponds to a 0-1 variable x_i. If x_i is set to be 1, this means Item_i is selected into the test sheet; otherwise $x_i = 0$ (see Equation (5)). Equation (2) guarantees the test sheet will meet the difficulty constraint. Equation (3) gives the test sheet size constraint. Finally, Equation (4) ensures that the neighboring set with respect to each test item Item_i in A-IRG must have at least one test item selected into the test sheet, which guarantees that the resulting test sheet will meet the dominating set constraint.

Exposure rate control

Assume a testing system has generated t test sheets $S_1, S_2, \ldots,$ and S_t for testing so far. Suppose the test item Item_i appears x times in the t test sheets. Then the exposure rate $Xposure_i$ with respect to test item Item_i is defined as, $Xposure_i = x / t$, and the average exposure rate $Avg\_Xposure(t)$ with respect to the t test sheets is defined as follows:

$$Avg\_Xposure(t) = \frac{\sum_{\text{Item}_i \in S_1 \cup S_2 \cup ... \cup S_t} Xposure_i}{|S_1 \cup S_2 \cup ... \cup S_t|} \quad (6)$$

In the next section, we describe the proposed algorithm, which can generate a near-optimal test sheet for our considered problem for which the average exposure rate will not be too high compared to other conventional algorithms.

The proposed algorithm

The main objective of the TSCOP is to optimize the average discrimination of the generated test sheet; however, the other objective is to decrease the average exposure rate of the testing. The above two objectives conflict with each other, since the previous one tends to always select the "better" test items into the test sheets, but the latter one tends to balance the chance of each test item being selected into the test sheets in order to control the average exposure rate such that it is below a certain level. In this paper, we propose a Multi-stage Test Sheet Composing Algorithm (MTSCA) using the randomized rounding technique in our algorithm design. The main approach of the MTSCA is that, first, we relax the integer programming optimization problem TSCOP to be a linear programming optimization problem, which can be solved to optimize the result by using some well-known polynomial time algorithms (for example, the Ellipsoid method or Interior-point algorithm). Then, we use the randomized rounding technique on the above optimum linear solution to round it to be an integer solution with random fashion. Due to the resulting integer solution possibly not being feasible, a feasibility modification process is also proposed to modify the current solution so that it can be feasible. Then the corresponding test sheet with the resulting solution will be the generated test sheet of our proposed MTSCA. Since the above MTSCA adopts randomized rounding, the generated test sheet will be different each time the algorithm is invoked. A detailed algorithm description of the MTSCA is provided as follows.

The Multi-stage Test Sheet Composing Algorithm (MTSCA)

Let set $V = \{\text{Item}_1, \text{Item}_2, \ldots, \text{Item}_n\}$ and $C = \{e_1, e_2, ..., e_k\}$ be the test item set and the basic concept set, respectively. Let (b_i, p_i, C_i) be the test item characteristic vector with respect to test item $\text{Item}_i \in V$. Assume the user specifies the test sheet size to be k and the upper (lower) bound of the average difficulty of the generated test sheet to be p_u (p_l). Firstly, we will construct the A-IRG $G_A = (V_A, E_A)$ with respect to the above test items. The proposed MTSCA consists of the following three stages.

Stage 1. Solving the linear programming problem model

First, we relax the integer decision variables $x_i, \forall \text{Item}_i \in V_A$ of the integer programming problem model TSCOP to be real decision variables. The resulting linear programming model is as follows:

$$\text{Max.} \frac{\sum_{1 \le i \le n} x_i \cdot b_i}{\sum_{1 \le i \le n} x_i} \quad (7)$$

s.t.

$$p_l \le \frac{\sum_{1 \le i \le n} x_i \cdot p_i}{\sum_{1 \le i \le n} x_i} \le p_u \quad (8)$$

$$\sum_{1 \le i \le n} x_i = m \quad (9)$$

$$\sum_{\{j | \text{Item}_j \in N(\text{Item}_i)\}} x_j > 0, \forall \text{Item}_i \in V_A \quad (10)$$

$$x_i \in R, \forall \text{Item}_i \in V_A \quad (11)$$

Generally, the above model can be easily solved using some existing polynomial time algorithms, such as the well known Ellipsoid method or Interior-point algorithm. For detailed solution steps, one can refer to some Combinatorial Optimization works (e.g., Aarts & Lenstra, 1997), so we omit the detail here. Let the resulting optimum solution be $(x_1^*, x_2^*, ..., x_n^*)$, where $x_i^* \in R, 1 \le i \le n$.

Stage 2. Randomized rounding

This stage rounds the above real number solution $(x_1^*, x_2^*, ..., x_n^*)$ to be 0-1 integer solution $(\hat{x}_1^*, \hat{x}_2^*, ..., \hat{x}_n^*)$ according to the following rules.

For each solution value $x_i^*, 1 \le i \le n$,

Case 1 if $x_i^* \ge 1$, then $\hat{x}_i^* = 1$;

Case 2 if $x_i^* \le 0$, then $\hat{x}_i^* = 0$;

Case 3 if $0 < x_i^* < 1$, then we randomly choose a real number t from range [0,1]. In case of $t \le x_i^*$, then $\hat{x}_i^* = 1$; otherwise, $\hat{x}_i^* = 0$. For example, assume $x_i^* = 0.7$ and the random number t=0.5. Since $t \le x_i^*$, we set the resulting value $\hat{x}_i^*$ to be 1.

Perform the above randomized rounding process on each of the solution values $x_i^*, 1 \le i \le n$, and an integer solution $(\hat{x}_1^*, \hat{x}_2^*, ..., \hat{x}_n^*)$ will then be obtained. Due to the above solution perhaps not being feasible with respect to the TSCOP, the following stage will modify the resulting integer solution $(\hat{x}_1^*, \hat{x}_2^*, ..., \hat{x}_n^*)$ so that it becomes feasible solution.

Stage 3. Performing the feasibility modification process

In the case of the obtained solution $(\hat{x}_1^*, \hat{x}_2^*, ..., \hat{x}_n^*)$ after performing Stages 1 and 2 being feasible for the TSCOP, then the execution of Stage 3 is omitted. On the other hand, if the solution is infeasible, then the three steps of Stage 3 have to be performed in order to obtain a feasible solution. The three steps include, the *difficulty feasibility modification*, the *dominating feasibility modification*, and the *test sheet size feasibility modification*, and are stated as follows.

1. The difficulty feasibility modification:

Let set S be the test item set in graph G_A with respect to the current solution $(\hat{x}_1^*, \hat{x}_2^*, ..., \hat{x}_n^*)$. That is, $S = \{\text{Item}_i \mid \text{if } \hat{x}_i^* = 1\}$. If S meets the difficulty constraint, then skip this step. Otherwise, if the average difficulty of S is less than the specified lower bound p_l, then we let set U={Item_{i1}, Item_{i2},…, Item_{il}} be the collection of test items not currently selected in S, and its difficulty value is greater than the lower bound (that is, if $\text{Item}_{it} \in U$, then $\text{Item}_{it} \in V_A - S$ and $p_{i_t} > p_l$). Choose the test item Item_{it} with the highest discrimination value in set U, and then put it into S. Then update sets S and U by $S \cup \{\text{Item}_{it}\}$ and U=U-{Item_{it}}. Repeat the above process until the average discrimination value of S is greater than the lower bound p_l. On the other hand, if the average discrimination of the current solution after performing Stages 1 and 2 is greater than the specified upper bound p_u, then the operations are similar to the above description except that set U={Item_{i1}, Item_{i2},…, Item_{il}} is set to be the collection of test items not currently selected in S, and its difficulty value is less than the upper bound.

2. The dominating feasibility modification:

If set S is not a dominating set in graph G_A, then the following operations will be performed. Let set $U = V_A - S$ and let the test item Item_{it}^* be the highest discrimination value in set U. If adding Item_{it}^* will not violate the difficulty constraint and can enhance the basic concept coverage, then $S = S \cup \{\text{Item}_{it}^*\}$ and $U = U - \{\text{Item}_{it}^*\}$. Otherwise, we just drop it from set U; that is, $U = U - \{\text{Item}_{it}^*\}$. Repeat the above process until set S becomes a dominating set.

3. The test sheet size feasibility modification:

If the current test sheet size is greater than the user specified number k; that is $|S| > k$, then some test items have to be removed. Firstly, we sort the test items in S according to the discrimination value in nondecreasing order, and let Item_{i1}, Item_{i2},…, $\text{Item}_{i|S|}$ be the resulting order. Then, starting from the first test item Item_{i1}, check whether or not removing this item from S will violate the difficulty constraint or the dominating constraint. In case of either one of the constraints being violated, then skip this item and do nothing; otherwise, remove Item_{i1} from S and let the resulting set S be S-{Item_{i1}}. Continue the above process sequentially on the test item list until $|S| = k$, and then output the resulting solution set S.

On the other hand, in case of $|S| < k$, then some test items which have not been selected in set S have to be added to S. Similar to the above case ($|S| > k$), the candidate test item checking list is no longer S but $U = V_A - S$. Then sort the test items in U according to the discrimination value in nonincreasing order, and

decide whether or not to and the current item in the list to S until $|S| = k$.

```
Procedure Feasible-modification-process;
{
/* Step 1. The difficulty feasibility modification */
  let S be the test item set in G_A with respect to solution (x̂*_1, x̂*_2,...x̂*_n);
  if (S does not meet the difficulty constraint) then {
    repeat
      if (the average difficulty value of S < p_l ) then
         U = {Item_it | Item_it ∈ V_A − S and p_it > p_l};
      else U = {Item_it | Item_it ∈ V_A − S and p_it < p_l};
      if (U = φ ) then randomly remove some test items from S
              until the resulting U becomes nonempty;
      let Item*_it be the test item with the greatest discrimination value in U;
      S = S ∪ {Item*_it};
      U = U ∪ {Item*_it};
    until (S meets the difficulty constraint);
     }
/* Step 2. The dominating feasibility modification */
  repeat
    U = V_A − S ;
    let Item*_it be the test item with the greatest discrimination value in U;
    if (add Item*_it into S will not violate the difficulty constraint and can enhance the basic concept
            coverage) then S = S ∪ {Item*_it};
    U = U − {Item*_it};
  until (S becomes a dominating set);
/* Step 3. The test sheet size feasibility modification */
  if (|S| > k ) then {
     sorting the test items in S according to the discrimination value in nondecreasing order, and let the
          resulting order list be L = (Item_i1, Item_i2,..., Item_i|S|);
     repeat
       remove the first item Item_j from L;
       if ( S − {Item_j} does not violate the difficulty and dominating constraints) then S = S − {Item_j};
     until (|S| = k );
  }
  else if (|S| < k ) then {
     sorting the test items in V_A − S according to the discrimination value in nonincreasing order, and let
          the resulting order list be L = (Item_i1, Item_i2,..., Item_i|V_A−S|);
     repeat
       remove the first item Item_j from L;
       if ( S ∪ {Item_j} does not violate the difficulty and dominating constraints) then S = S − {Item_j};
     until (|S| = k );
  }
 return(S);
```

Figure 4. The complete procedure for the feasibility modification process

```
Algorithm Multi-staged Test Sheet Composing;
{
 construct the A-IRG G_A = (V_A, E_A);
 /* Stage 1. Solving the linear programming problem model */
    Solve the linear programming model and let the resulting solution be (x_1^*, x_2^*, ..., x_n^*);
  /* Stage 2. Randomized rounding */
    for each solution value x_i^* in (x_1^*, x_2^*, ..., x_n^*) do {
     if ( x_i^* ≥ 1) then x̂_i^* = 1;
     else if ( x_i^* ≤ 0 ) then x̂_i^* = 0;
     else { choose a random number t from [0,1];
        if ( t ≤ x_i^* ) then x̂_i^* = 1; else x̂_i^* = 0;
        }
    }
  /* Stage 3. Performing the Feasibility-modification-process */
    S=Feasible-modification-process();
 output(S);
}
```

Figure 5. The complete procedure for the Multi-stage Test Sheet Composing Algorithm (MTSCA)

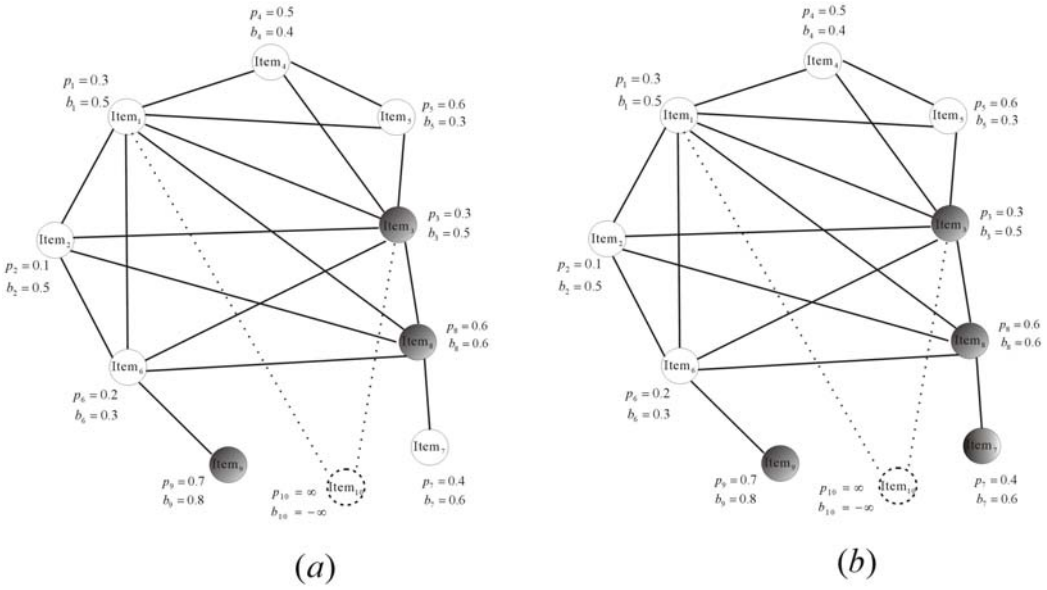


Figure 6. A numerical example to illustrate the solution steps of the MTSCA

According to our simulations, the test item set S after performing the processes of Stages 1 and 2 is very close to being a feasible solution. Thus Stage 3 generally only makes minor modifications to set S. The complete feasibility modification process and the proposed algorithm description are shown in Figures 4 and 5, respectively.

Numerical example

In this subsection, we use the problem instance shown in Figure 3(b). Assume that the user specifies the test sheet size to be 4 and the difficulty range as [0.4, 0.5]. Suppose the resulting solution after performing the processes of Stage 1 is (0, 0, 0.6, 0.8, 0.8, 0, 0, 0.9, 0.9, 0). In Stage 2, for each non-zero decision variable in the above solution, randomized rounding is performed, and we let the resulting solution be (0, 0, 1, 0, 0, 0, 0, 1, 1,

0). As shown in Figure 6(a), the corresponding test item set S for the above solution is {Item$_3$, Item$_8$, Item$_9$}, which is identified by gray nodes. Since S is not feasible, thus the modification processes in Stage 3 will be performed to modify S and make it feasible. In the difficulty feasibility modification process, due to the average difficulty value of S being equal to $(p_3 + p_8 + p_9)/3 = (0.3 + 0.6 + 0.7)/3 = 0.53 > 0.5 = p_u$, which violate the difficulty constraint, some test items in $V_A - S$ with a smaller difficulty value than $p_u (= 0.5)$ will be selected and added to S to lower the average difficulty value until the difficulty constraint is met.

In this example, the U={Item$_1$, Item$_2$, Item$_6$, Item$_7$}. Since Item$_7 \in U$ has the greatest discrimination value in U, then add it into S and the resulting S becomes {Item$_3$, Item$_7$, Item$_8$, Item$_9$} (see Figure 6(b)). The average difficulty value of S becomes (0.3+0.4+0.6+0.7)/4=0.5. Since S meets the difficulty constraint the difficulty modification process stops. In the dominating feasibility modification process, due to S being a dominating set in V_A, nothing will happen to it after performing this process. Finally, since $|S| = 4$, it meets the test sheet size constraint. Similarly, set S remains unchanged after performing the test sheet size feasibility modification process. Therefore, set {Item$_3$, Item$_7$, Item$_8$, Item$_9$} is the resulting output test sheet of our proposed MTSCA.

Time complexity analysis

Let the number of test items in the considered problem be n and the given size of the test sheet be k. The time complexity analysis for the feasibility modification process is as follows. Initially, the construction of the augmented graph will take O(n) computation steps in the worst case, since the number of basic concepts is much less than n in general. The Step 1 (difficulty feasibility modification) will firstly take $O(n \log n)$ computation steps to sort the test items according to the discrimination values in non-increasing order. The loop in this step will iteratively remove (or add) test items from (to) the solution until the difficulty constraint is met, and will be repeated at most O(n) times. Moreover, in each item remove (or add) step, the average discrimination value has to be updated, which will take O(n) computation times. Thus, Step 1 will totally take $O(n) \times O(n) = O(n^2)$ computation steps. Similar arguments can be made for Step 2; thus it takes $O(n^2)$ computation steps to adjust the current solution to meet the dominating constraint. For Step 3 (test sheet size feasibility modification), it firstly sorts the test items in either set S (the if case) or $V_A - S$ (the else case) according to the discrimination value in non-increasing order, which will take at most $O(n \log n)$ computation steps. Then for either of the above cases, the loop in Step 3 will repeatedly modify the solution by removing (or adding) at most k items. In addition, for each iteration step of the loop, the process has to check whether the updated solution will violate the difficulty and dominating constraints by taking O(n) computation steps in the worst case. Thus the sorting and loop in Step 3 take at most $O(n \log n) + O(n \cdot k)$ computation steps. Finally, summing the computation time of the above three steps, we conclude that the feasibility modification process (Stage 3 of the proposed algorithm MTSCA) will take $O(n^2) + O(n^2) + O(n \log n) + O(n \cdot k) = O(n^2)$ computation steps to modify the solution to becomes a feasible solution in the worst case.

Now, let us get back to the time complexity analysis of the proposed algorithm MTSCA. The first stage of MTSCA tries to use a polynomial time algorithm (such as the Ellipsoid method or Interior-point algorithm) to solve the linear programming model, which is known to take $O(n^3 \cdot L)$ computation steps, where L denotes the bit-length of the data. In Stage 2 (Randomized rounding) of MTSCA, it iteratively rounds the n solution values one by one into a 0-1 value in random fashion; thus Stage 2 will take O(n) computation steps. According to the above arguments, we have that Stage 3 (the feasibility modification process) takes $O(n^2)$ computation steps in the worst case. Summing the computation time of the above three stages, we have that the worst case running time of MTSCA is $O(n^3 \cdot L) + O(n) + O(n^2) = O(n^3 \cdot L)$. In the following, we demonstrate the performance of the MTSCA against other conventional methods through simulations.

Simulation results

Our experiments had two purposes, namely to compare the performance in terms of the average discrimination value and the average exposure rate of the proposed algorithm MTSCA with three different traditional test sheet composition methods. The compared methods, including the random selection method, the genetic algorithm (GA), and a GA modified method with exposure rate control called GA-exposure, are described as follows.

The compared algorithms

(1) The random selection method

Firstly, this method randomly selects some test items to form an initial test sheet. Due to the resulting test sheet perhaps not being feasible, the feasibility modification process proposed above is adopted to obtain a

feasible solution.

(2) The genetic algorithm

In this method, each test sheet solution is encoded by an n-bits binary string $X = (x_1, x_2, ..., x_n)$. In the case of $x_i = 1 (x_i = 0), 1 \le i \le n$, it stands for the test item Item$_i$ being (not being) selected in the test sheet. The fitness function F(X) in the GA is defined as follows. Function F(X) takes the average discrimination value ($w = \sum_{i=1}^{n} b_i x_i / \sum_{i=1}^{n} x_i$) as the main part, and some penalty functions are adopted to force the solution not to violate the constraints. The penalty functions include the coverage constraint violating penalty function (δ), and two difficulty constraint violating functions (α and β). The coverage constraint violating penalty function δ is defined as,

$$\delta = w \times (1 - \frac{a}{m}) \qquad (12)$$

where m denotes the number of basic concepts in the testing range and a denotes the number of basic concepts covered by the current solution

The lower bound (upper bound) of difficulty constraint violating penalty functions α (β) are defined as,

$$\alpha = w \times [p_l - \frac{\sum_{i=1}^{n} p_i x_i}{\sum_{i=1}^{n} x_i}]^+,$$

$$\beta = w \times [\frac{\sum_{i=1}^{n} p_i x_i}{\sum_{i=1}^{n} x_i} - p_u]^+,$$

Note that the function $[x]^+ = \max\{x, 0\}$. Combining the above functions, the fitness function of the GA is $F(X) = w - \alpha - \beta - \delta$.

The selection method of the GA in our simulation uses Roulette Wheel selection, and the crossover operation and mutation uses one-point crossover and bit-mutation, respectively. Similarly, in the case of the solution generated by the GA not being feasible, we again invoke the feasibility modification process to obtain a feasible solution.

(3) The GA-exposure algorithm

The GA-exposure is similar to the GA described above, except that the discrimination value b_i in the fitness function is replaced by $b_i / Xposure_i$, where $Xposure_i (1 \le i \le n)$ denotes the current exposure rate with respect to Item$_i$. The other operations (such as the selection method, the crossover operation, and the mutation operation) are all the same as in the GA. Once again the feasibility modification process is invoked if the generated solution is not feasible.

The numerical results

The first purpose of our experiment is to conduct a comparison of the performance results of our proposed algorithm MTSCA with the other test sheet composing methods in the average discrimination results estimations. For each simulation case of test item number n (n=500, 1000, 1500, 2000, …, 5000), we randomly generated 500 problem instances for simulation. The specified test sheet size k is set to 25 and the difficulty range is set to [0.5,1] and [0.4,0.6], respectively. Thus, there are totally 500 average discrimination values for each test sheet composition method. We then take the average of the 500 discrimination values. The performance results are shown in Figures 7-8 with different sets of specified difficulty range. These results demonstrate that the performance of our proposed method MTSCA is very close to that of the GA, which gains a high average discrimination value of the composed test sheets. The random selection method gains the worst discrimination value in these performance evaluations. We also conducted another experiment for evaluating the performance on the average discrimination value when the number of test items was fixed (n=2000) and the number of test sheets generated varied. As shown in Figures 9-10, the GA (random selection method) achieved the greatest (lowest) average discrimination values compared with the others in each of the evaluation cases. Our proposed method MTSCA is very close to the GA's performance.

The second purpose of our experiment was to evaluate the proposed method MTSCA against the other test sheet

composition methods on the average exposure rate comparison. In the experiment, the number of test items is fixed and set to 2000 (n=2000), and we randomly generated 500 problem instances for each given test sheet's value. Figures 11-12 show the performance results of these experiments. As shown in these figures, the GA has the worst performance results on the average exposure rates. Besides, the GA-exposure performs much better than the GA does; however, the exposure rates are greater than 0.6 in most cases. Among these methods, without a doubt, the random selection method achieves the best performance results, and our proposed method MTSCA performs very close to the random selection method. Based on the above simulation results, we conclude that the traditional test sheet optimization composition methods (such as the GA) only perform well on average discrimination comparisons, but perform worse on average exposure rate comparisons. In contrast, the random selection method performs well only on average exposure rate comparisons, but is the worst in the other comparison cases. However, our proposed method (the MTSCA) performs comparably on both the average discrimination values and the average exposure rate comparisons, making it, overall, the most effective method.

CONCLUDING REMARKS

In this paper, we propose a test sheet composing optimization problem called the TSCOP. We then transform the TSCOP to a dominating set optimization problem in graph theory. A randomized rounding based algorithm called the MTSCA is proposed to give a near optimal solution to the considered problem. The simulation results show that our proposed MTSCA performed better than other conventional test sheet composition methods on both average discrimination value and average exposure rate comparisons. In the future, the considered problem model will be extended to a multi-objective optimization problem, and we will try to design algorithms to enhance the generated results.

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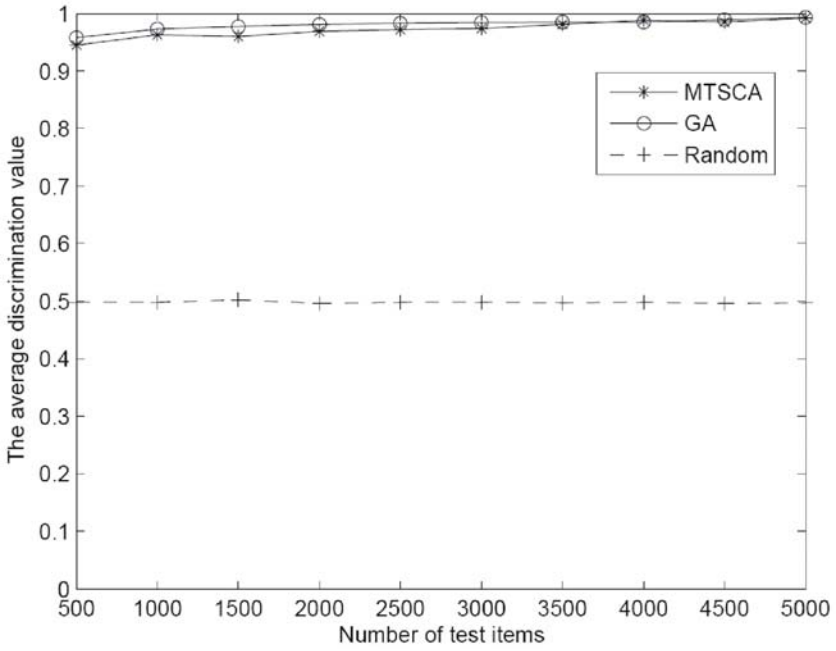

Figure 7. Performance evaluation on average discrimination value (difficulty range is [0.5,1])

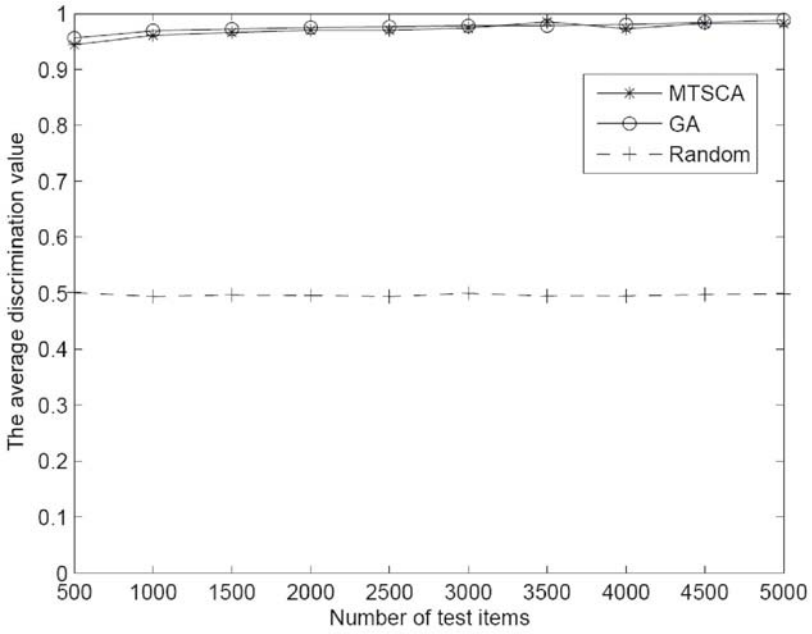

Figure 8. Performance evaluation on average discrimination value (difficulty range is [0.4,0.6])

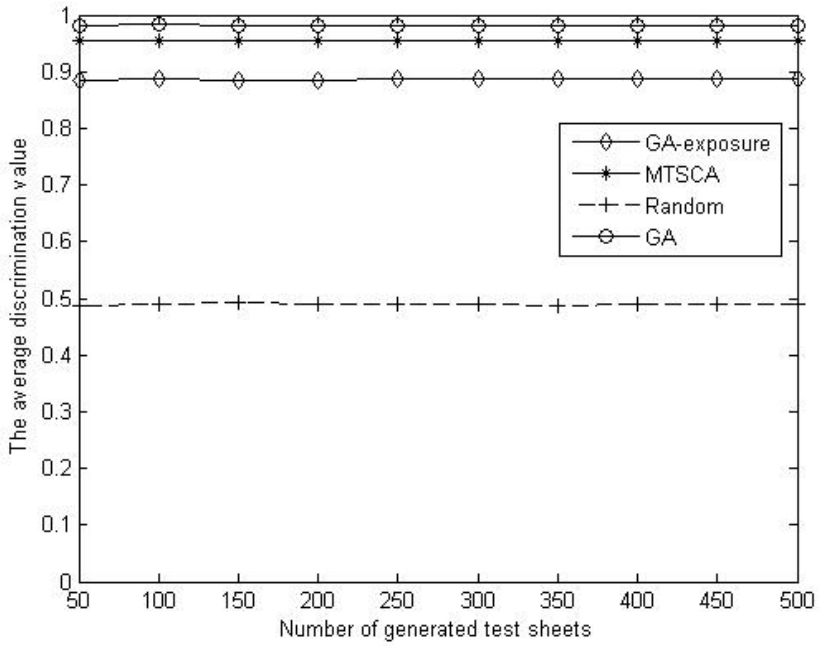

Figure 9. Performance evaluation on average discrimination value as the number of generated test sheets varied (n=2000 and difficulty range is [0.5,1])

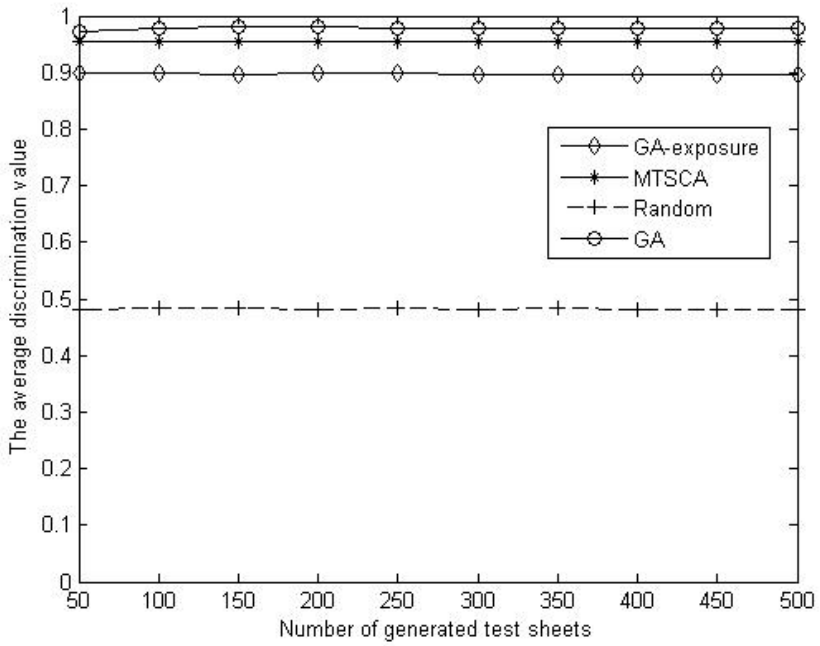

Figure 10. Performance evaluation on average discrimination value as the number of generated test sheets varied (n=2000 and difficulty range is [0.4,0.6])

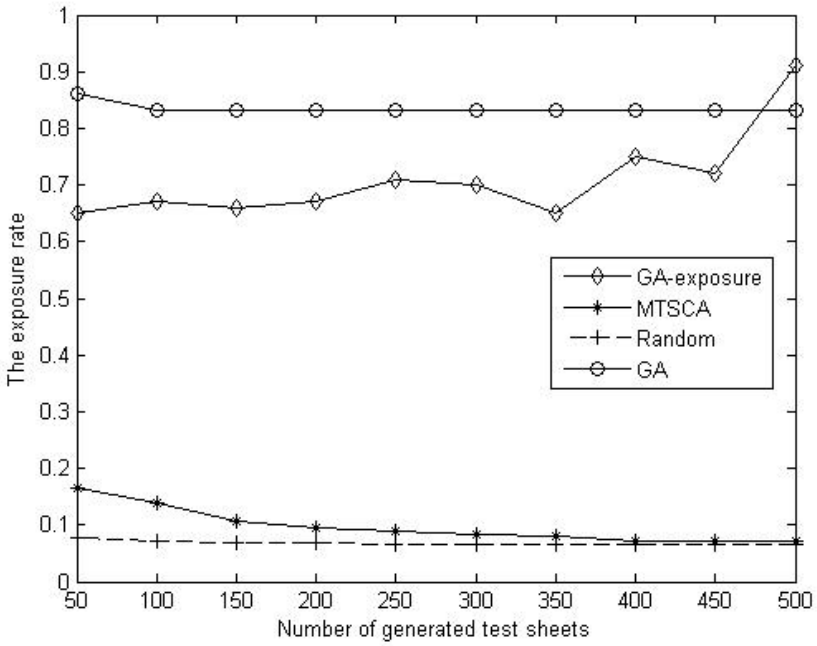

Figure 11. Performance evaluation on exposure rate (difficulty range is [0.5,1])

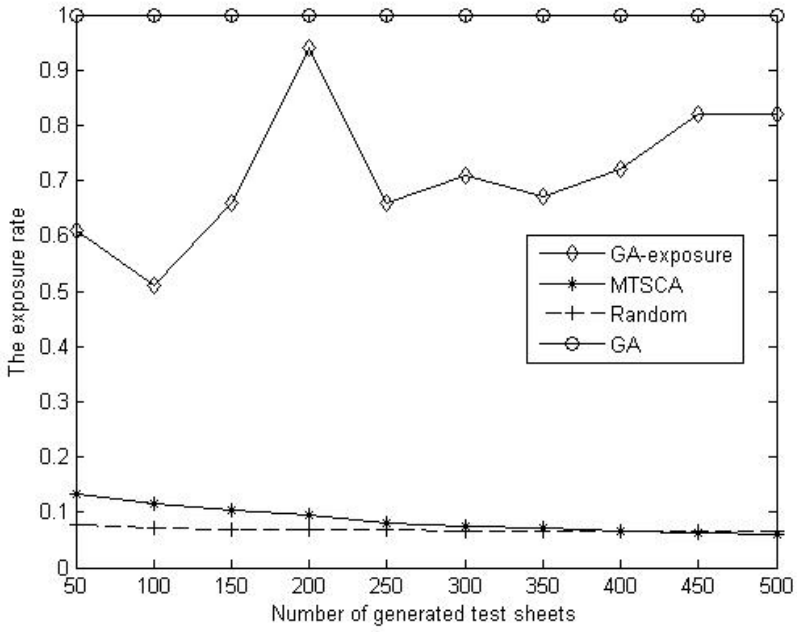

Figure 12. Performance evaluation on exposure rate (difficulty range is [0.4,0.6])

APPLYING AUTHENTIC LEARNING STRATEGIES IN A MULTIMEDIA AND WEB LEARNING ENVIRONMENT (MWLE): MALAYSIAN STUDENTS' PERSPECTIVE

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ABSTRACT
The advancements of ICT have impacted significantly on educators to utilise the technologies in their classrooms (Sivapalan & Wan Fatimah, 2010). There is also a significant move to make curriculum and content more authentic and relevant for student learning (Apple, 2008) and to allow students to become creative thinkers and problem solvers. However, there is more to utilizing information technology than merely uploading teaching materials online (Palloff & Pratt, 2001), and educators still lack the confidence in designing proper learning environments that engage and educate (Chung 2008). This paper presents a study conducted that incorporated Herrington and Kervin's (2007) authentic learning strategies into a multimedia learning environment (MWLE) and reports on its impact on student learning. Results showed that students reported positively towards learning in this environment and to the authentic activities in the modules, which allowed them to do well in their project. These results strongly support authentic learning strategies as a means to innovate and engage students in technology-backed 21st century classrooms.

INTRODUCTION

As we move into 21st century teaching, more relevant, authentic and applied teaching and learning strategies need to be incorporated into learning environments to innovate the student learning process. The availability of many types of technologies have resulted in learners who not only can multi-task between various digital technologies, but who are also "multi-processors", i.e. are able to process many activities at the same time (Brown, 2002). The impact and influence of the Web and multimedia technologies means there is a new dimension of literacy, one that moves away from teacher-based authority to more discovery-based and applied learning, that requires students to become more creative and critical thinkers, problem-solvers and collaborators (Brown, 2002, Lombardi, 2007; Tan, Teo & Chye, 2009). Apple's Classroom of Tomorrow (ACOT2) identified six areas of focus in designing learning environments: 1) understanding 21st century skills and outcomes, 2) relevant and applied curriculum, 3) informative assessments, 4) creating a culture of innovation and creativity, 5) social and emotional connections with students, and 6) ubiquitous access to technology (Apple, 2008). The 2010 Horizon Report (Horizon, 2010) suggests many future technologies to watch, all of which place much emphasis on increased levels of student engagement and collaboration. With these challenges in mind, educators are now looking to equip themselves with proper pedagogies and technological literacies to address these new dimensions in teaching and learning.

In Malaysia, institutions of higher learning have heeded the Government's call to incorporate multimedia materials into the learning environments and classrooms (MOE, 2008), and create graduates that are more equipped with problem-solving skills and creative thinking skills (Hong, Lai & Holton, 2003;Lee, 2005; Norhayati & Siew, 2004; Neo, 2005, 2010). Constructivist-based classrooms and learner-focus content are being developed that marry both Web technology and multimedia content within the learning environments for more engaged student learning. However, there is more to utilizing information technology than merely uploading teaching materials online (Palloff & Pratt, 2001), and there is still a lack of confidence among educators in the design and development of content materials for the Web (Chung 2008), as much of the

learning environments in Malaysia are still curriculum-based. Furthermore, Herrington and Kervin (2007) argue that in many classrooms, technology is often employed for the wrong reasons, where the teacher is usually the one who is using the technology to deliver content to the students. The content is usually an extension of their course notes delivered in PowerPoint slides, which students will then download into their computer, and ultimately print out to study from, or simply video/film demonstrations that take the place of lectures. As such, the technology itself is the focus of the classroom learning process, and not on the content or subject matter. And when added to that the need to create industry-ready graduates that would be able to enter seamlessly into the workforce, educators are thus challenged to develop learning environments that engage and motivate while providing authentic and relevant content to students, using theoretically sound pedagogies. As such, there is a need to provide learners with an authentic learning environment where they can be highly motivated to learn while enhancing their processing skills and engage in more cognitively challenging activities. This study seeks to investigate adapting authentic learning strategies proposed by Herrington and Kervin (2007) and its impact on the student learning process within a multimedia learning environment (MWLE). The learning environment would blend various learning strategies such as Web-based courseware materials to engage students' cognitive processing skills, a multimedia group project that would require them to collaborate and build management and teamwork skills, and Web 2.0 tools to enable them to collaborate and socially network with each other.

Authentic Learning Strategies in Technology-Backed Environments

Current research shows that many graduates today are ill-equipped with problem-solving and communication skills needed to meet the demands of the IT industries (Tan, Teo & Chye, 2009). This mismatch has prompted Malaysian educators to seek new ways to inculcate the appropriate skills and knowledge into the students in order to meet the rising expectations of the IT society. Research shows that students need skills to plan and evaluate their learning activities and to synthesize the information they garner (Laurillard, 1993). Jonassen (1999) suggested that students would learn better through a constructivist learning environment and Herrington, Reeves, Oliver and Woo (2004) suggested that these learning environments should be authentic and relevant to the student in order to better engage them. Herrington and Herrington (2006) further posit that content be designed to be as authentic as possible by incorporating content and activities to reflect the way the knowledge is used in real life situations. The learning activities would call for students to become active participants in their own learning processes, learn to solve problems and work collaboratively. Peers would play an important role in encouraging the student's learning process and will expose students to multiple perspectives and solutions to their problems, and as such, imbue themselves with skills such as active learning, critical and creative thinking skills, and teamwork.

Authentic learning is defined as a learning that "*…focuses on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice. The learning environments are inherently multidisciplinary*" (Lombardi, 2007, p.2). Authentic learning is important because it allows for students to experience real-world problems while in a learning environment (Herrington, Reeves, Oliver & Woo, 2004; Herrington & Herrington, 2006). Brown (1999) posits that students should be able to solve problems and recognize solutions, and understand what it is like to be held responsible for their work and their final outcomes, and in doing so, enable them to become legitimate members of a community of practice. Reeves, Herrington & Oliver (2002) suggested that characteristics of authentic learning environments include real-world relevance embedded into the learning environment's activities, ill-defined activities that would require students to engage in problem identification and problem solutions, complex tasks and the opportunity to examine the problem from multiple perspectives and use a variety of resources to complete it, opportunity to collaborate with others and reflect on the choices and decisions made, individually and socially, multidisciplinary activities that provide and allow students to assume multiple roles and utilize their prior knowledge and skills while experiencing and building new knowledge beyond a single, well-defined domain, asssessments that are seamlessly integrated into the activities and reflect real-world assessments, the creation of whole products or final outcomes that are owned by the learners and a diversity of outcomes, and multiple solutions from learners that reflect their creativity and originality.

In addition to that, the incorporation of multimedia and web technologies would further enhance the student learning process as it supports discovery-based activities. Jonassen, Carr & Yueh (1998) have suggested that technology can become a student's "intellectual partner" and help them analyse, synthesize and organize their knowledge and comprehension. This is in line with how authentic activities can be incorporated into online modules by using multimedia as a technological support, since authentic activities require learners to apply theoretical knowledge into real context, and incorporating authentic learning strategies will have an impact on their cognitive, social and affective behaviors. Cairncross & Mannon (2001) believe that the learning process can be enhanced through integrating multimedia as it provides users control over the delivery of information

and supports interactivity. They also stress that multimedia can support multiple representations of the same piece of information in a variety of formats which gives learners an authentic learning environment by providing multiple roles and perspectives (Herrington, Reeves & Oliver, 2010). With the advent of multimedia and Web 2.0 technologies, learners are no longer multi-tasking only; they are also "multi-processing" (Brown, 2002). In addition, social networking activities are permeating their learning process and have become extensions of the learner's identity and learning process. This means that students are now processing information, chatting and developing at the same time and no productivity loss is incurred. As such, the learning environments should reflect these new dimensions of learning. In particular, as suggested by Apple's Classroom of Tomorrow Report (Apple, 2008), there are three underlying concepts that would help define and structure this curriculum, which include, allowing student choice in the curriculum and content, which would motivate student to learn, perform, and achieve better, authentic learning tasks and meaningful content to provide "just-in-time-delivery", and the integration of technology to become less visible as a separate entity. Herrington and Kervin (2007) present 10 strategic principles of authentic learning that support technology, and provide educators and learners tremendous opportunities to develop highly motivating and integrative communities of learners. These principles suggest that technology can be used to support authentic learning in a classroom. Therefore, the multimedia learning environment (MWLE) was designed to take create a learning community in the classroom that incorporated Herrington and Kervin's 10 principles of authentic learning strategies.

Designing the m-PSLE with Authentic Learning Strategies

The MWLE was designed with 3 components: 1) Content and courseware materials that were Web-based and uploaded for students' asynchronous access. The materials were designed incorporating Herrington and Kervin's (2007) principles of authentic learning for a more authentic learning online environment; 2) An authentic learning task in the form of a multimedia project which would require students to work in groups and determine their solutions to their problems.; and 3) multimedia and web tools that were fully utilized to enable students to develop, research, collaborate and network amongst themselves. These tools include development tools such as Adobe Flash, Dreamweaver, Youtube, Wikipedia and Google for research, Yahoo IM and Skype for collaboration, and Yahoo Blogger and Facebook for communication among peers and experts. Figure 1 shows a conceptual design of the students' learning process in this environment.

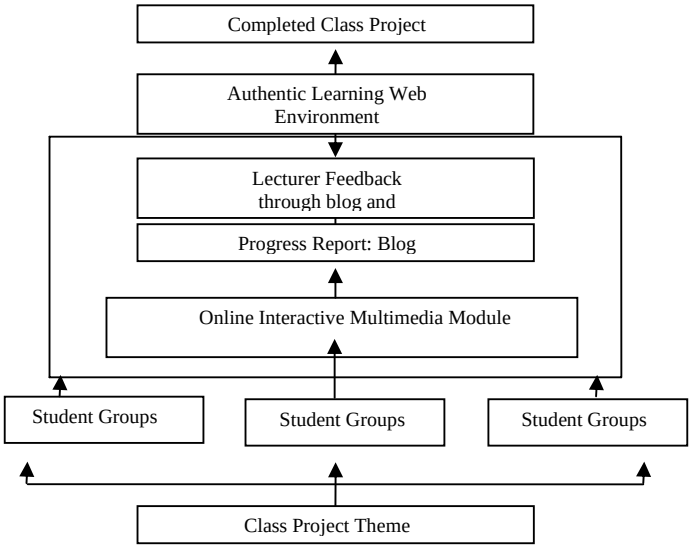

Figure 1 The student's learning process in the MWLE

The study consisted of 41 students (N=41) taking the Interactive Multimedia class in the Multimedia University, from the Faculty of Management, both female (45.2%) and male (54.8%), local (81%) and international (19%). Students were given both lectures (face-to-face and web-based) on topics pertaining to multimedia development, and lab tutorials once a week on Adobe Flash and Dreamweaver. The class was also told to imagine themselves as employees of a multimedia development company and given the task to design a cutting edge online magazine for client. This project was authentic and relevant to the students as they were going to be interviewing for internship placements in real multimedia firms in the Malaysian SuperCorridor (MSC) in the next year. The theme of the class project was "Online magazine" and the entire class had to decide and

determine the overall monthly online magazine to be created. Students then divided themselves into groups of 5 to develop a section of the magazine. The section would be a fully interactive multimedia application created using Adobe Flash, and each member would be responsible for at least one part of the application. This was to prevent any "piggybacking" in the group, as well to ensure that each member would use their Flash skills which they were taught in their tutorial classes. Herrington and Kervin's (2007) authentic learning strategies were adapted and incorporated into this MWLE in both the online web modules as well as in the classroom. Specifically these principles were present in both the online modules designed for students' to learn from and in the group project that they undertook:

1. **Authentic context –** Context that reflects the way knowledge will be used in real life.

Web modules: The class syllabus was used to provide the context of the module. The content of the modules were relevant to the success of the development of their multimedia project

Group Project: Students assumed the role of employees of a multimedia development firm and given a multimedia project themed "Online magazine" where they would have to develop a collective online magazine with sections for different topics, similar to real-life e-magazines.

2. **Authentic activities –** Activities that people do in the real world.

Web modules: In various points of the module, relevant activities are added into the content to help students find and solve problems using the theories they have learnt in the module (eg. in the Design Principle topic students were asked to redesign signage for a door, embedded into the content itself; see Figure 2).

Group Project: Student groups were given various tasks during the development of their project, which included presenting their proposal for approval of the client, brainstorming and group discussions, presentations of work-in-progress and preparation of project documentation, which mirrored activities in a real-life project development setting. Groups were also asked to set up team blogs in Yahoo Blogger and a Facebook page to post and update their progress of their work.

3. **Expert performance --** Allowing students to observe the task before it is attempted and to access the modelling of processes.

Web-modules: YouTube videos of expert opinions on certain topics were sourced and integrated into the content.

Group project: Student groups kept in constant contact with their lecturer and tutors as consultations were held to discuss their progress. Students also consulted their seniors and peers who had had more experience with multimedia project developments, as well as for advance technical skill advice. They also used the web to search for forums that provided solutions to their technical and development issues.

4. **Multiple roles and perspectives --** Different people, media and resources are employed as required to provide a rich array of opinions and points of view.

Web modules: Explanation of certain topics and terms were linked to various credible external websites for students to explore and see different points of view. In addition to that, multimedia (video, graphics, text, audio and animation) were used to explain the topics.

Group project: Students assumed many roles in the project. Besides being a multimedia developer for their own particular section in the application, they also assumed the roles of Group Leaders, Secretary, Graphics Designer, Sound Engineer, Voice Talent, to name a few.

5. **Collaboration --** Allowing students to collaborate with one another to solve problems and articulate what they have learnt.

Web modules: The modules provide links to existing forums, blogs and online communities to allow students to have a place to discuss and learn the topics taught in the module.

Group Project: Brainstorming activities resulted in students having to discuss and compromise on their ideas, and to share prior knowledge and expertise where necessary. Groups posted their progress on their group blogs which solicited comments and feedback from their members as well as from their other peers, and from the lecturer/tutors. Group presentations elicited constructive peer comments and suggestions from other groups who also gave praise and support.

6. **Reflection --** Requiring students to reflect upon a broad base of knowledge to solve problems, and to predict, hypothesise, and experiment to produce a solution.

Web modules: Activities and quizzes in the module encourage students to reflect on what they have learnt.

Group Project: Each group gave 3 presentations throughout the duration and each presentation resulted in peer and lecturer/tutor feedback which students used to reflect on their work. They also had to post their progress on their blogs and in the class Facebook page.

7. **Articulation --** To ensure that students have the opportunity to articulate, negotiate and defend their growing understanding.

Web modules: Forums and blogs allow students to voice their opinions in discussion, further allowing students to make use of the knowledge they have gained.

Group project: Groups had to articulate their concepts and ideas via storyboards and sketches and presentation to the class.

8. **Coaching and scaffolding** -- The teacher merely observes the student and provides support and feedback when necessary.

Web modules: Contact to lecturer is provided in the module. Activities and quizzes have clear and concise explanations to help guide students through the module.

Group Project: Consultations were held at the end of each class for face-to-face discussions. Yahoo IMs, and blog and Facebook comments were provided by the lecturer and tutors for all progress updates by the groups.

9. **Integrated authentic assessment** -- Assessment that is seamlessly integrated with the activities provided.

Web modules: Quizzes were given at the end of each topic to allow students to gauge how much they know about that topic, instead of only one main overall quiz.

Group project: Groups were assessed through in-class quizzes, their storyboards, their presentations, their blog updates and presentations. Progress discussions were made every 2 weeks to provide them with cumulative assessments and feedback. They were also given progressive tutorial assignments on Flash development to assess their technical skills.

10. **Professional learning** -- Keeping up with new technological developments.

Web module: The module encouraged students to get involved in an online community of professionals through forums, blogs and so on to keep up with the changes in technology.

Group project: Students were using a variety of technologies, ranging from development software (Flash, Dreamweaver, and any other supporting software of their choice), online research tools (Youtube, Wikipedia, Google, etc), communication tools (Yahoo! Instant Messenger, Skype, gmail chat, sms, etc.) and social networking tools (Yahoo! Blogger, Facebook, etc.) Figure 2 shows some examples of the different modules' interfaces that were designed with these authentic learning strategies. In this figure, authentic activities were incorporated into the lecture on design to allow the students to try and design an appropriate door signage, while Figure 3 adapts expert performance, multiple roles, and coaching strategies into the module to better understand the content.

Figure 2 Embedding authentic activities into the module "Designing the Multimedia Interface"

Activities such as these were incorporated into the modules at various parts of the chapters, and not simply at the end of the module, to enable students to demonstrate their understanding of the content learned before they continue to the next parts. These activities are also authentic in nature as they reflect a genuine design problem that multimedia developers face in real working conditions. For example, in the module on "*Designing The Multimedia Interface*" (see Figure 2), students were provided with interface-related activities so that they can practice what they had learned in the preceding chapters. In doing so, students were able to interact with the content while they were learning, thus building upon their knowledge.

Subject matter experts from YouTube were also embedded into the modules to integrate expert information into the content material to provide students with expert support for the topics. These would provide students with

real-life working examples and conditions which would better prepare them for their careers. They can also implement the knowledge acquired here into the development of their final product, thus allowing authentic learning to take place both online and in the classroom. As posited by Herrington & Kervin (2007), such authentic and relevant examples would provide expert exposure and professional learning for the students while acting as a coaching tool for them for when they develop their own application for their class project. By exposing them to real-life experts from all over the world through Web tools, the learning becomes more authentic and relevant to students, thus improving their retention and comprehension of the subject material.

In addition to learning online, the ubiquitous availability of these technological infrastructures promoted increased collaboration and communication among the class. In this class project, students called their online magazine "La Vie", designed their own logo, and decided on the various magazine sections within La Vie, which would be tasked to specific groups to create. The class also created a class Facebook page for the magazine and used it to blog and post ideas, collaborate on design issues and seek help where necessary (see Figure 3). This Facebook page would support class collaboration and postings that would be shared amongst all its members. This Facebook page was in addition to their own individual blogs on their group's project development and their own individual progress in it. Students also posted their progress Facebook to document their group's project and how each member was progressing in it. These blogs would be monitored by the lecturer and tutors and were accessible to everyone in the class.

Figure 3 The Facebook page of the class' interactive online magazine, "La Vie"

The objective for students to blog their about work was to allow them to reflect on their efforts on their project. Williams and Jacobs (2004) had noted that blogs had the potential to be a "transformational technology for learning and teaching". Blogging also helps strengthen the "collaboration" principle of authentic learning (Herrington & Kervin, 2007). The quizzes in the module had enabled them to reflect on their knowledge of the content, and now, with the blogs, they can further reflect on how well they have incorporated that knowledge into their project. If students needed to go back to the modules to get more information, they could do so, as the modules were available to them asynchronously during their course.

The students were given 14 weeks to complete their project and submit their final product. As seen in the class' Facebook page in Figure 4, there were 12 different final products in the class, ranging from "Music" to "Travel" to "Sports" , "City Spy" and "Food", and so on, as each group submitted an interactive multimedia application of their group's magazine section. In each of these sections, the student groups would have to design and develop an interactive application that reflected that section's overall concept, while adhering to the

overall magazine's theme. In Figure 4, for example, one student group designed a section called, "City Spy", highlighting events of the month on selected Asian cities, Kuala Lumpur (Malaysia), Jakarta (Indonesia), Singapore (Singapore), Sydney (Australia), and Bangkok (Thailand). Each of the 5 members in each group would be tasked to develop and write on each of these 5 cities.

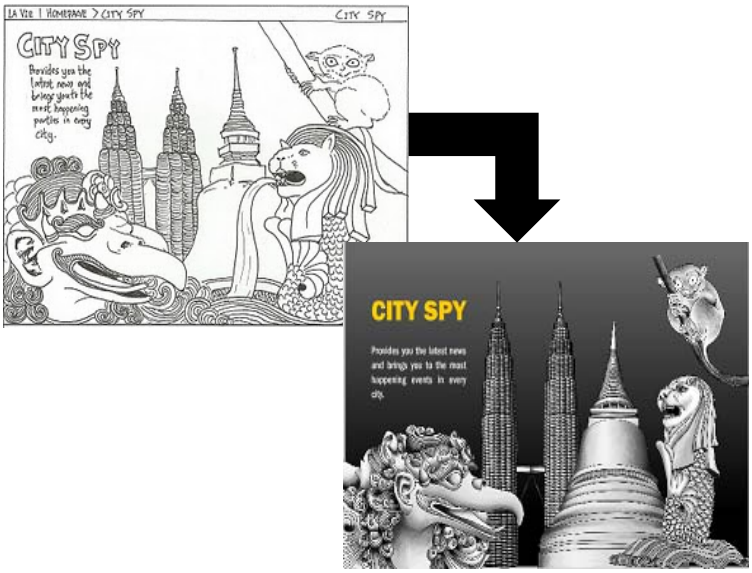

Figure 4 One group's sketch on their concept of the magazine section, City Spy", translated into the final application

These applications were assessed on their creativity, complexity, the overall layout and interface design of the application, the interactivity and use of multimedia elements, and their work-in-progress documentations. Overall, all students scored As and Bs in their final results.

ANALYSIS OF DATA

To investigate the impact of this authentic learning environment, students were given pretests 2 weeks before viewing the online modules and posttests immediately after the treatment. Table 1 shows the results of the pre and post test for the one of the online modules, "*Multimedia Authoring*":

Table 1 Paired Samples Statistics and Paired Samples T-Test Results

	Paired Differences				
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
				Lower	Upper
Pretest-posttest	-3.29	2.657	.415	-4.131	-2.454
Pretest score	9.00	2.012	t	df	Sig. (2-tailed)
Posttest score	12.29	2.657	-7.934	40	.000

Results show that students scored a higher mean of 12.29 after going through the module than before taking it (mean = 9.00), indicating an increase in understanding of the content when authentic and multimedia components were presented. A paired sample t-test as 95% confidence level was also conducted to measure the significance of the 3.29 change in learning scores. Results show that the change was statistically significant ($p<0.05$), indicating that students enhanced their learning outcomes after using the web module.

In addition, students were also given a survey to gauge their perceptions on learning from a web module, the authentic principles and relevance of the content, and the overall attitude and perceptions of the MWLE. The survey was measure on a 5-point Likert scale where 1 = Strongly Disagree (SD), 2 = Disagree(D), 3 = Undecided(U), 4 = Agree(A) and 5 = Strongly Agree(SA). Analysis of the data yielded a Cronbach Alpha of 0.974, which indicates a high reliability of survey items. Results from the survey are shown in below (means reflected results of students who answered positively, from 4 and above on the scale) and can be seen to address

three categories: 1) Learning on the Web (Table 2); 2) Learning with Multimedia (Table 3); and 3) Authentic learning in the environment (Table 3).

Table 2 Students' perceptions of Learning on the Web (ranked in descending order)

Survey Item (Learning with Multimedia) N=41 (Cronbach Alpha = 0.974)	**Mean (m)**	**SD**	**% (p)**
1. Overall, I like this web module	4.34	.728	90.2
2. I can understand the topic better after using the module	4.27	.837	87.8
3. I prefer this learning method in my learning process	4.17	.704	87.8
4. I enjoyed learning in the Web environment	4.12	.872	82.9
5. I enjoyed the accessibility the web environment gave me	4.10	.768	80.5
6. I find learning with the web interesting and engaging	4.05	.669	85.4
7. The Web environment motivated me to explore the topic more	3.83	.803	70.7
Comments: *"I like interactive web module because I can understand the topic better* *"Really good, because I actually read it and did not get bored!"* *"This is online learning, so this method is easy to use and a lot of notes or knowledge uploaded there, so it easy to learn this subject".* *"Help me to learn the important point and very clear in concept of web module."* *"I really like the interactivity and the flow of the website."*			

1) Learning on the Web: Results showed that overall, students liked using the web module (Item #1, m=4.34, p=90.2) and enjoyed the Web environment very much (Item # 4, m= 4.12, p=82.9). They also reported preferring to learn through this method (Item #3, m= 4.17, p=87.8), with 87.8% of them reporting that they understood the topic better after going through the module (Item #2, m= 4.27). 80.5% of students reported that they enjoyed the accessibility to the web environment (Item #5, m=4.10), with 85.4% reporting being interested and engaged in learning on the web (Item # 6, m=4.05, p=85.4). Learning on the Web was also motivating for them as 70.7% of students reported that learning in this Web environment motivated them to learn more about the topic (Item #7, m=3.83). These results are supported by students who commented on the survey that *"I like interactive web module because I can understand the topic better", "Really good, because I actually read it and did not get bored!"* and, *"This is online learning, so this method is easy to use and a lot of notes or knowledge uploaded there, so it easy to learn this subject".* They also commented that the web environment *"Help me to learn the important point and very clear in concept of web module"* and *"I really like the interactivity and the flow of the website."*

Table 3 Students' perceptions of Learning with Multimedia (ranked in descending order)

Survey Item (Learning with Multimedia) N=41 (Cronbach Alpha = 0.974)	**Mean (m)**	**SD**	**% (p)**
1. I enjoyed learning with multimedia	4.32	.687	92.7
2. I liked the use of multimedia to illustrate ideas and concepts	4.24	.734	87.8
3. I like having multimedia elements in the content	4.17	.771	90.2
4. Multimedia helped me understand the topics better	4.12	.714	85.4
5. Interacting with the module motivated me to learn the content	4.12	.748	82.9
6. I find the multimedia elements in the content appealing	4.05	.740	87.8
Comments: "*It make me understand better"* *With the web module it save my time a lot rather than reading the boring powerpoint slides,"* *"Its interesting and its relevant to the topic"* *I learnt more using this module through the multimedia elements"* *"It helps to identify which part is important and notify the keywords for the topic"* *" It makes me easy to remember it".*			

2) Learning with Multimedia: Students also reported positively on the use of multimedia in the module. 87.8% of students reported that they found the multimedia elements in the content appealing to them (Item #13, m=4.05). 87.8% students also reported that they liked the use of multimedia elements in the content to illustrate the concepts of "*Multimedia Authoring*" (Item # 9, m=4.24), allowing them to understand the content better (Item # 11, m=4.12, p=85.4). Over 90% of the class reported very favourably to learning with multimedia (Item

#8, m= 4.32, p=92.7), enjoying the multimedia experience in the module (Item # 10, m=4.17, p=90.2), and thus being motivated to learn (Item # 12, m=4.12, p=82.9). Students' comments strongly supported the results on learning with multimedia, as shown in their following comments; "*It make me understand better. With the web module it save my time a lot rather than reading the boring powerpoint slides,", "Its interesting and its relevant to the topic. I learnt more using this module through the multimedia elements",* and,"*It helps to identify which part is important and notify the keywords for the topic. It makes me easy to remember it*".

Table 4 Students' perceptions of Authentic Learning (ranked in descending order)

Survey Item (Authentic Learning) N=41 (Cronbach Alpha = 0.974)	**Mean (m)**	**SD**	**% (p)**
1. I felt that the content in the web module was relevant to my learning	4.29	.680	92.7
2. The activities provided in this Web module were authentic and relevant	4.22	.613	90.2
3. I enjoyed using the module to learn the topic	4.22	.852	82.9
4. The examples provided in this Web module helped me understand the topic better	4.10	.700	85.4
5. The quiz in this Interactive Web module helped me reflect on the topics taught	4.02	.790	80.5
6. The links to other relevant websites were useful to my learning	3.95	.865	73.2
7. The videos in the module were relevant to my learning	3.93	.755	80.5
8. I liked that there were links to external websites like Wikipedia	3.83	.738	73.2
9. I can apply what I learned from this Web module in real-life	3.80	.749	65.9
Comments: *"The direct links and some video examples make me easier to understand the topic"* *This module helps me in creating an icon is not as easy as I thought"* *"Its interesting and its relevant to the topic"* *"The content and activities help me to understand stage by stage of the learning process of the topic. The flow and direct links are very useful"* *"It has helped me because I not only get to learn the theoretical part of this subject, I also get ideas from the module of how I can implement them practically."*			

3) Authentic learning in the environment: With respect to the authentic principles that were incorporated into the module, results showed that the incorporation of authentic learning principles in this environment provided students a platform to learn better and be more engaged in the content, as students did report favourably on these items in the survey. A high majority, 92.7% of students reported that they found the content presented in the module relevant to their learning (Item #14, m= 4.29). They also reported that the activities that were presented to them in the module were authentic and relevant to them (Item #15, m=4.22, p=90.2), and that the examples provided increased their understanding of the topic (Item #17, m=4.10, p=85.4). Students were able to reflect (Item # 18, m=4.02, p=80.5), found the external links useful (Item #19, m=3.95, p=73.2 and Item # 21, m=3.83, p=73.2), as well as the videos presented in the module (Item #20, m=3.93, p=80.5). Overall, 82.9% of students enjoyed using this module to learn the topic (Item #16, m=4.22). Similarly, student feedback also supported this result as students commented that, "*The direct links and some video examples make me easier to understand the topic", This module helps me in creating an icon is not as easy as I thought", "Its interesting and its relevant to the topic", "The content and activities help me to understand stage by stage of the learning process of the topic. The flow and direct links are very useful"*.

DISCUSSION AND CONCLUSION

The results of the study show that student learning was successfully enhanced in the MWLE. The online modules provided supplemental and richer support for students to increase their understanding of the subject matter, and able to use the information to implement into their projects. They were able to learn using multimedia to create multimedia applications and was in line with Cairncross and Mannon (2001)'s suggestion of using interactive multimedia. In addition, authentic learning and deep thinking occurred during the study as students were able to critically process the information needed to solve their project's design problem. Students found the activities in the module exciting as the students felt the activities were authentic and relevant to them. This showed that students prefer activities that are relevant to what they are learning and are based on real-world problems as it helps them understand how the theoretical knowledge can be applied in real life situations. Therefore the incorporation of authentic learning principles as mentioned by Herrington and Kervin (2007) played a crucial role in enhancing a student's learning process.

The Youtube and external links provide them the platform to further research the topic and increased their acquired knowledge, as had been suggested by Herrington and Kervin's (2007). Students were able to demonstrate and support authentic learning as they were able to create a final polished product, and not something that was created in preparation of something else, and supports Herrington, Reeves & Oliver's (2010) research suggestions. Their final outcomes were proof of their learning (Winnips & McLoughlin, 2001) and would be useful to them in the real-world. Many of them reported that they now knew what it took to create an interactive multimedia application and developed the necessary skills to repeat the process when they seek employment.

Adding integrated authentic assessment as mentioned by Herrington & Kervin (2007) was highly beneficial to the students as they mentioned it helped prepare them for their exams and project, and also promoted their reflection on the topics learnt. Doing the quizzes also motivated the students to learn as they felt a sense of achievement when they scored well on the quiz. The authentic activities from Herrington & Kervin (2007) were effective as students were able to recognize the relevance of the content in the module to their project as they reported that they were able to apply what they learnt from the module into the completion of their project. This resulted in the students scoring well and obtaining As and Bs in their final grade.

The development of the MWLE via project-based learning also supported the incorporation of authentic learning strategies as it provided students with real-world complex situations which they would have to solve collaboratively and cooperatively. By working together to complete the project, students developed realistic teamwork and management skills integral to their careers. They also were able to recognize the relevance of these skills and the environment in which they were learning from, and were quite positive about it, as evidenced from their comments on their survey and in their blogs. The use of Web 2.0 technologies and social networking tools allowed the class to better communicate with each other and solicit constructive feedback, relevant to the effectiveness of their learning process. By uploading their progress onto the web and commenting their peers' work, students developed more reflection on their own work and thus paid more attention to the quality of their project, again supporting the reflection strategy by Herrington and Kervin (2007). Interestingly, although 31.7% of students were undecided of the application of the module's content to real-life (Item #22, Table 2), as a whole, and most importantly, students had fun in the classroom, in learning from the module as well as in doing their project. They were able to claim ownership of their work, be responsible for their learning path and develop a network of collaborators within the classroom setting, which would stand them in good stead for their future careers. In light of this, authentic learning has been shown to be effective in enabling students to learn and become more involved with their learning. Added to that the incorporation of multimedia and web technologies, and students evolved into becoming "multi-processors" of information.

In conclusion, our study has shown that the authentic learning strategies did properly gauge students' attention and further enhanced their learning process, and the results are consistent with Herrington and Kervin's (2007) suggestion that these 10 authentic learning strategies would properly support technology-backed classes. In this study, we have incorporated these strategies into a multimedia learning environment (MWLE) and investigated its impact on student learning. Student feedback and learning outcomes showed that these authentic learning strategies were effective in engaging students and increasing their understanding of the subject matter, providing strong support for the effectiveness of using these authentic learning strategies in an MWLE.

ACKNOWLEDGEMENTS

The authors would like to thank the students of Multimedia University for their participation in this study. This project was funded by the Telekom Malaysia Research & Development Funding, under the Multimedia University flagship project, Digital Home.

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ASSESSING THE USABILITY OF UNIVERSITY WEBSITES: AN EMPIRICAL STUDY ON NAMIK KEMAL UNIVERSITY

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ABSTRACT
Web sites are emerging as a key component of an organization's survival in our ever globalizing competitive world. Usability of a web site has assumed a great deal of importance in terms of satisfying web site users' needs and expectations. The aim of the study is to evaluate and to explore the usability level of Namık Kemal University (NKU) website and provide guidance to develop better and more usable web sites. The research hypotheses have posed six different theoretical factors to be positively associated with website usability. The results have revealed that five of the six factors can positively and significantly affect the web site usability perceptions of NKU members. Results also revealed that some of the demographic factors tested, such as gender and web experience, have significant impacts on usability perceptions of individual users. Furthermore, the study also discusses the potential benefits of improved website usability on governance and proposes ways to improve the usability of websites.
Keywords: Information and Communication Technologies, Governance, Website, Usability, University.

1. INTRODUCTION

The internet is radically changing the traditional way that organizations interact with public. For organizations, the web gives access to a large audience and improves operational efficiency. Web sites are becoming key components of an organization's survival in the globalized competition. The web site represents an organization, communicating an organization's culture, values, and vision. The web site acts as a delivery mechanism for services that facilitate various tasks a stakeholder needs to perform. The site also serves as a platform through which an organization can interact with its stakeholders.

University web sites are no exception. The university website is not only a cost efficient and timely method to communicate with various stakeholders such as students, faculty, administrative staff and visitors it is also a way for a university to shape its image. Universities need to do everything within their power to keep positive images with their various constituents, and one way to do this is to make use of the opportunities website presents.

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

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

This research, aims to measure the usability of the Namık Kemal University (NKU) web site via the five assumed factors of usability defined by WAMMI (Website Analysis and Measurement Inventory): attractiveness, controllability, helpfulness, efficiency and learnability. The research is important because the

results are expected to provide guidance for developing better and more usable web sites not only for NKU but for other higher educational institutions as well.

This paper is composed of six sections. Introduction (Section 1) is followed by Literature Review (Section 2) where the concept of usability and the five assumed components of website usability that are employed for the research are explained and discussed. In Research Methodology (Section 3) detailed information regarding the survey and the way the survey is conducted is explained. Research Hypotheses (Section 4) lists and details the six hypotheses that are tested. Five of the hypotheses are constructed on one of the five assumed factors of usability. The sixth hypothesis is constructed on demographic factors. Findings and Analysis section (Section 5) presents the results that the research reveals. Conclusion and Discussion (Section 6) is the last section of the study. The section summarizes the overall results; provide guidance for more usable web sites, discusses the other possible contributions (such as better governance via improved communication with stakeholders) that higher usability could initiate. The section also highlights topics for further research in the area.

2. LITERATURE REVIEW

Usability is defined in different terms by multiple researchers. Shackel (2009) describes usability as "a technology's capability to be used easily and effectively by the specified range of users, given specified training and user support, to fulfill the specified range of tasks, within the specified range of environmental scenarios". According to Preece (1994) "usability is measured of in which a system can be learned and used, its safety, effectiveness and efficiency and the attitude of its users towards it." Zaphiris and Darin (2001) define web usability as "anyone using any kind of web browsing technology must be able to visit any site and get a complete understanding of the information, as well as have the full and complete ability to interact with the site if that is necessary."

Usability refers to terms such as ease of use and ease of learning that implied providing users with systems requiring minimum cognitive and physical effort to accomplish users' needs and expectations (Sindhuja and Surajith, 2009). Powell (2000) argues the web site usability as "the extent to which a site can be used by a specified group of users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use". In other words, the web site usability is a test on the successfulness of web site's user in doing some task or finding information in the web site. (Yusof et. al, 2010)

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

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

There are numerous tests for evaluating the website usability. Some examples are, QUIS (Questionnaire for User Interface Satisfaction), SUMI (Software Usability Measurement Inventory), NIST Web Metrics (The National Institute of Standards and Technology Web Metrics). More recently developed questionnaires to measure the user satisfaction of web sites are MUMMS (Measuring the Usability of Multi-Media) to assess multimedia software and WAMMI to assess web sites (Levi and Conrad, 2001).

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

As mentioned previously WAMMI proposes five factors to assess the usability of websites. Brief explanations for the WAMMI factors are as follows (http://www.wammi.com/demo/graph.html):

Attractiveness
Attractiveness is one of the key factors to a successful website (Liu and Arnett, 2000). Attractiveness is the capability of the software product to be attractive to the user (e.g., through use of color or graphic design; ISO/IEC 9126-1, 2001). Attractive websites are visually pleasant, and appeal the interest of the users, whether it is functionality or information. Tan and Wei (2006) argue that the appearance of a website is a crucial factor that improves the perception of information in order for subjects to perform better cognitive mapping and assessment of decisions for execution. The same study suggests that the graphical representations such as icons, colors, images and animations, give website a higher attractiveness. This could improve the degree of users' satisfaction with the website (Zhang et. al, 2000).

Controllability
The degree of control a person reports has over his/her interaction with a particular website. In other words, controllability is whether users feel that they are in control of the software product (Seffah et.al. 2006). If a site is well on controllability the users most probably feel they can navigate around it with ease and do the things they want to do. Poor controllability of a website usually means a poorly organized site that disrupts the way they normally expect to do things.

Efficiency
According to International Organization for Standardization (ISO) efficiency refers to the resources used in completing a task (ISO,1998). Lee and Kozar (2011) define website efficiency as a representation of resources expended in relation to achieving goals while visiting a website. The users perceive efficiency when they can achieve goals with a quick visit without putting forth much cognitive effort. When site users give a high efficiency rating they feel they can quickly locate and do what is of interest to them in an effective and economical manner. They feel that the web site responds at a reasonable speed. Disorientation, or the tendency to lose one's sense of location in a Web site, can cause users to become frustrated, lose interest, and experience a measurable decline in efficiency (McDonald and Stevenson, 1998)

Helpfulness
Paul Siegel argues that helpfulness is the key to web success. Finding ways to help users for every step of their visit: before they reach the site, during their visit, and after the visit play a crucial role on the usability (http://www.insiderreports.com). A website which is high on helpfulness corresponds with the users' expectations about its content and structure. A site with a low level of helpfulness can be misleading about its layout and content.

Learnability
In order to achieve the best efficiency and effectiveness possible while using a device, users must first learn how to interact with the device. Learnability is related to achieving a sufficient level of competence with the device to be able to complete goals in an efficient and effective manner. The ease, in time or effort, with which users can learn a device, is its learnability. Learnability or the ease with which the features required for achieving particular goals can be mastered. It is the capability of the software product to enable users to feel that they can productively use the software product right away and then quickly learn other new (for them) functionalities (Seffah et.al. 2006). There are numerous studies that identify learnability as a key attribute of the usability (Brink et al., 2002; Guenther, 2003; Nielson, 1993). Based on Nielson's usability model (1993), learnability refers to how easy it is for casual users to learn a system. In the websites with high learnability users feel they are able to start using the site with the minimum of introductions and everything is easy to understand from the start. In the websites with low learnability users feel that the site may be using concepts or terminologies which are unfamiliar and need more explanations.

3. RESEARCH METHODOLOGY
In this section, the research administration and survey design, main research hypothesis and their justifications, empirical analysis results and major findings will be discussed.

Research Administration and Survey Design
The main purpose of this research is to measure the usability of the NKU website. The research employed non-probability convenience sampling methods to collect data from NKU students, faculty members and administrative staff. This research was conducted during the period of December 2011 to January 2012. The research was conducted by following two different methods simultaneously. First, some internal stakeholders (students, faculty members and the administrative staff) were personally asked to respond to the online questionnaire that was posted to the NKU website. Second, the link to access the questionnaire was forwarded to all internal stakeholders via NKU email system. In order to encourage the participation a 50 Turkish Liras

(around 28$) gift check of an online bookstore was offered to a participant. The number of valid questionnaires reached 339 as of 16 January 2012 which was the cutoff date for the survey implementation.

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

4. RESEARCH HYPOTHESES

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

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

Attractiveness is the capability of the software product to be attractive to the user through use of factors such as color or graphic design. The research predicts that a higher attractiveness perception by NKU website users will result in an increased level of usability for the NKU website.

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

The second assumed usability factor is controllability. Controllability is basically how users feel when they navigate around the site. If the users feel in charge and easily execute their needs on the site this points to increased controllability. The research predicts that a higher controllability perception by the NKU website users will result in an increased level of usability for the NKU website.

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

The third assumed usability factor is helpfulness. A website which is high on helpfulness will fulfill the users' expectations about its content, layout and structure. The research predicts that a higher helpfulness perception by the NKU website users will result in an increased level of usability for the NKU website.

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

The forth assumed usability factor is efficiency. An efficient website allows its users to quickly locate and do what is of interest to them in an effective and economical manner. The research predicts that a higher efficiency perception by the NKU website users will result in an increased level of usability for the NKU website.

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

The fifth assumed usability factor is learnability. Learnability is related to achieving a sufficient level of competence with the device to be able to complete goals in an efficient and effective manner. The ease, in time or effort, with which users can learn a device, is its learnability. The research predicts that a higher learnability perception by the NKU website users will result in an increased level of usability for the NKU website.

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

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

professional characteristic is whether they are students, academic personnel or administrative personnel. Statistical differences were investigated among these three groups of professional careers.

5. FINDINGS AND ANALYSIS

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

Descriptive Statistics

The major descriptive statistics are presented in Table 1 below and discussed accordingly.

Table 1: Descriptive Statistics

Characteristics	N	%	Characteristics	N	%
Gender			Internet Experience (Year)		
Female	122	36,2	<1	3	0,9
Male	215	63,8	1-3	17	5,1
Occupation			3-5	38	11,3
Student	207	61,6	5-10	144	43,0
Faculty	94	28,0	>10	133	39,7
Administrative	35	10,4	Mostly Used Browser		
Age (Year)			IE	114	34,1
<18	13	3,8	Firefox	62	18,6
18-24	189	55,9	Chrome	151	45,2
25-34	68	20,1	Safari	3	0,9
35-44	46	13,6	Opera	1	0,3
45-54	19	5,6	Other	3	0,9
55-64	1	0,3	Time Spend Online (Min)		
>65	2	0,6	<2	33	9,8
Affiliation with the University (Year)			3-5	60	17,8
<1	151	44,9	6-10	22	6,5
1-3	95	28,3	11-30	42	12,4
3-5	35	10,4	31-60	56	16,6
>5	55	16,4	>60	125	37,0

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

Hypothesis Testing

The research hypotheses presented in section B were tested by regression analysis. Linear regression models were run to test six individual models. Before feeding in regression equations, the items/questions representing dependent and independent variables as six constructs of WAMMI were aggregated by using the method defined by Tavakolian (1989). In this method, the simple arithmetic average of each factor was calculated. Further to make the factors more normally distributed and continuous, each aggregated factors' logarithms were calculated. The regression results of the WAMMI test were presented in Table 2 below.

Table 2: WAMMI Test Results

Independent Variables	**Dependent Variable**
	LN(Usability) (Linear Regression)
Constant	-0,394* (0,057)
LN(Attractiveness)	0,337* (0,059)
LN(Control)	-0,014ns

	(0,083)
LN(Helpfulness)	0,172** (0,078)
LN(Efficiency)	0,384* (0,074)
LN(Learnability)	0,419* (0,078)
Df	294
Adj-R2	0,737

*Standard Errors are Given in Parenthesis, *p<0,01, **p<0,05, ns=non-significant*

As it is easily observed from Table 2 above, all WAMMI constructs, except Control have turned out to be significant with high significance degrees (p<0,001 and p<0,05). The WAMMI factors are positively related with usability perceptions as it is hypothesized in underlying theory. Hypothesis 1, Hypothesis 3, Hypothesis 4 and Hypothesis 5 are accepted, however Hypothesis 2 is rejected.

The second set of regression tests are aimed to investigate whether demographic or professional differences among survey participants would have caused any statistical differences in their usability perceptions of NKU web site as proposed in Hypothesis 6. The results are presented in Table 3 below.

Table 3: Effects of Demographic and Professional Differences

Independent Variables	**Dependent Variable**
	LN(Usability) (Linear Regression)
Constant	1,313* (0,089)
Gender	-0,107** (0,048)
Age (Over 34)	0,022ns (0,067)
Academic	-0,017ns (0,060)
Experience (Over 5 years)	-0,136** (0,061)
Df	329
Adj-R2	0,029

*Standard Errors are Given in Parenthesis, *p<0,01, **p<0,05, ns=non-significant*

As it can be observed from Table 3 above, gender has turned out to be a significant variable in predicting participants' perceptions on usability of NKU web site. Since the differences were observed based on males when coding the dummy gender variable, it can be interpreted that males find NKU web site less usable compared to their female counterparts, given the existence of negative coefficient. Age has not turned out to be a significant variable. The usability perception of participants who are 34 years and older were significantly different from the participants that are younger than 34 years. Similarly, professional differences have not caused any differences in web site usability perceptions of participants as well. However, internet usage experience has revealed significant differences in usability perceptions of participants. Participants with 5 years or more experience seem to be less satisfied with the usability of NKU web site compared to the ones who are less experienced (less than 5 years).

6. CONCLUSION AND DISCUSSION

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

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

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

4), and learnability (Hypothesis 5) are accepted. However hypothesis that claim usability of the NKU website is positively associated with its controllability (Hypothesis 2) is rejected.

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

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

Continuous feedback from the users presents valuable input to universities to improve their web sites. In order to satisfy the constantly changing demands of the website users and improve the usability of the website, university administrators may deploy a site intercept survey on their website and collect survey data for an extended time which will give the administrators extensive opportunities to improve the website.

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COMPUTER SELF-EFFICACY, COMPETITIVE ANXIETY AND FLOW STATE: ESCAPING FROM FIRING ONLINE GAME

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ABSTRACT
Flow state in game playing affected by computer self-efficacy and game competitive anxiety was studied. In order to examine the effect of those constructs with high competition, this study select "Escaping from firing online game" which require college students to escape from fire and rescue people and eliminate the fire damage along the way of running. 101 students participated the game and filled up the questionnaires, after they tried 20 minutes. Three hypotheses of this study were analyzed and the results indicated computer self-efficacy and game competitive anxiety had a positively association with flow state, but computer self-efficacy had a negative association to game competitive anxiety.
Keywords: Computer self-efficacy, competitive anxiety, flow state

INTRODUCTION

The emergence and success of new technology sectors in both new and established educational settings is inextricably linked with individuals able to recognize new opportunities and lead their exploitation. New technology use is advanced by those with self-efficacy, with confidence in their abilities to perform the learning tasks. Computer self-efficacy (CSE) was derived from the social–psychological concept of self-efficacy which postulates that an individuals' perception of his/her abilities affects his/her actual performance (Bandura, 1994). As applied to the field of computer usage, CSE is believed to influence an individual affect, persistence, motivation (Deng, Doll, Truong, 2004), to use that device. CES has been found to influence an individual's willingness to learn and use a computer (Wilfong, 2006).

Parayitam et al. (2010) assumes that computer anxiety is a kind of emotional and cognitive reaction that occurs while the individual is working and interacting with computer and it happens as a consequence of the lack of awareness and the individual's attitude towards the computer as a threatening object. While some studies focus on computer attitudes and utilization (Al-Khaldi & Al-Jabri, 1998), others stressed on testing the effects of self-efficacy and competence on computer anxiety and computer use (Shih, 2006). However, increasing CSE can lower computer anxiety thus improving performance and willingness to learn (Konerding, 1998; Thatcher et al., 2007).

Csikszentmihalyi's (1975) *flow theory* described the experience of the intrinsically motivated; individuals who engage in an activity because they enjoy it, find it interesting or challenging, and perceive they have the necessary skills to accomplish it. Flow occurs when someone perceives the challenge of an activity to be balanced with his or her skills. Schweinle, Meyer, and Turner (2006) pointed out that flow affect is an important factor in students' perceived learning skills and that challenge can pose a threat to students' self-efficacy. As such, this study used "Fire Escape" game which is situational problem solving in firing and the play time for each run is limited to 3 minutes and 30 seconds that would cause supposedly different flow state and computer anxiety by individual players with different computer self-efficacy. Therefore, the purposes of this study are to examine the correlation between computer self-efficacy and flow state, and game competitive anxiety; and game competitive anxiety and flow state.

RESEARCH CONTENTS AND HYPOTHESES

According to self-efficacy theory, an individual's behavior is predicted by the beliefs they hold about their capabilities, rather than their actual capabilities. Bandura argues that individual's level of 'motivation, affective states, and actions are based more on what they believe than on what is objectively true' (Bandura, 1997, p. 2). Self-efficacy judgments with respect to some specific tasks such as anxiety may elicit some emotional reactions in terms of their ability to perform such tasks, which in turn, influence their emotional states.

Computer use and Computer self-efficacy should be directly related since we are more likely to attempt and persist in behaviors that we feel capable of performing. Confidence or autonomy competence in self-efficacy is considered as one important factor that enhances the flow of intrinsic motivation because learners are given a sense of control over choices they may take in learning (Ryan & Deci, 2000). Quinn (2005) argues that flow is

the merging of action and awareness and the other dimensions form the antecedents and consequences of the engagement experience. In this sense, the computer self-efficacy might positively affect the flow experience, then, the research hypothesis is:

H1: Computer self-efficacy will be positively related to flow state
Psychologists have classified general anxiety into two areas. One domain is trait anxiety, and the other is state anxiety (Biggs & Moore, 1993). Trait anxiety can be described as "a general readiness to react with anxiety in many situations" (Biggs & Moore, 1993, p. 243). State anxiety refers to "anxiety actually experienced in a particular situation" (Biggs & Moore, 1993, p. 243). Competitive anxiety was viewed as negative and predicted to have debilitative consequences for performance (Jones, 1995). In game-playing, players have a tendency to perceive competitive situations as threatening will respond to these situations with competitive state anxiety (Scanlan, 1978).

H2: Game competitive anxiety will be positively related to and affect the flow state
Individuals experienced an increase in anxiety when attempting to perform behaviors they didn't feel confident performing (Stumpf, Brief, & Hartman, 1989). That is, as anxiety increased, efficacy beliefs decreased due to self-doubt and emotional arousal when performing the behavior (Oliver & Shapiro, 1993). In the sense, the present context this means that Computer self-efficacy should be positively related to the anxiety and the flow state

H3: Computer self-efficacy will be positively related to game competitive anxiety

RESEARCH MODEL
Based on the above research hypotheses, the research model of this study was proposed as in Figure 1 below.

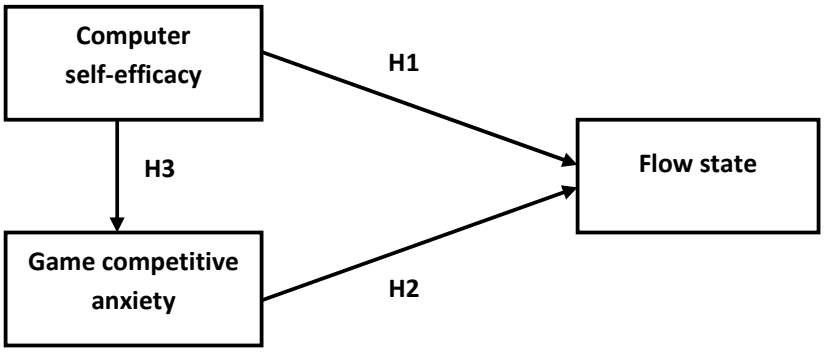

Figure 1. Research model.

Design of Game
Author et al., (2009) classified the educational games into five categories: practice way, fighting way, simple confrontation way, evolution way and plotting way. Although games were classified to be many kinds, speaking from the viewpoint of learning by playing or learning for playing, all games have educational meaning (Dewey, 1938). The study takes online game as the research situation, and uses a disaster prevention game, "Fire Escape" (Patent No.: 201010266147.7) developed by Digital Game Learning Laboratory of XXXXX for making survey. Players have to select the role to involve fire escape action and have to rescue 4 persons along the way to get out from the building, so this game is a kind of Role play. Through Flash technology, the game creates 2.5D scenes and simulates the objects of house, department store, commercial office building. The game scene is shown in Figure 2. With cognition of disaster prevention knowledge through learning by playing, players have to possess several important concepts at a site on fire, including turning off the gas, carrying wet towel, and walking with the body close to the ground, in order to finally achieve the objective of helping children escape from the site on fire successfully. From the backstage with scores of players, we can review players' performance.

Figure 2. The game scene.

Research Instruments

Computer self-efficacy

The primary focus of this study will be the relationship of computer self-efficacy to game playing. This study should also be able to identify if high levels of CSE are more closely linked to the anxiety and flow state. There are several computer self-efficacy scales. Most begin by listing computer related skills and asking respondents to identify the computer skills that they possess. Various scales have been developed to measure this computer self-efficacy, the Cassidy and Eachus scale are expressing the belief that they feel competent and confident about using computer systems; they expect to encounter few difficulties and believe they will be successful in what they are trying to achieve (Cassidy & Eachus, 2002).This study utilized their version of the Computer Self Efficacy scale, with the following 7 items: I think computer is easy to learn, I think computer is easy to use, It is not difficult to operate a computer, It is easy to do things with computer, I am confident that I can learn computer skills, I can learn to use computer well without guidance, and I can solve computer problems with operating instructions.

Competitive anxiety

The competitive anxiety is measured through the continuum of "not worried" to "very worried". This study referred Cox, Russell and Robb (1999) Anxiety Rating Scale (ARS) which is a short form for assessing competitive state anxiety during and immediately prior to competition, and developed 4 items to measure this dimension, includes: Playing the game, I am worried that I can't pass, Playing the game, I feel my heartbeat, Playing the game, I am worried that I will not get a high score, Having difficulties during the game, and I feel very nervous.

Flow Scale

The Flow State Scale II (FSS-II) (Jackson & Eklund, 2002) and the Work related Flow scale (WOLF), (Bakker, 2005) have been popularly used in quantitative measure. This study utilized Bakker (2005) conceptualization of the flow experience with the three dimensions of absorption, work enjoyment and intrinsic work motivation, items included: I can handle game, I can concentrate on the game, I enjoy the game, I can't feel happened around while playing the game, I like this game, I fell the time is too fast while playing the game, and after playing the games, I still want to continue.

Data collection and analysis

The study took online game as the research situation. The sampling target used the only account and password to sign in the fire escape online game (website: http://140.122.79.240/escape2, attached with online description) developed by Digital Game Learning Laboratory of National Taiwan Normal University, and start playing it for

20 minutes. Then the player was asked to fill out the online questionnaire, which was edited through the free office suite, Google Docs. The group of players of the online game was mainly students. Therefore, the study carried out convenient sampling of the students of national and private colleges and universities, and invited them to do the online questionnaire survey.

After collection of the returned questionnaires, the samples suspected of being filled out carelessly were deleted. With the remaining valid samples, descriptive statistics, reliability analysis and correlation analysis were carried out by SPSS. Besides, a statistical software, Amos was also used to make path analysis, and study testing of hypotheses.

RESEARCH RESULTS

Basic data analysis of sample

The questionnaire survey took place during the period from Nov. 28, 2011 to Jan. 1, 2012. It was carried out by the way of "convenient sampling," with "students" taken as samples. There were 111 online questionnaires collected, with 101 questionnaires being valid samples, achieving a validity rate of 90.99%. In the aspect of gender, the proportion of female participants (56.4%) is higher than the proportion of male participants (43.6%). In the aspect of distribution of faculties, most of the participants study at Faculty of Management (46.5%), and the next ones are Faculty of Humanities and Social Science (20.8%) and Faculty of Design (or Tourism Design) (15.8%). The total number of participants from these three faculties occupies almost 70% of all samples. In the aspect of college and university type, 42.6% of the participants study at public university of science and technology, and 57.4% of participants study at private university of science and technology.

Descriptive statistics and reliability analysis

According to the research situation of online game and operational definition of the idea, most suitable questions were designed for the questionnaire. Regarding content validity of the questionnaire, the study reviewed the quality of the questionnaire by means of item analysis. Item analysis mainly takes each item of scale or each question of the test questions as the target, and gradually analyzes its usability. Reliability and validity are the major features of a test. These two features have to be determined by the quality of questions, which can be enhanced through item analysis. The study carried out item analysis of the questionnaire by firstly calculating the total scores of the participants. After that, the participants were rearranged according to the descending order of their scores. 27% of the total participants counting down from the one with highest score and 27% of the total participants counting up from the one with lowest score were selected to be high score group and low score group respectively. T-test was taken for the results of these 54% of total participants. The questions with significance level reaching .001 were selected. As shown in Table 1, each of the questions reaching significance level is retained.

Table 1. Summary of item analysis on the studied questionnaire

Construct	Question No.	t-test		To be deleted or retained
		t value	Significance (two-tailed)	
Computer self-efficacy (total 7 questions)	1	5.289	.000	Retained
	2	6.171	.000	Retained
	3	4.747	.000	Retained
	4	4.829	.000	Retained
	5	5.277	.000	Retained
	6	6.308	.000	Retained
	7	6.252	.000	Retained
Game competitive anxiety (total 4 questions)	1	4.605	.000	Retained
	2	5.851	.000	Retained
	3	5.936	.000	Retained
	4	5.011	.000	Retained
Flow experience (total 7 questions)	1	3.023	.000	Retained
	2	8.276	.000	Retained
	3	9.774	.000	Retained
	4	6.089	.000	Retained
	5	5.043	.000	Retained
	6	7.880	.000	Retained
	7	7.174	.000	Retained

From Table 2, a descriptive statistical analysis of the various research constructs is known. The one with the

greatest standard deviation, being 0.921, is the subjective norm; and the one with the smallest standard deviation is 0.694, showing that the degree of variation among the various constructs is small. In the test of internal consistency analysis on reliability, a coefficient factor, Cornbach's α is taken to measure the consistency degree of the detailed items inside in order to ensure the correctness and preciseness of measurement procedure with computer self-efficacy (α= .905); game competitive anxiety (α=.857); flow state (α=.795); and total construct (α=.816). These results show that the questionnaire of the study has good reliability.

Table 2. Descriptive statistical analysis of the various constructs

Construct	Mean	Standard deviation	No. of questions	Cronbach's α
Total scale	3.35	.498	18	.816
Computer self-efficacy	3.58	.741	7	.905
Game competitive anxiety	3.08	.921	4	.857
Flow state	3.28	.694	7	.795

Correlation Analysis

As known from Table 3, the degree of correlation between two constructs, game competitive anxiety and flow state, shows a positive correlation, with correlation coefficient being (r=.503, p<.5). Between computer self-efficacy and game competitive anxiety, the correlation is negative but not significant, being (r=-.176, p>.5). Between computer self-efficacy and flow state, the degree of correlation appears to be nil (r=.100, p>.5).

Table 3. Matrix of product-moment correlation coefficient

Construct	Computer self-efficacy	Game competitive anxiety	Flow state
Computer self-efficacy	1		
Game competitive anxiety	-.176	1	
Flow state	.100	.503**	1

Path analysis

As known from the research model chart shown in Figure 3, computer self-efficacy has direct positive relationship with flow state; game competitive anxiety has direct positive relationship with flow state; and computer self-efficacy has direct negative relationship with game competitive anxiety.

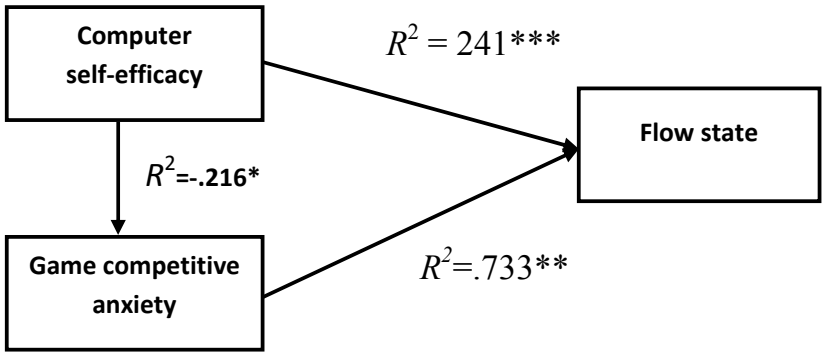

Figure 3. Verification chart of research model

The study uses path analysis to explore the maximum likelihood path coefficients among different variables in the research structure, attempting to verify their cause-effect relationship and direction. The significance and overall situation of different path coefficients can be seen from the direct effect value.

As known from Table 4, the direct effect value of computer self-efficacy on game competitive anxiety is -216; the direct effect value of computer self-efficacy on customer satisfaction is .241; and the direct effect value of game competitive anxiety on flow state is .733. Viewing at the square (R2) of multiple correlation coefficients,

the explained variance of computer self-efficacy on game competitive anxiety is 4.7%; and the explained variance of computer self-efficacy and game competitive anxiety on flow state is 51.9%

Table 4. Direct effect value

Construct	Computer self-efficacy	Game competitive anxiety
Game competitive anxiety	-216	.000
Flow state	.241	.733

DISCUSSION

Using the factor constructs of computer self-efficacy, game competitive anxiety and flow state, the study explores whether different individuals of college students have different flow states during learning from game. Regarding research hypothesis1: Computer self-efficacy will be positively related to flow state, the findings of the study are: (1) The study's Hypothesis 1, supposing that computer self-efficacy has significant positive relationship with flow experience, has been supported. It implies that when college students have stronger feeling of computer self-efficacy, their flow experience will be raised. This conclusion is consistent with the viewpoint of the abovementioned scholars, proving the significance of computer self-efficacy to the entry to flow state. According to Ryan and Deci (2000) assertion, self-efficacy is a kind of intrinsic motivation while engaging in a game, one will have positive flow state The result is also supported by Zhao and her colleagues' (2011) study on the relation between the internet self-efficacy and flow experience, and found they have positively association.

Regarding research hypothesis 2: Game competitive anxiety will be positively related to flow state, the results of this study indicated that Game competitive anxiety has significant positive relationship with flow state. It implies that when game competitive anxiety is raised, flow state will rise accordingly. The result is consisted to Jones's (1995) suggestion which indicated that competitive anxiety was viewed as negative and predicted to have debilitative consequences for performance. Csikszentmihalyi (2002) assesses the influence of personality in situation characteristics, such competitive anxiety, and the interaction on flow, and find that situation characteristics would enhance individual flow state.

Regarding research hypothesis 3: Computer self-efficacy will be positively related to game competitive anxiety, the findings of this study suggests that computer self-efficacy has significant negative relationship with game competitive anxiety. It implies that when computer self-efficacy is higher, the game competitive anxiety produced will be lower. In the current study we focus on if computer self-efficacy affect to competitive anxiety. The result is supported by Caprara et al. (2008) which refers to an individual's self-efficacy to be regulated by stressful or anxiety

FUTURE STUDIES

There are three episodes to play, in order to understand the game behavior, the future study may focus on if the cognitive style affect the interest of play. 2. To allow students to play more times to examine their anxiety and flow curve with inverted U hypotheses to realize the tendencies of game playing.

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CONDUCT OF PSYCHOLOGICAL COUNSELING AND GUIDANCE SERVICES OVER THE INTERNET: CONVERGING COMMUNICATIONS

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ABSTRACT
Technology brings novelties among human beings' lives and human psychology is also influenced by these novelties in positive and negative way. In the study, positive contribution of the technology and the importance of counseling services were wished to be indicated. School counseling services were conducted to illustrate the importance of online counseling services in the study. The method of the study was preferred as mix-method. The population of the study is Eastern Mediterranean University of psychological counseling and guidance's undergraduate students, Turkish Cypriot School Counselors and Turkish School Counselors. Data collection instruments were determined as a scale and semi-structured interview questions. Quantitative data analysis was done according to SPSS (T-Test, One Way ANAVO, Two Ways ANAVO) and qualitative data analysis was done according to Thematic analysis. Nationality, Gender differences, school counselors views about online counseling services, school counselors students' numbers and academicians' views about online counseling services are significant variables for the study. The findings indicate that online counseling services are essential for school environment to make contribution and to provide more services to students about school counseling services.

INTRODUCTION

In the field of technology and science, some developments have occurred fast so that interactions are observed in different fields. Thus, these changes lead to looking on every kind of social, political, and cultural infrastructure. Also, people have to keep up with these novelties and have to learn them. These interactions have significant influence on people's perspectives, values, judgments and systems of belief. "The Internet has become the main information and data provider its appearance at the end of the 20th century" .(Özad and Kutoğlu, 2010, p.245)

Psychological helping vocations have lots of duties because problems which are related to human being, increase and change ways. These helping vocations come across with several developments day by day. These vocations do not only take role in problem areas but also they have to provide supports. In field of health, industry, and education, people need to show own selves and to be successful in their jobs. In the situation, psychological counseling starts to serve different areas and in different ways (Cezmi, 2006).

Today, computer became indispensable part of daily life with help of development of technology. In 2002, more than 600 million people used the Internet. Thereto, more than half of the population of America have used the Internet (Nua Internet Surveys, 2002). The numbers of the Internet users have risen day by day (the most users are young). In schools, expert psychological counselors provide services in the field of psychological counseling and guidance. For providing psychological counseling and guidance services, the help of an administration and a teacher has a big contribution and it is not possible to provide service without the help of administration and teachers. When mothers and fathers join the process, the improvement of students can reach optimum level (Kuzgun, 1992, p.31).

Today, technology is used in each place of education from black board to book, and from projector to computers. Every new technology has impact on class, in other words each brand-new technology causes changes in education. "[T]echnology is also not a collection of machines and devices, but a way of acting. In addition, technology refers to modernity. In other words, technology offers people more opportunities to upgrade all kinds of their life style" (İşman, 2003, p.28), "With the developments of high technology and globalization, social, cultural, educational aspects of life become different and get better in terms of time space and communication" **(**İşman.et.al.,2004, p.55). Subsequently, new technologies bring new workloads for teachers.

The increasing usage of computers and idea of generalizing practice fields endorse computers to enter education. Computers have been used to give lectures on a lot of topics fast and provide students with changes to follow

and support their own understanding ways. These supporters can be projectors, computers and so on and so forth. Computers can be beneficial for supporting teachers' lecturing. Also, the Internet can be advantageous to pass from teacher centers education to students' center education in computer based teaching. Through the Internet, people come together to collect information and to set up new group and community (Savaş, 2006). "Rapid technological developments have their impact on education. It can be said that the practice of teaching science has been more traditional than any other curriculum area, but technological developments have affected science education also" (İşman.et.al.,2007, p.54).

The Internet spreads on each side of the whole world in order to help people reach information. The Internet can be used every level of education in every field of education. Computers have little information, inadequate programs and each program have elaborateness. Whereas collecting and finding information is easier (Ergün, 1998, p.128).

In contemporary education institution "students' personality services" set up to gain shift and improvement as well as teaching and management services. Guidance and psychological counseling services are important part of students' personality services. And, that aims to provide maximum level of benefit (Kuzgun, 1992; Yeşilyaprak, 2003). When literature was reviewed, we can say that today several psychological problems increase.

> Globalization has brought a great effect to human life not only in economic issues, but also in political, social, and cultural issues. Its effect can be positive, or negative, depends on the quality of human resources. Indeed, human resources with low quality will fail, whether the only human resources with high quality standard will succeed in facing global challenges **(**Jusuf, 2005, p.33).

According to Celkan (2004). Turkish community moved away from traditional family structure and wrapped fashionable structure. Because of immigration to big cities, the quantity of population increases rather than quality of population so that pathologic and unhealthy society occurred. Inside the problematic society, students have serious problems for over problematic students. In this situation, classic school counseling is not enough. Technology should be used to provide enough level of psychological counseling and guidance.

The Internet is used for prevention, evaluation and psychological counseling abroad. These services provide , groups of e-mail, websites, chat rooms, teleconferences (Garlier, Anumada, Hinkeman, Munaz & Quezada, 1995). Also, some programs are used in different areas to give up smoking (Escoffery, McCormick, & Bateman, 2004) and planning vocation (Malone, Miller & Hargraves, 2001). In the study, Zalaquette ans Sullivan (1998) found out that psychological counseling programs are often used over the Internet and the study emphasizes that the reaching process to these programs is very easy.

In the country (our country), the usage of the Internet is limited in the flied of psychological counseling and guidance services. Computer based vocational guidance practicing is only used in schools (Kuzgun & Sözalan, 2000). School psychological counseling and guidance services are weak inside of developing education systems. In psychological counseling and guidance services, technological innovations should be used.

Because of these weaknesses, we felt necessity of conducting the research about using internet in counseling services. According to the researchers' literature review, limited numbers of studies were conducted in this concept.

The aim of the study is to designate view of psychological counseling and guidance students, expert psychological counselor, and academician's in concept of using the Internet in psychological counseling and guidance services. For that purpose, social demographic characteristics (gender, nationality etc), psychological counselors' views plus students' views and the students' number in the school were taken into consideration for analyzing in terms of providing psychological counseling and guidance services.

METHOD

The study was conducted in 2011-2012 (spring semester) with 120 EMU's undergraduate students (in department of Psychological counseling and guidance), 60 expert psychological counselors (30 Turkish, 30 Turkish Cypriot) and 10 academicians were participants of the study.

In the study, data collection instruments were determined as a questionnaire and semi-structure interview's questions. The questionnaire belongs to Savaş (2006). Savaş (2006) developed the questionnaire "Liselerde Rehberlik ve Psikolojik Danışmanlık Hizmetlerinde İnternet Kullanımına İlişkin Görüş Anketi". The

questionnaire involves 4 parts. The research method of the study is mixed method and the design of the study is comparative.

For analyzing the questionnaire, one-way ANOVA, two-way ANOVA, T-Test and descriptive statistics, for doing the process, SPSS 15.1 were used. For determining, significant point was determined as 0.05. Semi-structure interview questions were analyzed according to Thematic Analysis. (The thematic analysis were done according to Patton 2002's 7 criteria).

FINDINGS

Quantitative data analysis: For the study, T-Test, One way ANAVO, two ways ANAVO were done to make interpretation for a quantitative data.

T-Test analyses were done for predicting relationships between gender differences and total grade of the questionnaire. Also, for predicting relationships between students and school counselors and total grade of questionnaire.

Independent Sample T-Test, there is no significant relationship between gender and views about online counseling services. Also, independent Sample T-Test was done for revealing participants' statues and their views about online counseling services.

Totally, over 180 participants, 130 participants claim , "Yes" and 50 participants proclaim , "No" about 'What is your opinion about online counseling service implementation?'.

Table 1. *The result of total grades of the scale according to participants' opinion about using online counseling services*

Total Grade	N	X	SD	df	t	P
Yes	130	55.32	9.15	176	4.76	0.00
No	50	47.90	9.44	81.74	4.69	0.00

Independent Sample T-Test was conducted to analyze the result of total grades of the scale according to participants' opinion about online counseling service implementation. The results show that the total grades of the scale differs significantly among participants' opinion [t(df=179)=.4.76].

Table 2. *The result of status and nationality according to school counselors' and students view of online counseling services two-way ANAVO*

Source	Sum of Squares	df	Mean Squares	F	P
Status	94.667	1	94.667	0.98	0.33
Nationality	2.043E-02	1	2.043E-02	0.00	0.99
Status*Nationality	397.926	1	397.926	4.10	0.04
Error	17271.106	177	97.029		
Total	530957.000	180			

A 3 X 2 ANOVA was conducted to evaluate the nationality and status on online counseling services. The ANAVO indicated that there is a cogent interaction between nationality and status.

Table 3. *The relation of the school counselors' students' number and the views of the school counselor about online school counseling services*

	Sum of Squares	df	Mean Square	F	p.
Between Groups	1276,651	3	425,550	8,619	,000***
Within Groups	2764,999	56	49,375		
Total	4041,650	59			

***p<.00001

ANOVA was conducted the school counselors' students number are related with the views of the school counselor about online school counseling services. Levene test indicated that variance of the school counselors' student number was heterogeneous. ANOVA results showed that the views of the school counselors' students is

different from the school counselors' student number. The result indicates that for the views of the views of the school counselor about online school counseling services [F (df=3) =8,61 p<.00001], Scheffe was conducted Post Hoc the views of the school counselor about online school counseling services in the number of student between 701-900 was significantly hihger than 14.79 the number of the student between the number of students of school counselors between 301 and 500 (p<.05, p<.001) respectively.

Qualitative data analysis: the view of academician about online counseling services. The academicians claim that online counseling services will be useful for shy students who could not come to school counseling services. The online counseling services should be available 24 hours in a day. The academicians also claim that online counseling services will provide opportunities to reach more students than classic counseling services. Additionally, counselors can provide immediate services to clients together. The drawbacks of online counseling services cause lack of giving enough attention to facial expression and body languages. The counselors are likely to miss these particular important sings. The academicians state that students like following novelties and they are the most of the population of the novelties, therefore, students are going to be voluntarily to take online counseling services. Also, academicians focused on importance of ethics issues in online counseling services.

DISCUSSION

The study emphasizes several important points for students in light of online counseling services. Robinson (2009) states that "The speed with which technology has become an integral part of modern day living is astounding" (p.1). Technology brings changes every phase of life. Therefore, school environments are influenced by these changes and people are also affected by these changes. Education system is also influenced by these changes. Namely, technological developments cause differences for human beings. The purpose of the study is to indicate psychological counseling students' and experts (who are psychological counselor)'s views about the online counseling services. The findings of the study illustrate that psychological counselors and students (who are studying psychological counseling and guidance) want to get benefit from online counseling services. For instance, school psychological counselors are not content with the numbers of students. Generally, they complain about students' numbers. Also, school counselors do not have enough course time especially in state schools, that is why, school counselors are willingly to use online counseling services to reach students more than classic counseling services. "Online modules offer an opportunities to overcome barriers to educational delivery" (Skye.et.al., 2011, p.185).

As already mentioned, nationality is an important variable for the study because two different nations were taken into account to show the difference between nations. Turkish and Turkish Cypriots are participants of the study and they live in different cultural environments and they are busy with different school environments. Thus, nationality has importance to show differences from country to country. For instance, school counselors who work in Turkey, have to work with different population and the numbers of population are not same with Turkish Cypriots' school counselors.

> Increased accessibility, for example, for rural and remote persons (although limited by bandwidth and availability of carriers), single or at-home parents, people with a disability, in cases of fear of violence or intimidation, people with agoraphobia, people who are relocating but want to work with the same therapist, fast-pace lifestyles, unusual employment hours (Robinson, 2009, p.3).
>
> The following review of the online-counseling literature includes all known, relevant, published articles or chapters in professional journals through December 2004. Dissertations and online journals without a peer-review process were not included; however, because the online-counseling field is in its infancy, all other published articles were included (Mallen et al., 2005, p.827).

Shortly, the field is very new and the researcher should give enough importance to conduct research in the field.

CONCLUSION

Technology is part of our lives and people should get benefit from it as well. In the study, the advantages of technology were discussed in light of online counseling services. Day by day, people face different problems and some of the problems are related to education systems. Education systems involve counseling services and these problems also have an impact on counseling services. Therefore, school counseling services need supports to cope with these difficulties via online services. School counselors and students views are mentioned about the benefit of online counseling services which mentioned in the study.

In the light of the research findings, the following can be recommended:

- Education systems should involve basic ground for online counseling services
- People should be aware of benefits of online services
- Family members (father, mother and sibling of the students) should be part of the process
- Government (Ministry of education) should give enough importance to online services
- Government should provide opportunities to learn basic skills about computer based counseling
- Ethical issues also should be taken into consideration. For instance, APA (American Psychology Association) and American Counseling Association (ACA)put particular criteria for determining ethics issues in online counseling services. In our systems, we have to give enough importance to ethics issues (Guillot, 2003 :20, ACA, 2006).

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CROSS-CULTURAL INTERFACE DESIGN AND THE CLASSROOM-LEARNING ENVIRONMENT IN TAIWAN

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ABSTRACT
This study examined whether using localized interface designs would make a difference in users' learning results and their perceptions of the interface design in a classroom learning environment. This study also sought to learn more about users' attitudes toward the localized interface features. To assess the impact of using localized interfaces on students' academic achievements, a 2 x 2 two-way factorial ANCOVA was used to evaluate whether there was a significant difference in students' post-test scores between students in a control group and experiment groups. A two-way MANOVA was applied to examine whether localized icons and layout would bring changes in users' perceptions of interface design. Descriptive statistics were used to evaluate the participants' reaction to localized user interface features. Findings indicated that applying a localized user interface improved neither software usability and adaptability nor the cultural representations and conveyance although culture could affect Human-Computer Interaction (HCI) and software usability.

INTRODUCTION
Through the globalization process, global software, with its standardized interface, is used around the world by users with diverse cultural backgrounds. Realizing that culture is a crucial factor in intercultural human-computer interaction and user interface design, there are many studies investigating intercultural interface design. The available studies show that culture does have a great impact on the usability of interface design and that globally marketed software should accommodate the cultural differences of the target end users (Evers & Sudweeks, 1998). Internationalization and localization are the commonly adopted processes to deal with culturally diverse end users in the industry (Bourges-Waldegg & Scrivener, 2000).

STATEMENT OF PROBLEMS
Internationalization is the process of developing software so that it can be used effectively by users of heterogeneous cultural backgrounds while localization is the process of adding culture-specific components to the software package to adapt to a specific region, language, or culture (Purvis et al., 2001). Localization is one of the commonly used approaches to design cross-cultural, Human-Computer Interaction (HCI). Literature and studies are available on software localization. However, HCI research is western-dominated. The dramatic differences in the social context of the studies and of the international end users could raise questions as to their findings (Day, 1998). Also, there is a lack of literature on the effects of localized versus non-localized interfaces on target culture users (Evers & Sudweeks, 1998). Moreover, there is a lack of studies exploring the effects of localized versus non-localized interface on users' perception and understanding of a given interface (Evers & Sudweeks, 1998).

PURPOSE OF THE STUDY
This study sought to understand to what extent cultural issues could affect system usability and acceptability. This study examined whether using localized interface designs would make a difference compared to a non-localized interface in terms of users' learning results. This study also examined whether the use of localized interfaces would make a difference in users' perceptions of interface design in terms of efficiency and in user satisfaction in the learning environment. Finally, this study sought more understanding of how users perceived the localized interface features.

RESEARCH QUESTIONS
Three research questions framed this study:
1. Does using localized interfaces, instead of a non-localized interface, make a difference in users' learning achievements in a classroom-learning environment?
2. Does using localized interfaces, instead of a non-localized interface, make a difference in users' perceptions of interface design in terms of efficiency and satisfaction in a classroom-learning environment?

3. What are learners' perceptions of the localized interface layout and/or icons?

Hofstede's dimension of culture (1997)

Hofstede's dimension of culture is the most quoted theory in relation to cross-cultural usability (Smith et al., 2004). He argued that there are five cultural dimensions to define all cultures: power distance, collectivism/individualism, masculinity/femininity, uncertainty avoidance, and long-term Confucian orientation (Hofstede, 1997). According to Hofstede, the power distance index is the dimension measuring the degree of inequality in society. It is "the extent to which the less powerful members of institutions and organization within a country expect and accept that power is distributed unequally" (Hofstede, 1997, p. 28). Collectivism/individualism measures the degree of individualism in a society. Individualism refers to the loose ties between individuals in societies: the extent to which individuals are expected to look after themselves. In collectivist societies, people are integrated into cohesive groups. Masculinity/femininity is a dimension of a given societal culture. Masculinity refers to societies with clearly distinct social gender roles. Femininity refers to societies with overlapping social gender roles. Uncertainty avoidance measures the tolerance of ambiguity in a society. It is "the extent to which the members of a culture feel threatened by uncertain or unknown situations" (Hofstede, 1997, p. 113). This variable measures the need for predictability – whether there is a strong need for written or unwritten rules. Long-term Confucian orientation measures the culture's long-term versus short-term orientation toward life's objectives. The values of cultures with long-term orientation include persistence and perseverance, respect for hierarchy of the status of relationships, thrift, and having a sense of shame. The values of cultures with short-term orientation include sense of security and stability, protecting your reputation, respect for tradition, and reciprocation of greetings, favors, and gifts.

Existing Literature about Cross-Cultural User Interface Design

There is a lack of empirical data on the effects of localized interface (Evers & Sudweeks, 1998). Likewise, no solid theory or model exists to build cross-cultural user interface design (Evers & Sudweeks, 1998; Kersten et al., 2000; Smith et al., 2004). There are, however, studies available which provide empirical evidence of the effects of cultural elements on user interface usability in cross-cultural user interface design.

Barber and Badre (1998) examined the usability of several hundred websites using different languages from different countries. The results indicated that website design is influenced by both genre and cultural preference and practices. They suggested that some cultural markers could be particular to given countries and regions, or applied across genres. The study also suggested an interplay between culture and genre. Based on these results, Barber and Badre (1998) argued that cultural elements can affect user performance directly. They proposed the merging of culture and usability in international website design.

Smith et al. (2004) conducted a number of studies in China (Beijing, Dalian, and Kunming) to verify the extent to which Hosfstede's cultural dimension theory could apply to Chinese users in terms of overall website acceptance. The research results showed that the most important cultural dimension is power distance (PD). The research also showed that, in addition to PD, individualism/collectivism (IC) and uncertainty avoidance (UA) each affect acceptability of the website significantly. In contrast to the researchers' expectations, Chinese users showed marginal preference to individualistic websites.

Marcus and Baumgartner (2004) applied Hofstede's (1997) five cultural dimensions to explore and analyze the cultural differences and similarities of several international corporate website designs in terms of user interface components. They found that the corporate websites varied significantly from culture to culture, especially from western and oriental cultures, despite those corporations' standardized interface design specifications.

Marcus (2001) conducted a case study on the user interface design of planet SABTRE™ Travel Information Network, which is one of the largest private online networks used exclusively by travel agents. Planet SABTRE™ interface design focused on fitting the needs of international users. It supports multiple languages and enables icon switching to create a more customized and culturally appropriate interface for global users. The user evaluations of this software interface showed that users from other countries have significant difficulties in recognizing some standardized icons that U.S. users would recognize immediately.

According to Marcus (2003), Point Forward and Sony-Ericsson developed a prototype personal digital assistant based on Hofstede's cultural model. This prototype was developed based on fundamental Chinese concepts for information, organization, and communication. The interface design focused on concepts of people, relationships, and wisdom instead of applications and documents. The usability study showed an acceptance rate of over 80 percent.

THEORETIC FRAMEWORK

Based on the existing literature and research of cross-cultural user interface design, Shen et al. (2006) proposed a culture-centered design (CCD) model to guide the design process. The CCD model is a holistic design approach which addresses "…the conveyance of cultural identity, language, visual communication, and research on target users group related to cognition and usability" (Shen et al., 2006). The CCD model focuses on understanding the social and cultural background of the target users and iteration and evaluation at every stage of the design process. The CCD model argues that users' perceptions about, and interactions with, the user interface are significantly affected by their socio-cultural experience and background. Successful cross-cultural interface design requires the understanding and acknowledgement of differing cultural perspectives.

The CCD model applies a two-level cultural filter to achieve this cultural understanding. The CCD cultural filter is composed of two filter planes: the designers' filter and the end users' filter. The two filters project in parallel towards the user interface design. The upper level of the cultural filter is the designers' filter. Designers formulate their point of view about interface design based on their personal experience and on knowledge from their own social-cultural context and background. Through the cultural filter, designers' perspectives are projected onto the user interface design. There are two levels of the designers' filter. On the first level, designers collect relevant cultural data and check the usability and evaluation tools, as well as other available technical tools.
On the second level, designers collect cultural information about the target culture in terms of language, logical thinking patterns, and social taboos, in order to build a culturally appropriate user interface.

The lower level of the cultural filter is the end users' filter. The end users' filter represents the users' perspectives about the interface based on their social and cultural background. Users formulate their understanding about the interface and behave accordingly through their own cultural filter.

Ideally, according to the CCD, the user interface should represent the target users' cultural values and identities. However, design decisions made based on designers' perspectives might not be appropriate for potential users from different cultures. It is crucial designers be conscious of the possibility that target users might have significantly different cultural backgrounds in terms of language, logic, and taboos. Designers have to be sensitive to the users' culture, whether they share that cultural background or not. Moreover, designers should be able to reflect, and examine their own perspectives through the users' cultural filter plane. CCD cultural filters are not only a tool, but also a "…reflective mental-map between the designer's perception and the end user's perception" (Shen et al., 2006, p. 831).

Using the CCD model, Shen et al. (2006) designed and tested a new computer user interface for a Chinese user group to find out whether the design could really lead to improved conveyance of cultural identity and product usability. Their research showed positive outcomes for the use of the interface and the CCD system. Shen et al. (2006)'s new computer user interface, Garden OS Interface, uses the Chinese garden as its overarching metaphor. It redesigns both interface layout and icons to improve system usability as well as to represent users' cultural identity.

This study employs Shen et al. (2006)'s new computer user interface based on the CCD system to examine how and to what extent cultural issues can affect system usability and acceptability.

RESEARCH DESIGN

In this experimental study, achievement tests and questionnaires were employed to evaluate the effectiveness, efficiency, and satisfaction of the localized interface based on CCD's garden OS interface. To evaluate the effectiveness, a post-test was administered to the users to assess how effectively the localized user interface influenced students' achievement. A survey questionnaire was used to assess the users' subjective opinions about the efficiency and satisfaction rate regarding the courseware user interface.

Design of the research instruments

The instruction topic was intended to teach students some basic knowledge about viruses based on section one, "Viruses," of chapter 20 "Viruses and Bacteria," in the book *Holt Biology*, by Johnson and Raven, published in 2004. All the materials were translated from English into Chinese. The translations were approved by experts in related fields who were fluent in both English and Chinese.

The courseware was designed using Macromedia Flash 8. The reading materials were divided and organized in a way that students could navigate and read through at their own pace within the allocated time. The original interface was designed based on complementary multimedia course materials on the *Holt Biology Texas Visual*

Concept CD-Rom, by Holt, Rinehart, and Winston (Holt, Rinehart, and Winston, 2004). The localized user interfaces in this experiment were designed based on the culture-centered design (CCD) of Shen et al. (2006). Shen et al.'s (2006) garden OS interface design and research was the first attempt to apply a theory of adopting cultural factors into the actual user interface design. According to their research, the garden OS interface—which reflected the Chinese users' cultural background—could have a general positive impact on user satisfaction and learning. In this study, Shen et al.'s garden OS interface was used to test whether it could effectively help students' learning achievements. The garden OS interface tailored the interface to Chinese users by altering layout and icons (see Appendix A).

Pre-test and post-test utilized the same test items to evaluate students' knowledge about the viruses. The only difference between the pre-test and post-test was the order of test items. The tests were translated into Chinese and proof read by experts who were fluent in both English and Chinese to ensure consistency of meaning between the English and Chinese versions. The internal consistency for the pre-test and post-test was proved acceptable and yielded a 0.72 and a 0.76 Cronbach Alpha score respectively.

The questionnaire for the control group and experimental groups were to investigate demographic and computer usage information, students' general opinions about the efficiency and satisfaction of the software interface and to assess users' perceptions about specific localized features of the interface. All questionnaires were translated into Chinese and proof read by several people fluent in both English and Chinese to ensure consistency of meaning. The internal consistency for the two variables, i.e. efficiency and satisfaction, was piloted and yielded a 0.84 for efficiency and satisfaction for 0.83 Cronbach Alpha score.

Procedure

One week before the experiment, the 20-minute online pre-tests were administered to the students in all experimental groups to assess their prior knowledge about the subject matter. During the experiment, students used the pre-installed courseware to self-study the course subject in the computer lab. Instructors assisting in this experiment played only the roles of technology assistant and supervisor. Students in all groups had 40 minutes to self study the material. Course materials for the experimental groups and the control group were exactly the same in content. The only difference was in the courseware interfaces. Students in three treatment groups used courseware with a localized interface tailored for Chinese users: an icon group utilizing localized icons, but with an original layout; a layout group using a localized layout but original icons; and an interface group using both localized icons and layout. Students in the control group used the courseware with an original user interface. After a 10-minute break, students were instructed to take a 20-minute closed book online post-test. After the post-test, all students were instructed to accomplish an online survey to collect demographic and computer usage information, as well as their opinions about the efficiency and satisfaction of the user interface.

Effectiveness of the localized interface

To answer research question one, a two-way ANCOVA at .05 probability level was applied and three null hypotheses were tested:

1. Using layout (localized vs. original) in the user interface does not make a difference in students' academic achievements.
2. Using icons (localized vs. original) in the user interface does not make a difference in students' academic achievements.
3. There is no interaction between using icons and layout in students' academic achievements.

Table 1: ***ANCOVA for Students' Posttest Scores***

Source	***SS***	***df***	***MS***	***F***
Pretest	1092.15	1	1092.15	19.88*
Layout	44.27	1	44.27	.37
Icon	67.76	1	67.76	.27
Layout*Icon	68.42	1	68.42	.27
Error	7855.93	143	54.94	
Corrected Total	9304.72	147		

*p <.05

Students' pre-test scores were used as a covariate to control for the influence of prior knowledge of the subject matter on students' post scores. Table 1 above shows that with *FPretest* (1,143) = 19.88, p <.05, the null hypothesis of no relationship between students' pretest scores and posttest scores was rejected. It revealed that there was a statistically significant relationship between the students' prior knowledge and their performance in posttest. The students' pretest scores were appropriately covariate. With *FLayout* (1,143) = .37, *FIcon* (1,143)

= .27 and *FLayout*Icon* (1,143) = .27, we failed to reject the null hypothesis one, two, and three respectively. It seemed that using a localized interface (icons and layout), instead of the original interface, failed to make a difference in terms of users' learning achievements. And surprisingly, even though there was no statistically significant difference detected between groups, users in the control group who used the original user interface had a higher mean score (M=30.6) in the posttest than those in the experimental groups. This study was unable to replicate the localized interfaces' positive effects noted in most of the available usability studies (Marcus, 2001; Marcus, 2003; Shen et al., 2006; Smith et al., 2004). On the contrary, it provided evidence that contradicted the popular perception that a localized interface promotes the effectiveness of international software.

General interface efficiency and user satisfaction

To answer research question two, a two-way between-subjects multivariate analysis of covariance (MANOVA) at .05 probability level was applied. Two independent variables were the interface layout and interface icons. Two dependent variables were students' perceptions about user interface efficiency and students' satisfaction rate toward the user interface. Three null hypotheses were tested:

1. Using layout (localized vs. traditional) in the user interface does not make a difference in students' perceptions toward the user interface efficiency and user satisfaction.
2. Using icons (localized vs. traditional) in the user interface does not make a difference in students' perceptions toward the user interface efficiency and user satisfaction.
3. There is no interaction between using icons and layout in students' perceptions toward the user interface efficiency and user satisfaction.

Table 2: ***MANOVA for Perceptions about User Interface Efficiency and Satisfaction***

Source	Wilks' Lambda	df_1	df_2	F
Layout	.997	2	94	.131
Icon	.987	2	94	.638
Layout*Icon	.993	2	94	.332

*p <.05

With F_{Layout} (2, 94) = .131, F_{Icon} (2, 94) = .638, and $F_{Layout*Icon}$ (2, 94) = .332 in Table 2, we failed to reject the null hypothesis that using localized layouts in the user interface does not make a difference in students' perceptions toward the user interface efficiency and user satisfaction. With F_{Icon} (2, 94) = .638, we failed to reject the null hypothesis one, two, and three respectively. Results indicated that incorporating localized layout and icons into user interface did not significantly affect users' perceptions about interface efficiency and how satisfied they felt about the interface in general. The results of data analysis suggested that applying a localized user interface did not bring changes in users' perceptions about the interface, nor did it make users more satisfied with the interface. The results provided evidence that differed from the commonly accepted notions and results of other usability studies (Marcus, 2001; Marcus, 2003; Shen et al., 2006; Smith et al., 2004).

Localized User Interface Features

To answer research question three, descriptive statistics were applied to analyze data collected from part three of the treatment group questionnaires. 105 out of 148 students filled out the survey after treatment. Results suggested that users in the localized layout, localized icon and localized interface groups had neutral opinions (68%, 62% and 69.6% respectively) toward the most of the localized interface features as well as the "look and feel" of the interface in general. Also, most of them held neutral opinions about whether the localized interface could better convey cultural significance (64%, 50% and 64% respectively). In addition, subjects did not prefer the localized interface to the conventional interface (52%, 58.3% and 52.2% respectively). The results of this study suggested that, contrary to statements based on other usability studies, localized user interface did not necessarily bring target users' acknowledgement in terms of cultural representations, nor did it bring users' preferences over non-localized interface (Marcus, 2003; Shen et al., 2006).

DISCUSSION

The results of this study showed that this localized user interface improved neither software usability and adaptability nor the cultural representations and conveyance. Also, in spite of the fact that this user interface was designed to accommodate the cultural needs of the target users, results showed that users neither held more positive opinions toward it nor preferred it over the standardized interface as expected. It was also very surprising to find out that users even failed to recognize this interface as a better representation of their cultural heritage. Two factors could contribute to this phenomenon.

Changing Chinese culture

According to Hofstede's dimension of culture, Asian and Western cultures have fundamental differences in terms of power distance, individualism/collectivism, masculinity/femininity and uncertainty avoidance (Hofstede, 1997). Traditional Chinese culture differentiates from Western culture profoundly, in that it values group mentality over individuality, harmony over competition, restraint and submission over contention, status over equality, and morality over knowledge (Liu, 1991). However, instead of being "ontologically objective," culture is "continuously interacting and developing" (Bourges-Waldegg & Scrivener, 1998, p. 289).In the era of globalization, global economy brings foreign investments, products, and advanced technologies, which leads to extensive intercultural communications and mergence (Li & Zou, 2004). Globalization creates new forms of cultural and social interactions that inevitably bring changes in every aspect of everyday life and significantly transform traditional Chinese culture (Liu, 2004).

With the development of globalization, western values such as individualism, equality of opportunity and competition, material wealth, and nuclear family have been accepted and adopted by the Chinese (Li & Zou, 2004). And "Western consumer culture, or popular culture, has now found its largest marketplace in the world's most populous country" (Liu, 2004, p. 82). Some argued that, though the variances still remain to some extent, contemporary Chinese culture has been Americanized (Li & Zou, 2004). Nevertheless, it is also not true that Chinese tradition has been lost in the process of globalization. In fact, it is "still alive and vivacious in terms of its forms, structures, and functions" (Liu, 2004, p. 85). It seems current Chinese culture is characterized by both intercultural mergence and contradiction. Contemporary Chinese culture "has become increasingly a site of dialogical contention of a diverse variety of forces, among which the culture industry, or the commercial popular culture, and China's local and national forms and styles … intersect and interpenetrate" (Liu, 2004, p. 85).

The interface applied in this study, the garden OS interface, used the traditional Chinese garden as the overarching metaphor so that the interface could better reflect and represent the culture of target users. It was designed under the assumption that the traditional Chinese garden was still viewed as a microcosm of society and as the representation of the state or well being of China by target Chinese users. This design assumed that modern Chinese still viewed the traditional garden as a reflection of the world around them so that it could "offer insight into cultural specific design principles such as layout, style, and aesthetics" (Shen et al., 2006, p. 833).These assumptions may not be tenable since modern Chinese, particularly younger generation, probably do not view the world in this way due to dramatic cultural changes.

The research subjects of the study were 15 to 19 years old. This generation is frequently referred to as "newer new humanity" by both themselves and society in general. The "newer new humanity" are a new generation of Chinese, pursuing both en vogue and pleasure-seeking lifestyles. They might have more in common with their Western peers in terms of life styles and value systems than with their ancestors (Liu, 2004). In today's China, with the progress of urbanization and modernization, for most urban youths such as the participants in this study, the traditional Chinese garden is not something present in their daily life. Like their western peers, they are mostly exposed to it in classrooms, books, movies, and during tourist trips. However, they can still associate it with Chinese due to their cultural heritage. Probably for them, the traditional Chinese garden is a representation of ancient Chinese culture. It is not a reflection of the contemporary Chinese culture and society they are living in. Hence, even though users could still probably recognize localized interface features' connections to their cultural heritage, they could not acknowledge localized interfaces as a better conveyance of their cultural identities. This might be one of the reasons that most of the participants in treatment groups did not prefer the localized interface to the conventional interface, and had neutral opinions about whether the localized interface could better convey cultural significance.

Culture is multi-layered

Interface localization is based on the idea that designers should study and understand the "target culture" so that they can identify and localize the cultural attractors to accommodate users' cultural differences. Culture is a value system that is usually thought to be shared by people with the same race/ethnicity/nationality, in the same region, or using the same language. At the same time, culture is also a multi-layered entity. It is "an orientation system provid[ing] a structure for the field of action of an individual belonging to the society, organization or group" (Beu, Honold, & Yuan, 2000, p. 349).

Despite the fact that people may have dramatic differences in their main value systems, they can share the same group culture under certain contexts. For example, an Asian internet user may have more in common with an American internet user than with an Asian non-internet user in the context of internet usage. Cultures are not mutually exclusive either (Yeo, 1996). One can belong to numerous cultures at the same time. A Chinese individual working for an international company belongs to both Chinese culture and the international company

culture. In different contexts, people could react and behave differently based on the specific culture that related to a certain context. Hence, we should not assume a particular target culture based simply on the target users' nationality, race, ethnicity, and language. Context is a crucial factor that should be taken into consideration.

Today's personal computing paradigm and most international software originated from North American. Their design and development are deeply rooted in Western culture and language (Sacher, Tng, & Loudon, 2001). When they were first introduced in the international market, most of them used a standardized, non-localized interface with translations. Even though they assumed and represented American values, behaviors, and goals, they distributed rapidly and found huge success in the global market. Most culturally diverse users, such as Asian users, were exposed to computers and the internet through these products. For those users, though they belonged to different cultures, the learning and frequent usage of new technology subdued their cultural differences to a large extent when they used computers (Onibere, E., Morgan, S., Busang, E. & Mpoeleng, D., 2001). For them, in the context of computers and software usage, these products came to represent their native computer culture. In this sense, new localized software that tries to represent and accommodate their national culture might actually be an alien cultural impostor for them instead (Bourges-Waldegg & Scrivener, 1998). One example was the success of word processing software in Japan. When word processing software programs were introduced to Japan, it was designed based on western typewriter metaphors. Japanese had a very different writing style than Western countries. They used to write from top to bottom and from right to left on rule-lined writing pads. Western typewriters were seldom used in Japan at that time. Nevertheless, it was not only that the Japanese accepted Western word processing software. They also got so accustomed to it that using localized world processing software programs was awkward (Ito, M. & Nakakoji, K., 1996).

The participants in this study were a younger generation of Chinese, "born at the age of globalization and technology innovations" and were "the generation of information technology and the internet" (Liu, 2004, p. 150). Ninety-three percent of participants in this study have computers at home. Sixty-four percent of them use computers frequently/very frequently. Seventy-three percent of them rated their computer skills as fair or better. They were not novice users of the computer and the internet. Like the Japanese word processing software users, they've become accustomed to westernized metaphors and interface. For them, in the context of computer usage, the garden OS interface might be foreign, rather than an interface that better represented their cultural identities. In this sense, it was no wonder that using the garden OS interface failed to lead to the improvement of usability in this study.

CONCLUSIONS AND IMPLICATIONS

The results of this study suggest that applying a localized user interface did not always lead to improved software usability as previous studies indicated. However, the results did not imply that cultural factors were not crucial in the cross-cultural HCI design process. Rather, this study provided empirical evidence and offered more insights on how significantly culture could affect HCI and software usability. It demonstrated that culture is a sophisticated and constantly changing entity. For educators and researchers, when it comes time to evaluate and choose cross-cultural software programs, it is vital to keep in mind that looking for localized features that seem to symbolize the "target culture" is not enough, and could be misleading. Instead, one should look for culturally appropriate features within the specific context. More importantly, one should look for features that address culturally relative representations to facilitate effective human computer communication and interaction in a diverse cultural environment, and within a specific context.

LIMITATIONS AND RECOMMENDATIONS

Firstly, this study was conducted using middle school students in one middle school in Taiwan and further studies should include subjects of more diverse demographic backgrounds to better represent the target population. Secondly, participants had very limited time to get familiar with and use the software interface before taking the posttest and complete the questionnaire. It was possible that this limited treatment time contributed to the results that this study failed to replicated the localized interface's positive effects in previous studies. Future studies should allow more adequate time for treatment to eliminate this possible confounding variable. Thirdly, this study evaluated the short-term effects of different cross-cultural software interfaces only. Future studies could seek to evaluate long-term effects of different interface designs. Fourthly, quantitative data were analyzed for this study only. Observations, case studies, and interviews can be used for further study to provide more sophisticated and comprehensive data for further understanding about cross-cultural interface designs.

Globalized markets bring the need for localized and software packages tailored to target cultures and markets (Evers & Sudweeks, 1998). Further research studies are needed to shed more light on effective cross-cultural interface design. Moreover, further research and studies are needed to deepen and extend our understanding

about the relationship between culture and software usability, and to find more productive and effective approaches for software localization.

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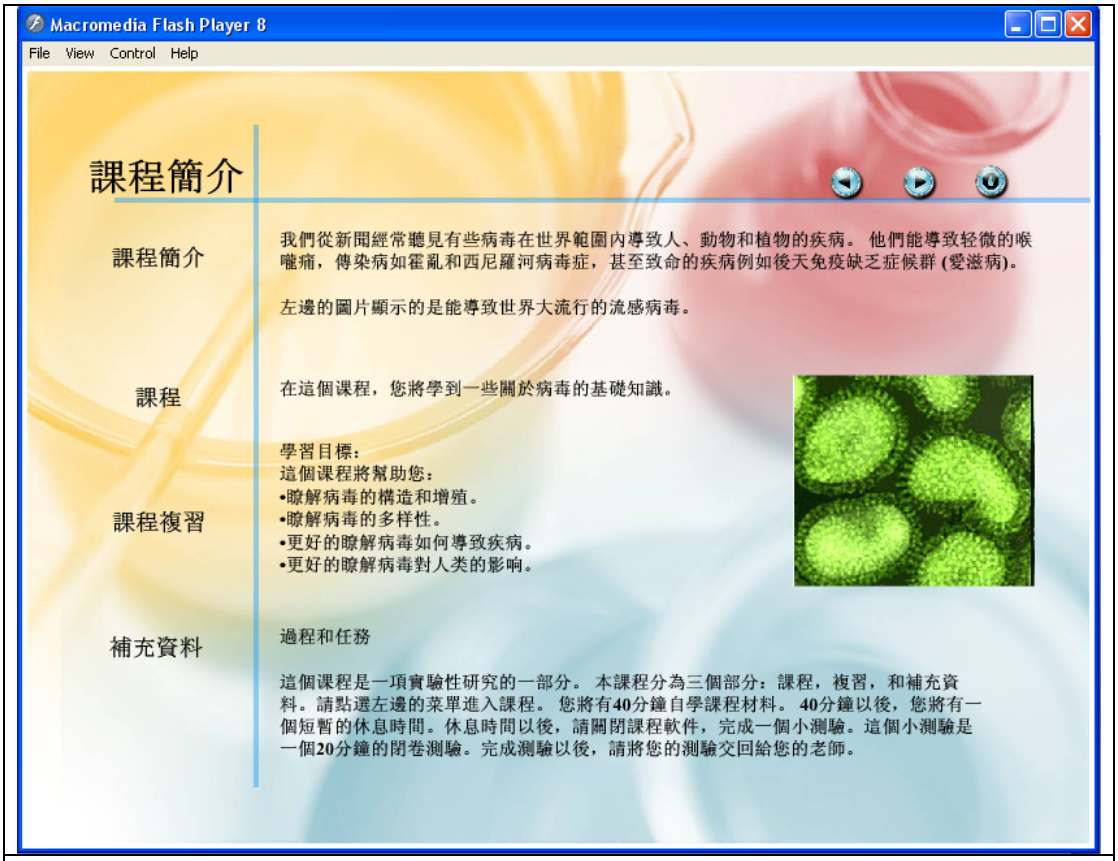
Appendix A

Screen shots of user interface design in control and experimental groups



Screen Shots for Non-localized User Interface Design (Control Group)

Screen Shots for Localized Layout User Interface Design (Localized Layout Group)

Screen Shots for Localized Icon User Interface Design (Localized Icon Group)

Screen Shots for Localized User Interface Design (Localized Interface Group)

DETERMINATION OF CRITICAL ACHIEVEMENT FACTORS IN DISTANCE EDUCATION BY USING STRUCTURAL EQUATIONMODEL: A CASE STUDY OF E-MBA PROGRAM HELD IN SAKARYA UNIVERSITY

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ABSTRACT
Nowadays, distance learning education has been started to become familiar in behalf of classical face to face education (F2F) model. Web based learning is a major part of distance education systems. Web based distance learning can be defined shortly as an education type which doesn't force students and educators being into the same mediums.
This education model has a student-cantered structure. In this type of education students can learn given lectures without dependency of time and place. And also students can communicate with their educators via various technology platforms. This is a fact that there are many factors have been effecting achievement of students in web-based distance learning. The success of students can be increased while determining weighted achievement factors.
This study aims for determining critical achievement factors in a case study of e-mba distance education program held Sakarya University, by using structural equation model.
Keywords: Internet, Web based distance learning, Factors of achievement, Structural equation model

1. INTRODUCTION

Continuously developing technology and changing requirements force making changes on common learning methods. Educational technology tries to bring solutions to the problems including all aspects of the phenomenon of human learning (Alkan, 1998). Due to increasing demands for education and learning subjects, discussions on radical thoughts about mentioned subjects become more visible. E-learning has increasingly become a viable, effective way of delivering instruction and training (Khan, B. H., Granato, L. A., 2007). Common base of developed alternative learning methods is creation of a practical medium for overcoming insufficiencies of classical learning methods. The most popular distance based model is web based education model (WBE).

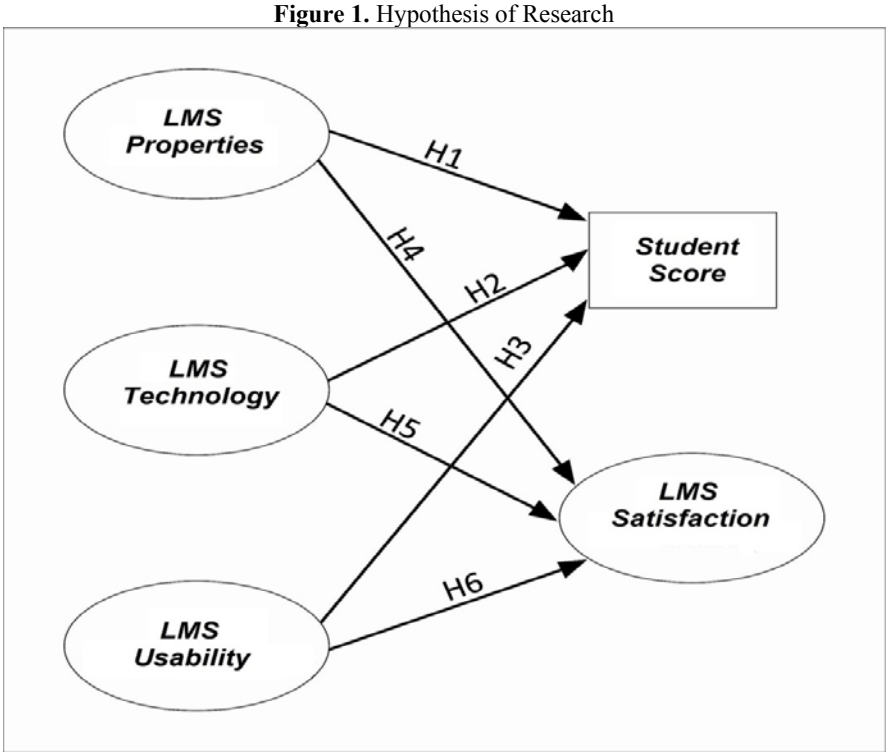
Because of increasing usage rates of information technologies, educators have been highlighted importance of inevitable global education requirements. These requirements force educators for developing new education and learning programs and models (İşman, 2005). Today there have been developed many instructional design models in distance education literature (İşman, 2011). There has been also open source learning management systems that challenges developing the most suitable e-learning platforms (Aydın, C.C., Tirkes, G., 2010).

In web based education models reachability of educational web portal, easy and simple design of portal and logical relations among portal page contents can increase success of students during learning process (Girard, T., Pınar, M., 2011). The presentation of teaching materials by means of the computer technology helps students to process and develop information, to find alternative solutions, to take an active part in the learning process and to develop their problem solving skills (Serin, O., 2011). Users experience the usability of a web site before they have committed to using it and before making any purchase decisions (Nielsen, J., Norman, D., 2000). So it is assumed to be a direct proportional relation between properties of web portals and success rates. Starting with that point, for investigation content first hypothesis is determined as follows;

H_1: Sensation of students about properties of web portal is directly relational with their achievements during learning process.
It is assumed that access types of lectures and direct communication links with lecturers can contribute positively on success of students in distance learning web portals. So it is expected that technology used in we portal effects achievements of students. After mentioning this expectation the second hypothesis is determined as follows;
H_2: Sensation of students about used technology in web portal is directly relational with their achievements during learning process.
In web based education models, logical relations among portal page contents can increase success of students during learning process. So it is expected to be a direct proportional relation between usability of web portals and success rates. After mentioning this expectation the third hypothesis is determined as follows;
H_3: Usability of web portal is directly relational with achievements of students during learning process.

In web based education models, properties of web portal can increase satisfaction of students during learning process. So it is assumed to be a direct proportional relation betweenproperties of web portals and student satisfaction. Starting with that point, for investigation content fourthhypothesis is determined as follows;
H_4: Properties of web portal is directly relational with student satisfaction during learning process.
In web based education models, access types of lectures and direct communication links with lecturers can improve satisfaction of students. So it is expected that technology used in we portal effects satisfaction of students. After mentioning this expectation the fifthhypothesis is determined as follows;
H_5: Sensation of students about used technology in web portal is directly relational with their satisfactions during learning process.
In web based education models usability of web portalcan increasesatisfaction of students during learning process. So it is assumed to be a direct proportional relation betweenusability of web portals and student satisfaction rates. Starting with that point, for investigation content sixthhypothesis is determined as follows;
H_6: Usability of web portal is directly relational with satisfaction of students during learning process.

Figure 1. Hypothesis of Research



2. RESEARCH METHODOLOGY

2.1 Aim of Research

Some characteristics that motivating students in distance learning systems might be concerned with using technology, medium statements, learning style of distance system. There has been many works performed also on student characteristics of distance education (Ergul, H. 2004).This study aims for determining critical achievement factors in a case study of e-mba distance education program held Sakarya University, by applying data mining techniques on enrolled students' own ideas, web portal log information and overall scores recorded in student office databases. Another purpose of this study is to investigate relations between identified factors and students' satisfactions.

2.2 Sampling Process

By the purpose of determining critical achievement factors in a case study of e-mba distance education program held Sakarya University, In 2008-2009 education year a survey held among 350 students enrolled this program via internet platform. Data collecting tools used during investigation have been prepared along with literature Research and three achievement factors have been determined. In the first phase of survey, demographic structure and fact questions are inquired, in the second phase factor questions are inquired. First factor comprises six questions about technology, second one comprises seven questions about property, third one comprises seven questions about usability and forth factor comprises six questions about satisfaction.

On the other side, applying data mining techniques on Sakarya University Distance Learning Management Systems' (DLMS) logs login numbers of enrolled students have been acquired. For the indicator of student achievements, overall scores of students have been acquired into student affairs database records.

2.3 Data and Information Analysis

Due to testing identified hypothesis, structural equation model is used. Before applying mentioned equation model, reliability of used scales has been identified. For reliability scale, importance of internal consistency phenomenon has been highlighted. This scale guarantees a common scalability base for variables (Hair et al., 1998). This scale has been investigated by using Cronbach Alpha method. For minimal limits of Cronbach Alpha coefficient is taken as 0.70 values. This value is an applicable value in literature. Results of Alfa coefficient and scale variables acquired in investigation process are given in Table-1.

Table1. Reliability Coefficients of Scale Used During Investigation Process

Technology	**Alfa Coefficient**
C1. For reaching lectures, presenting contents as asynchronous methods effect achievement. **C2.** For reaching lectures, presenting contents as synchronous methods effect achievement. **C3.** Communicating lecturers via e-mail effects achievement. **C4.** Communicating lecturers via portal forums effects achievement. **C5.** Online Communication with lecturers at least once a week in a known periods effects achievement. (Chat ,Msn ,Perculus etc) **C6.** Ability of Portal's social interactive medium effects achievement.	**0.94**
Properties	**0.89**
D1. Reachability of portal effects achievement. **D2.** Easy and simple design of portal effects achievement. **D3.** Clear and understandablecontents effect achievement. **D4.** Consistency and harmony among portal pages effects achievement. **D5.** Edaquate update periods of platform effect achievement. **D6.** Symmetric establishments of portal platform' components effect achievement. **D7.** Answering my own satisfactions of portal effect achievement.	
Usability	**0.87**
F1. Consistency of presented items in different page effects achievement. **F2.** Easy and simple design of portal's page effects achievement. **F3.**Easy access to information needs effects achievement. **F4.** Access speed of portal effects achievement. **F5.** Existence of support sections effects achievement. **F6.** Contributing adequate answers about directed questions effects achievement.	
Satisfaction	**0.91**
J1. I feel happy when I surfs in portal. **J2.** I lost my time-sense when I surfs in portal. **J3.** It is easy to use portal **J4.** Design of portal is modern and dynamic **J5.** Design of portal is cool. **J6.**Visual aspects of portal is satisfactory.	

After exhibiting reliability of scales, identifying relational weight dependencies between each variable and each factor explanatory factor analysis has been handled and results has been shown in Table-2.

Table 2 Explanatory Factor Analysis Results

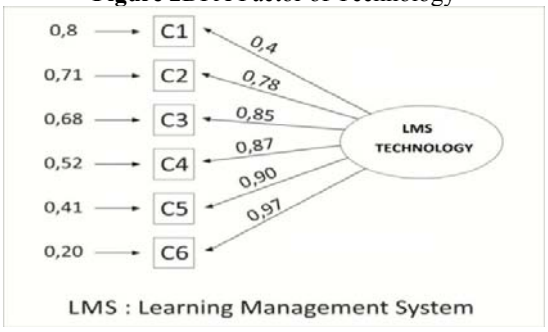
Factor Type	**F1**	**F2**	**F3**	**F1**
TECHNOLOGY				
C1	**0.543**			
C2	**0.775**			
C3	**0.834**			
C4	**0.750**			
C5	**0.841**			
C6	**0.765**			
PROPERTIES		**0.755**		
D1		**0.752**		

D2		**0.605**		
D3		**0.687**		
D4		**0.863**		
D5		**0.589**		
D6		**0.574**		
USABILITY				
F1			**0.755**	
F2			**0.552**	
F3			**0.605**	
F4			**0.755**	
F5			**0.552**	
F6			**0.755**	
SATISFACTION				
J1				**0,823**
J2				**0,798**
J3				**0,554**
J4				**0,723**
J5				**0,623**
J6				**0,523**

DFA for Factor of Technology

Figure 2 shows the results of confirmatory factor analysis of the technology factor. C1, C2, C3, C4, C5 and C6 question codes representing the observed variables as sketched in Figure 2. Each of the codes and questions expressed in the analysis are also given in Table 1.

Figure 2DFA Factor of Technology



In Figure 2, the value shown on directed arrows from technology factors towards observed variables shows each factor that resembles an utilization of the observed variables for the standard regression coefficient (confirmatory factor analysis loads). Error values of the observed variables from the error values towards each observed variable are given by directed arrows.

Table 3 Fit Indexesfor Factor of Technology

Technology	**Fit Indexes**					
	χ^2/df	**GFI**	**AGFI**	**TLI**	**CFI**	**RMSEA**
	6,71 / 2	,787	,837	,770	,789	,065

When investigating Fit Indexes of factor of technology (Table 3) it was shown that results failed within desirable limits of the values. The investigation of the error values for the variable observed in C1, is resulted with high covariance of with the value of other variables. For this reason, it is decided to remove C1 variable from the analysis.

After removal of the C1 variable, it is shown that the final fit index for the factor is into desirable limits as given in Table 4. Figure 3 shows the relationships between variables.

Figure 3 DFA Factor of Technology (1st Modification)

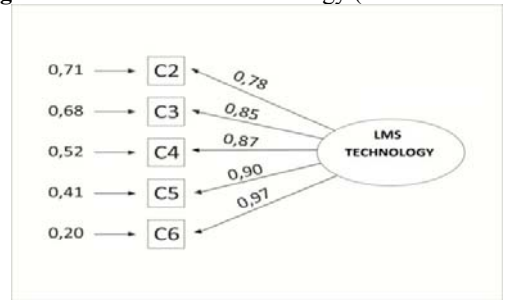


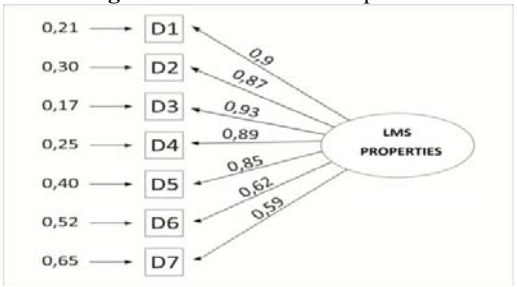
Table 4 Fit Indexes for Factor of Technology (1st Modification)

Technology	Fit Indexes					
	χ^2/df	**GFI**	**AGFI**	**TLI**	**CFI**	**RMSEA**
	6,71 / 2	,947	,927	,930	,919	,093

DFA for Factor of Properties

Figure 4 shows the results of confirmatory factor analysis for factor of properties. D1, D2, D3, D4, D5,D6 and D7 question codes representing the observed variables as sketched in Figure 4. Each of the codes and questions expressed in the analysis are also given in Table 1.

Figure 4DFA Factor of Properties



In Figure 4, the value shown on directed arrows from properties factors towards observed variables shows each factor that resembles an utilization of the observed variables for the standard regression coefficient (confirmatory factor analysis loads). Error values of the observed variables from the error values towards each observed variable are given by directed arrows.

Table 5 Fit Indexes for Factor of Properties

Properties	Fit Indexes					
	χ^2/df	**GFI**	**AGFI**	**TLI**	**CFI**	**RMSEA**
	6,065 / 5	,791	,864	,838	,921	,098

When investigating Fit Indexesof factor of technology (Table 5) it was shown that results failed within desirable limits of the values. The investigation of the error values for the variables observed in D6 and D7, is resulted with high covariance of with the value of other variables. For this reason, it is decided to remove D6 and D7 variables from the analysis.

After removal of the D6 and D7 variables, it is shown that the final fit index for the factor is into desirable limits as given in Table 6. Figure 5 shows the relationships between variables.

Figure 5DFA Factor of Properties (1st Modification)

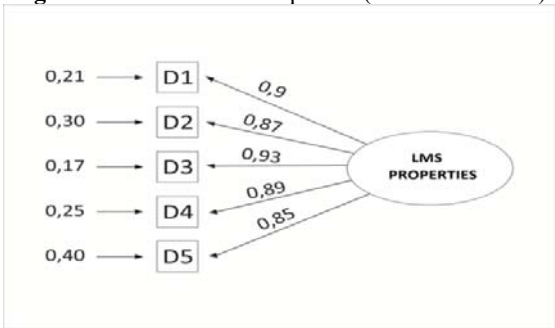


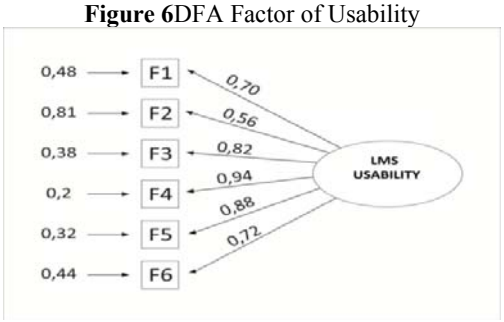
Table 6 Fit Indexes for Factor of Properties (1st Modification)

Properties	Fit Indexes					
	χ^2/df	**GFI**	**AGFI**	**TLI**	**CFI**	**RMSEA**
	6,065 / 5	,911	,924	,938	,921	,038

DFA for Factor of Usability

Figure 6 shows the results of confirmatory factor analysis for factor of usability. F1, F2, F3, F4, F5 and F6 question codes representing the observed variables as sketched in Figure 6. Each of the codes and questions expressed in the analysis are also given in Table 1.

Figure 6DFA Factor of Usability



In Figure 6, the value shown on directed arrows from usability factors towards observed variables shows each factor that resembles an utilization of the observed variables for the standard regression coefficient (confirmatory factor analysis loads). Error values of the observed variables, from the error values towards each observed variable are given by directed arrows.

Table 7 Fit Indexes for Factor of Usability

Usability	Fit Indexes					
	χ^2/df	**GFI**	**AGFI**	**TLI**	**CFI**	**RMSEA**
	6,065 / 5	,799	,884	,898	,881	,068

When investigating Fit Indixes of factor of usability (Table 7) it was shown that results failed within desirable limits of the values. The investigation of the error values for the variable observed in F2, is resulted with high covariance of with the value of other variables. For this reason, it is decided to remove F2 variable from the analysis.

After removal of the F2 variable, it is shown that the final fit index for the factor is into desirable limits as given in Table 8. Figure 7 shows the relationships between variables.

Figure 7DFA Factor of Usability (1st Modification)

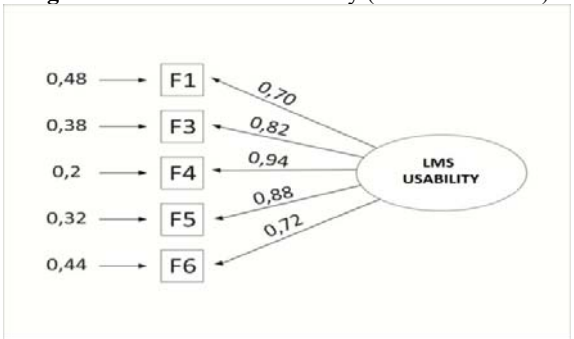


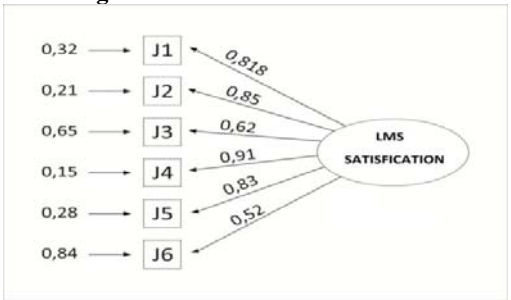
Table 8 Fit Indexes for Factor of Usability (1st Modification)

Usability	Fit Indexes					
	χ^2/df	**GFI**	**AGFI**	**TLI**	**CFI**	**RMSEA**
	4,024 / 2	,928	,986	,929	,979	,012

DFA for Factor of Satisfaction

Figure 8 shows the results of confirmatory factor analysis for factor of satisfaction. J1, J2, J3, J4, J5 and J6 question codes representing the observed variables as sketched in Figure 8. Each of the codes and questions expressed in the analysis are also given in Table 1.

Figure 8DFA Factor of Satisfaction



In Figure 8, the value shown on directed arrows from satisfaction factors towards observed variables shows each factor that resembles an utilization of the observed variables for the standard regression coefficient (confirmatory factor analysis loads). Error values of the observed variables, from the error values towards each observed variable are given by directed arrows.

Table 9 Fit Indexes for Factor of Satisfaction

Satisfaction	Fit Indexes					
	χ^2/df	**GFI**	**AGFI**	**TLI**	**CFI**	**RMSEA**
	6,065 / 5	,779	,864	,858	,861	,058

When investigating Fit Indexes of factor of satisfaction (Table 9) it was shown that results failed within desirable limits of the values. The investigation of the error values for the variable observed in J3 and J6, is resulted with high covariance of with the value of other variables. For this reason, it is decided to remove J3 and J6 variables from the analysis.

After removal of the J3 and J6 variables, it is shown that the final fit index for the factor is into desirable limits as given in Table 10. Figure 9 shows the relationships between variables.

Figure 9DFA Factor of Satisfaction (1st Modification)

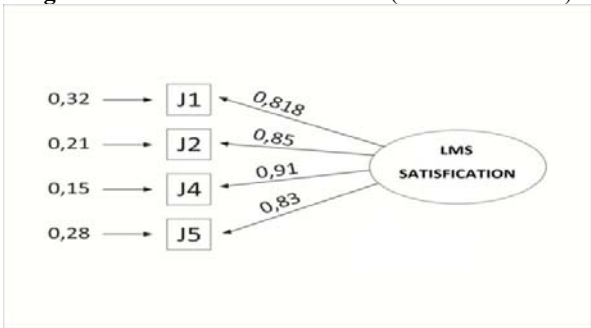


Table 10 Fit Indexes for Factor of Satisfaction (1st Modification)

Satisfication	Fit Indexes					
	χ^2/df	GFI	AGFI	TLI	CFI	RMSEA
	6,065 / 5	,979	,964	,958	,961	,019

After validation and reliability of scales used in investigation, for the aim of determining relations among properties, technology, usability, achievements and satisfaction of students in web technology based distance learning models, a structural equation model has been developed. Structural equation model is a statistical approach that identifies relations among measured (observed) and hidden variables (Hoyle, 1995). Structural equation model has become familiar with model testing for last many years among social scientists (Sütütemiz et al., 2009). The main reason for becoming familiar this model among social scientists is presenting a multi-test medium among all measured and hidden variables.

3. RESULTS OF RESEARCHES

In this part of study, application of structural equation model for testing demographic structures and research hypotheses has been handled and results of researches have been given.

3.1 Demographic Properties of Research Sample

Statistical information about demographic properties of 350 students enrolled e-mba distance education program held Sakarya University in 2008-2009 education year, such as frequency and percentage distributions are given in Table-11.

Table 11. Statistical InformationaboutDemographics in Survey

Sexuality	**Frequency**	**Percentage**
Male	207	74,2
Female	72	25,8
Total	**279**	**100**
Working Condition		
Works	237	88,5
Doesn't work	42	11,5
Total	**279**	**100**
Educational Situation		
Business Administration	187	67
Science	9	3,2
Engineering	56	20,1
Others	27	9,7
Total	**279**	**100**

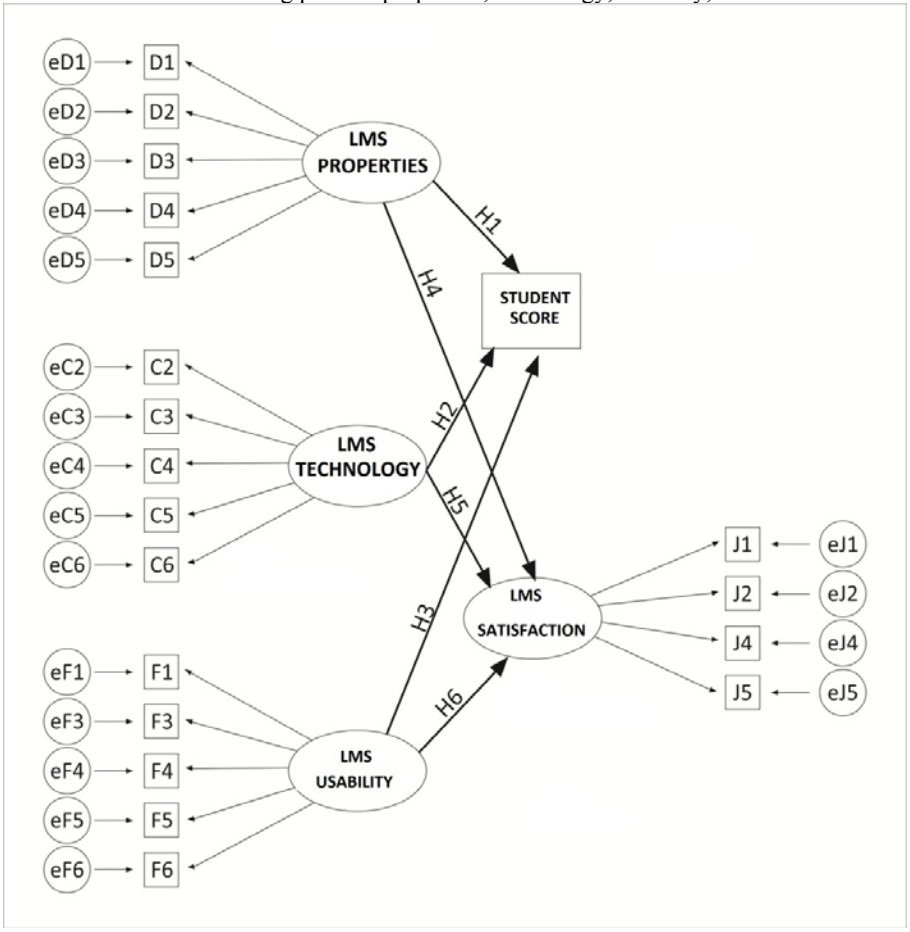
As seen in Table-10, number of males is nearly three times greater than number of females. Number of working participant students is nearly eight times greater than number of unworkings. This is an expected result, because distance learner students always have working opportunities. 67percent of participant students graduated from 4-year business administration program before enrolled distance learning programme. 20.1 percent of participant students graduated from engineering program, 3.2 percent graduated from science program and 9.7 percent graduated from other program before enrolled distance learning programme. This type of distribution confirms E-MBA programme's being continuous of business administration programs.

3.2. Implementation of Structural Equation Model

For the aim of determining relations among properties, technology, usability, achievements and satisfaction of students enrolled in e-mba distance education program held SakaryaUniversity; a structural equation model has been used. This model implemented via AMOS Statistical Simulation Package Software.

Students' sensations about properties of portal's page have been measured via seven variables, technology measured via six variables, usability measured via six variables, satisfaction measured via six variables, and overall scores of student have been acquired by student affairs database records. As highlighted above, before applying mentioned equation model, reliability of used scales has been identified by using Cronbach Alpha method and validation of used scales has been determined by confirmatory factor analysis method. The most used statistical techniques are percentage and factor analysis (Karataş, S., 2008). After implementing confirmatory factor analysis method, it has been brought out that error values have high rated covariance value both with theirselves and other variables. This make increases in total variance. After confirmatory factor analysis method; five variables of students' sensations about properties of portal's page, five variables about technology, five variables about usability, and four variables about satisfaction, totally 19 variables have been added into structural equation model. Figure-10 shows relations among portal's properties, technology, usability, satisfaction and scores.

Figure 10 Relation Model among portal's properties, technology, usability, satisfaction and scores.



Results ofa structural equation model for the aim of determining relations among properties, technology, usability, achievements and satisfaction of students enrolled in e-mba distance education program held Sakarya University, are given in Table-11and Table-13.

Table 12 Results for Research Model of Fit Godness Indexes

Fitness İndexes	Model
X^2 (Chi Square)	112,88
Freedom Degree	101
p (Goodness Degree)	0,001
x^2/df	1,047
GFI (Goodness Fit Index)	0,923
AGFI (Adjusted Fit Goodness Index)	0,891
RMR (Root Mean Square of Remainder)	0,026
IFI (Increased Fit Goodness Index)	0,938
CFI (comparative Fit Goodness Index)	0,958
NFI (Normed Fit Goodness Index)	0,969
TLI(Tucker-Lewis Index)	0.923
RFI (Relativities Fit Goodness Index)	0,920
RMSEA (Root Mean Square of Rapprochement Error)	0,027

Evaluation of harmony between data and model, three basic criteria are investigated during implementation of structural equation model. This criteria are Chi-square/df, goodness of fit) and RMSEA values. If results of analysis show similarities among expected values and acquired values, it can be said that there is a harmony between data and model.

Goodness statistics of investigated model are given in Table-12. In Table-13, perfect harmony between research model and data is shown into research model column and perfect harmony between model and data is shown into ideal model column.

When examining results shown in Table-12, Chi-square statistic taken into analysis is meaningful at 0.01 goodness level. However, because of excessive sensitiveness of Chi-square value to sample values requires another indicator for measuring harmony between model and data (Baker, Parasuraman, Grewal, Voss, 2002). So other harmony measurement criteria should be examined

One of other harmony measurement criteria is CMIN/DF value. This ratio need to be near zero or alt least to be under five (Yoo, Donthu, Lee, 2000). In Research model, this value is measured in 3,674. This value confirms reasonable harmony between model and data.

One of other harmony measurement criteria is Goodness of Fit Index-GFI. This index gets a value between zero and one. This index need to be combined assessments by CFI(Comparative Fit Index), NFI(Normed Fit Index), TLI(Tucker-Lewis Index), RFI(Relative Fit Index) and IFI(Incremental Fit Index). This mentioned sub-index get also a value between zero and one. Index value becoming near to one shows harmony between model and data. As seen in Table-12, 0.923-GFI value, 0.969- NFI value, 0.920- RFI value, 0.9381- IFI value, 0.925- TLI value and 0.958-CFI value are measured. This confirms reasonable harmony between our model and data.

One of other harmony measurement criteria is RMSEA value. In Research model, this value is measured in 0,027. This value confirms reasonable harmony between model and data. . Hoelter ,05 and ,01 indexes give minimum sample size in reliable interval of test hypotheses.Holding research hypotheses into 95 percent of reliability interval and 0.05 goodness values, required sample size should be 99 and holding 99 percent of reliability interval and 0.01 goodness value, required sample size should be 110. Number of samples used in this research is 350 and this value is enough for satisfied results.

Table 13 Hypotheses Test Results of Structural Model

	MLE : Non-Std MLE	Standard Ht.	t	Hypotesis Results
Properties→Score	0,228:0307	0,138	2,229	H1:YES
Technology→Score	0,051:0,047	0,148	0,321	H2:NO
Usability→Score	0,208:0,207	0,139	1,229	H3:YES
Properties→Satisfaction	0,218:0307	0,138	2,129	H4:YES
Technology→Satisfaction	0,256:0,042	0,141	3,621	H5:YES
Usability→Satisfaction	0,049:0,017	0,122	1,121	H6:NO
***** p< 0,01; **p< 0,05; *p<0,10**				

H1 tests relation between properties and student scores. For model, site properties (r=0.228) means positive and meaningful effects on student achievements (t =2,229; p<0,05). One unit increase in properties factor effect 0.228 unit increase at student achievements. So that H1 hypothesis confirms itself.

H2 tests relation between technology and student scores. For model, technology doesn't mean any effects on student achievements (p<0,587). So that H2 hypothesis cannot be accepted.

H3 tests relation between usability and student scores. For model, site usability (r=0.208) means positive and meaningful effects on student achievements (t =2,209; p<0,041). One unit increase in usability factor effect 0.208 unit increase at student achievements. So that H3 hypothesis confirms itself.

H4 tests relation between properties and student satisfaction. For model, site properties (r=0.218) means positive and meaningful effects on student satisfaction (t =2,129; p<0,04). One unit increase in properties factor effect 0.218 unit increase at student satisfactions. So that H4 hypothesis confirms itself.

H5 tests relation between technology and student satisfaction. For model, technology (r=0.256) means positive and meaningful effects on student satisfactions (t =3,621; p<0,044). One unit increase in technology factor effect 0.256 unit increase at student satisfactions. So that H5 hypothesis confirms itself.

H6 tests relation between site usability and student satisfaction. For model, site usability doesn't mean any effects on student satisfaction (p: 0,637). So that H6 hypothesiscannot be accepted.

3.3 CONCLUSION

In E-MBA web based distance education program, there are meaningful regression results about relations among variables of site properties, used technology, site usability, achievements and satisfaction of enrolled students as shown in Table-13. In another saying, H1, H3, H4 and H5 hypotheses confirm theirselves. On the other side, it is shown that H2 and H6 hypothesescannot be valid on this model.

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EFFECTS OF MULTIPLE SIMULATION PRESENTATION AMONG STUDENTS OF DIFFERENT ANXIETY LEVELS IN THE LEARNING OF PROBABILITY

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ABSTRACT
The purpose of this study was to investigate the effects of multiple simulation presentation in interactive multimedia courseware on the achievement of students with different levels of anxiety in the learning of Probability. The interactive multimedia courseware was developed in two different modes, which were Multiple Simulation Presentation (MSP) and Single Simulation Presentation (SSP). These presentation modes acted as independent variables, while the dependent variable was the students' mean score of posttest. The moderator variable was the different levels of anxiety. The sample of the study was 70 Form Four Malaysian students from five intact classes. Descriptive statistics and inferential statistics were carried out to analyse the research data. Analyses of Covariance (ANCOVA) were used to study the main effects and the interaction effect of independent variables against the dependent variables. The findings of this study showed that students in SSP mode had achieved significantly higher mean score of posttest than the students in MSP mode. The high anxiety students who were presented with SSP mode had achieved significantly higher mean score of posttest compared to the high anxiety students who were presented with MSP mode. This study implicated that students learn better when corresponding with SSP mode, especially for students with high level of anxiety.

INTRODUCTION
Visual presentation is one of the dominant methods in multimedia. According to Dwyer (1978), visual presentation is effective in teaching facts, concepts and procedures. Rieber (1994) explained that visual designed computer refers to the output of computer, encompassing graphic and text. Mayer (2001) further elaborated that there are two types of visual representations: static and dynamic. Static visual representation presents static illustration relating to the learning contents. Dynamic visual representation, however, is the combination of multiple media, for example, animation, 2D graphic (two dimensions) or 3D graphic (three dimensions), and also video. Selection of appropriate visual representation inevitably facilitates the learning process. However, to what extent does visual representation bring benefits to the learning of Mathematics, particularly for difficult Mathematics topics, such as 'Probability'? Research by delMas (2002) found that problems arise in learning probability when students inadequately developed rational number concepts and proportional reasoning as well as when conceptual conflict occurred between formal probabilistic ideas and everyday experiences.

'Chalk and Talk' is the preferred and convenient teaching method adopted by majority of the teachers to teach 'Probability'. This uncreative method causes the lessons to be boring and subsequently hinders students from further understanding the concept of 'Probability'. In view of this problem, interactive multimedia courseware emerges to promote students' understanding towards 'Probability' and correspondingly improve their performance in Mathematics.

Bruntlett (1998) justified that multimedia enhances the quality time between students and teachers whereby information is delivered in a faster pace with consistent quality. Interactive multimedia courseware captures students' attention, stimulates learning motivation, heightens creativity and encourages critical thinking (Charp, 1996). ChanLin (1999) emphasized that when students learned instructional materials with self-regulated visual presentation shows better achievement compared to systemized learning on the ground that self-regulated learning encourages students to synthesize their visual strategies when interacting and learning happened at the same time.

Gagne's Information Processing Model
According to Gagne's (1985), Information Processing Model proposes teaching with visual support. Gagne's Information Processing Model provides comprehensive description of how the human mind processes information by making analogies based upon the information processing system of a computer. This

information processing model also illustrates learning as a series of knowledge transformation in which cognitive process occurs when information is transferred from input to output affected by external stimulus (Gagne, 1985). This model infers that internal structure of human brain and internal cognitive process are following the structure (Gagne, 1985).

This internal human brain structure includes sensory register, short term memory (working memory), long term memory, executive control structure and expectancies structure (refer to Figure 1). Knowledge or information is transferred from perception through the stages of memory (Gagne, Briggs & Wager, 1992).

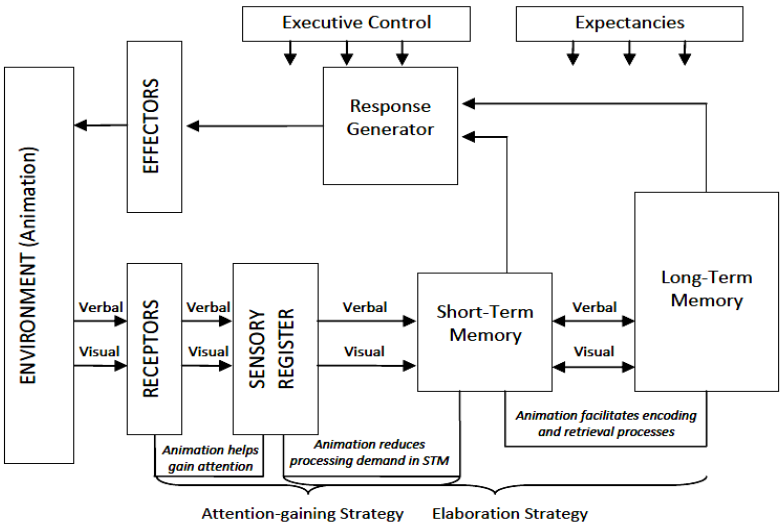

Figure 1: A Model of Animation, Dual-Coding and Information Processing (Gagne, Briggs & Wager, 1992)

Internal cognitive processes are attention, selective perception, semantic encoding, retrieval, response organization, control processes, and expectancies (Gagne, 1985). According to this model, the five senses of human function as receptors to interpret stimulus in the form of a neutral signal and is then sent to sensory register (Gagne, 1974). This information processing system will receive increased burden if all the impulses are accepted and this will weaken the functions of the brain. In view of this, it is noted that only meaningful and relevant input is selected and processed.

Cognitive Theory of Multimedia Learning

The Cognitive Theory of Multimedia Learning by Mayer (2001) accentuates three assumptions which are dual channel theory (Paivio, 1986; Baddeley, 1992), limited human memory capacity (Baddeley, 1992; Chandler & Sweller, 1991), and active learning processing (Mayer, 1999; Wittrock, 1989) as outlined below:

(i) there are two separate channels for visual (pictorial) and auditory (verbal) in terms of information processing system, information sourced from visual and auditory is processed distinctly;
(ii) each channel has a limited capacity in processing the total amount of information at a time;
(iii) information process in respective channels is an active cognitive process of organizing coherent mental representation and integrating information based upon prior knowledge.

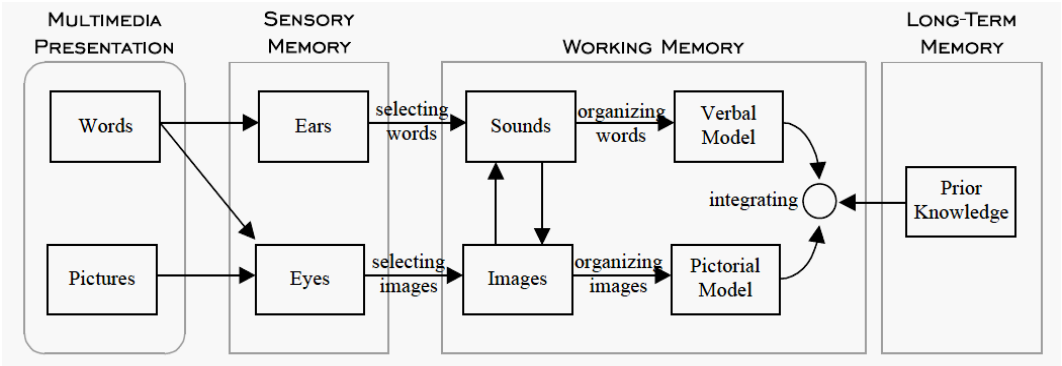

Figure 2: Cognitive Theory of Multimedia Learning (Mayer, 2001)

Words and graphics displayed through multimedia presentation enter the sensory memory through the eyes and ears. Written text and graphics are stored in visual sensory memory, whereas spoken words and sounds are stored in auditory sensory memory. In the figure above, the arrow showed from graphics to eyes relates to the graphics registered in the eyes; on the other hand, the arrow showed from words to ears relates to the spoken words registered in the ears; concurrently, the arrow showed from words to eyes relates to the written text registered in the eyes. All information in sensory memory is processed in the working memory which stores and manipulates knowledge. Working memory will organize the information in the structures of verbal and visual representations and the representations will then be integrated in long term memory.

Mayer (2001) explained that meaningful learning occurs when individual selects relevant information actively, organizes information into systematic representation and then integrates information with prior knowledge.

Interactive Multimedia Courseware

To investigate the effectiveness of using animation visual graphic in teaching and learning probability, this study was conducted by developing two modes of interactive multimedia courseware, namely Multiple Simulation Presentation (MSP) and Single Simulation Presentation (SSP). MSP mode and SSP mode are similar in terms of content, text presentation and graphic presentation. As for the differences, MSP mode displays three different types of presentation simultaneously on the same screen. On the contrary, SSP mode only displays one type of presentation on the screen.

In MSP mode, the presentations of experiment data, stack and bar are displayed simultaneously on one same screen (Figure 3); whereas for the SSP mode, the information is displayed in only one presentation: (i) experiment data (Figure 4); or (ii) stack (Figure 5); or (iii) bar (Figure 6).

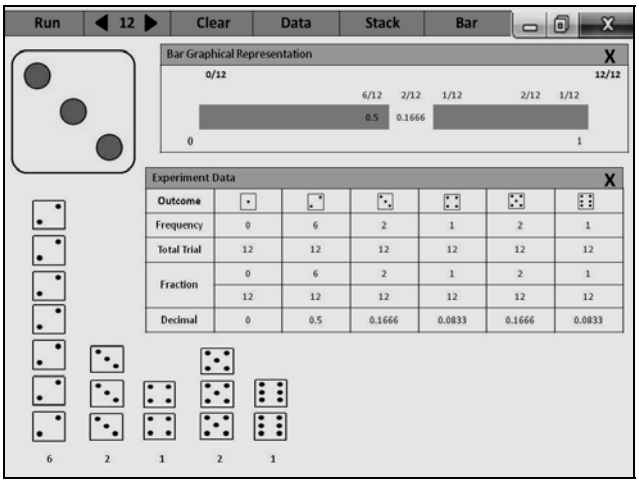

Figure 3: MSP mode

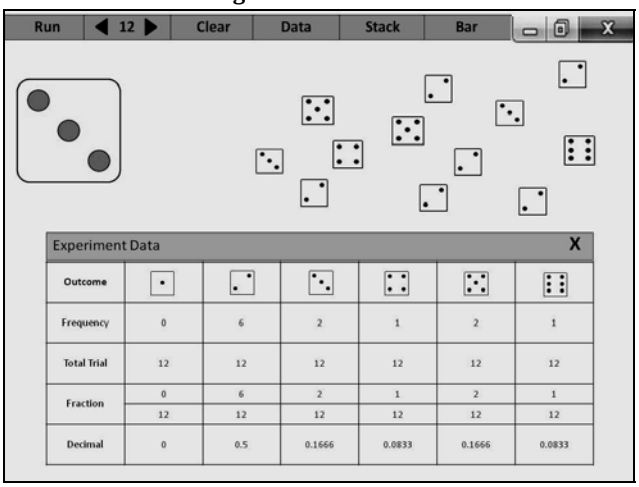

Figure 4: Experiment Data (SSP mode)

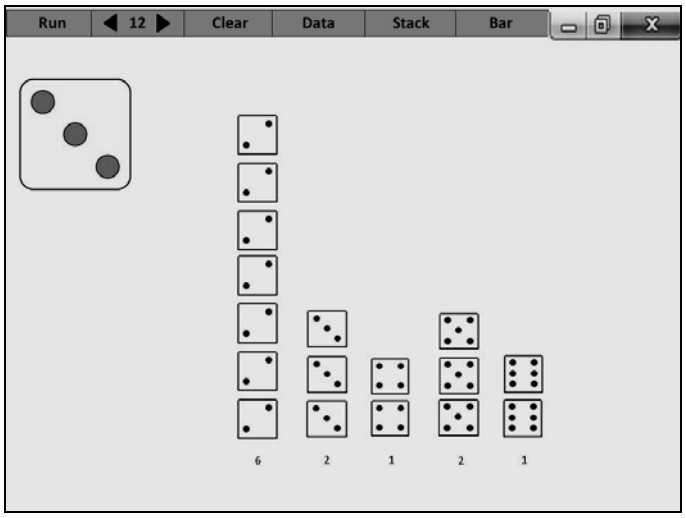

Figure 5: Stack (SSP mode)

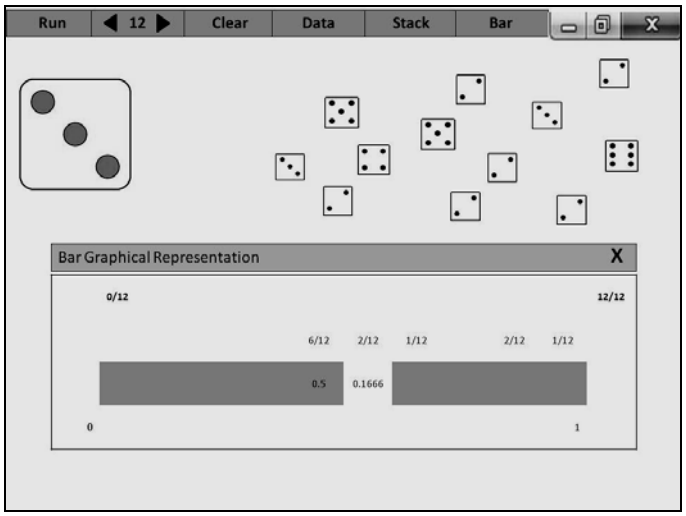

Figure 6: Bar (SSP mode)

Anxiety and Learning

To further enhance the depth of the study, the different levels of anxiety which is considered to influence students' performance was also explored.

Anxiety is a natural physiological response and behavior in consequence of the unpleasant feelings when facing difficult situations or having inabilities to execute task. Spielberger (1966) conceived anxiety as "subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation or arousal of the autonomic nervous system" (Spielberger, 1966, p.17). This emotional state brings positive and negative effects – effects of motivating and helping as well as effects of disturbing and frustrating cognitive process.

Duffy (1972) posited the inverted U-shaped relationship between anxiety and performance. This relationship explains that performance for a task peaks at the medium level of anxiety. Unfortunately, it is predicted that the low level of anxiety before the optimal level and the high level of anxiety beyond the optimal level will impair performance. The findings of Toh's (1998) research showed that students with high level of anxiety encountered difficulties in processing information and this situation hindered their performance.

Two types of anxiety are recognized by Spielberger, Gorsuch & Lushene (1970), which are State Anxiety and Trait Anxiety. State anxiety refers to temporary anxiety with varying intensities and it changes according to time. The level of state anxiety is usually low except when the subject is aroused with a highly dangerous stimulus. In

contrast, trait anxiety refers to individuals with relatively high tendency and frequency of being anxious over a long period. In this study, the term 'anxiety' refers to trait anxiety.

The differences which exist between levels of anxiety and modes of presentation need to be harmonized for promising accomplishment. Thus, this study focused on identifying and matching the modes of graphical presentation with the levels of anxiety.

METHOD

The design and development of the interactive multimedia courseware for the 'Probability' topic was based on the model of Instructional Systems Development proposed by Alessi and Trolip (2001). The screen design was established on Gagne's (1985) Nine Events of Instructional Model, and the visual and verbal presentation was grounded on the principles of Cognitive Theory of Multimedia Learning by Mayer (2001) to ensure the learning process is effective.

Research Design

This research adopted 2x3 factorial quasi-experimental design as illustrated in Figure 7:

	MSP	SSP
HA		
MA		
LA		

MSP - Multiple Simulation Presentation
SSP - Single Simulation Presentation
HA - High Anxiety
MA - Medium Anxiety
LA - Low Anxiety

Figure 7: Presentation Modes and Levels of Anxiety (2x3 Quasi-Experimental Design)

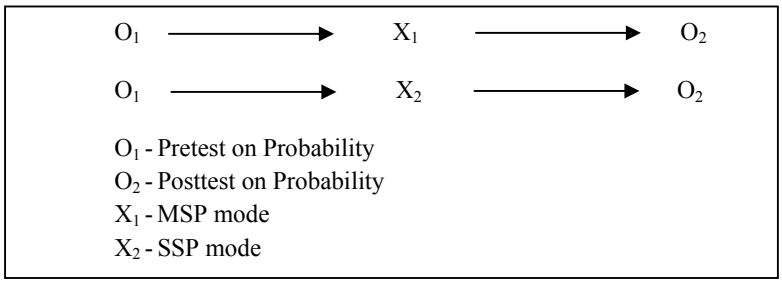

Figure 8: Research Design

Variables

This study involved three types of variables: independent variables, dependent variables and moderator variables. Dependent variables of this research were mean score of posttests; independent variables included two types of presentation modes, which are MSP (Multiple Simulation Presentation) and SSP (Single Simulation Presentation); moderator variables of this research refer to the levels of anxiety: high, medium and low.

Sampling

The sample size of this research was 70 Form Four Malaysian students aged between 16 and 17 years from five intact classes. These students were yet to be exposed to 'Probability', and they were from medium and low socioeconomic status. This sample was assigned randomly into two groups. They were unaware of the differences between each teaching mode.

Pretest and Posttest on Probability

A set of test questions was prepared to assess the mastery level of students on probability. All the items used in the instruments were developed with the help of two experts in Mathematics.

When developing the test items, the characteristics of validity, reliability and practical were taken into consideration by the researcher to ascertain if the instruments used met the requirements. For the content validity, the researcher referred to the Description of Measurements of Form Four Mathematics in accordance with The Malaysian National syllabus for Secondary School.

Pilot test was conducted to confirm the validity of the tests on probability. The questions of pretest and posttest comprised of 15 multiple-choice questions with four options. Twenty-five students completed the tests in 45 minutes. Questions for both pretest and posttest were the same in terms of content but they were different from the arrangement of sequence. To measure internal consistency, the value of Cronbach's alpha computed using SPSS (Statistical Package for the Social Sciences) was 0.729.

A-trait Anxiety Test

This instrument was translated into Malay language by a group of researchers involved in the InSpire USM project (Maznah & Ng, 1985). This Trait Anxiety Test was used to measure the trait anxiety levels of students and there were 20 statements about the feelings of students. The range of marks for each statement was between 1 and 4. 1 represented the total absence of worries whereas 2 to 4 represented the presence of worries. The marks for each statement were totaled corresponding to the selected numbers except for Statement 1, 6, 7, 10, 13, 16 and 19 in which the total marks were reversed. Alpha reliability coefficient was reported of more than 0.90. Based on the test, students were categorized into three groups according to their levels of anxiety: low, medium, and high.

Data Collection

Data collection was done voluntarily with the help of two assistant teachers. The researcher informed the assistant teachers about the detailed instructions in collecting data to ensure correct procedure was followed. The procedure of data collection was divided into four phases as shown in Table 1 below:

Table 1: Procedure of Data Collection

Phase	Experiment
Phase 1 (Before the use of interactive multimedia courseware: 'Probability' topic)	Pretest Cattell Test Trait Anxiety Test
Three weeks later	
Phase 2	Learning with interactive multimedia courseware: 'Probability' topic
One day later	
Phase 3	Learning with interactive multimedia courseware: 'Probability' topic
Phase 4 (The same day after the learning session with interactive multimedia courseware: 'Probability' topic)	Posttest

Internal Validity

All the questions and answers of pretest were re-collected after the test. Answers of pretest were concealed to avoid leakage of test questions. The sequence arrangement of the posttest questions were randomized and conducted three weeks later lest the sample still remembered the questions in pretest. The research sample was assigned randomly to each mode of presentation (MSP mode and SSP mode) to minimize the effects of selection bias.

External Validity

The research sample was randomly assigned to two different groups of presentation mode (MSP mode and SSP) and the sample was unaware of the differences. The sample of each mode was prohibited from interacting with another sample group. To prevent any cases of bias, the study was conducted by assistant teacher. The assistant teacher was a Mathematics teacher who was given detailed explanation for all the procedures.

FINDINGS

A number of statistical analysis techniques were employed, namely descriptive analysis, Pearson correlation, analysis of variance (ANOVA) and analysis of covariance (ANCOVA). The results of inferential statistics was discussed based on the hypotheses of this study at the significant level, p=0.05.

Table 2: Mean Score of Posttest and Standard Deviation of Each Presentation Mode and Anxiety Level

Presentation Mode	Anxiety Level	Mean	Standard Deviation	N
MSP Mode	Low	8.00	2.650	3
	Medium	9.58	2.760	19
	High	7.85	2.440	13
	Total	8.48	3.925	35
SSP Mode	Low	9.25	1.890	4
	Medium	9.68	3.270	22
	High	8.89	1.830	9
	Total	9.27	2.330	35
Grand Total	Low	8.65	2.140	7
	Medium	9.63	3.010	41
	High	8.37	2.230	22
	Total	**8.88**	**3.128**	**70**

Table 2 shows the mean score of posttest, frequency distribution of sample and standard deviation for the 'Probability' topic of each presentation mode together with different anxiety levels among students. Overall, the posttest mean score for students with high anxiety level was 8.37 which was slightly lower compared to students with low anxiety level with mean score 8.65. For MSP mode, posttest mean score for students with high anxiety level was 7.85 which was also slightly lower compared to students with low anxiety level with mean score 8.00. As for SSP mode, posttest mean score for students with high anxiety level was 8.89 which was also lower compared to students with low anxiety level with mean score 9.25.

Posttest mean score for students with high anxiety level exposed to MSP mode was 7.85 which was lower compared to posttest mean score for students with high anxiety exposed to SSP mode. Similarly, posttest mean score for students with low anxiety level exposed to MSP mode was 8.00 which was lower compared to posttest mean score for students with low anxiety level exposed to SSP mode.

Table 3: Two-Way ANCOVA for Posttest Mean Score According to Presentation Mode and Anxiety Level with Pretest Mean Score as Covariate

Source	Type III Sum of Squares	Df	Mean Square	F	sig.	Eta Squared	Observed Power
Covariate							
Pretest	186.004	1	186.004	39.227	.000	.384	1.000
Main Effect							
CATTELL	22.121	2	11.061	2.333	.366	.069	0.456
Mode	7.522	1	7.522	1.586	.391	.025	.237
Two-Way Interaction							
X Mode							
CATTELL	6.446	2	3.223	.680	.510	.021	.160
Error	298.731	63	4.742				
Total	**6336.000**						

* significance: p<0.05

The main effect of anxiety level is shown in Table 3, F-value (2,63) = 2.333, Mean Square = 11.061, p = 0.105 and $\eta^2 = 0.069$. This shows that there was no significant difference of posttest mean score between students with high anxiety level and students with low anxiety level exposed to MSP mode and SSP mode. Posttest mean score for students with high anxiety level ($\bar{x}$ = 8.37) was lower than students with low anxiety level ($\bar{x}$ = 8.65) as shown in Table 2. The degree or strength of relationship ($\eta^2 = 0.069$) between anxiety level and posttest mean score was low (Gay and Airasian, 1996).

Table 4: One-Way ANCOVA for Posttest Mean Score According to Presentation Mode and High Anxiety Level with Pretest Mean Score as Covariate

Source	Type III Sums of Square	df	Mean Square	F	sig.	Eta Squared	Observed Power
Between Groups	7.522	1	7.522	1.586	.212	.025	.237
Within Group	298.731	63	4.742				
Total	**6336.000**	**70**					

* significance: p<0.05

Table 4 shows the research data for students with high anxiety level, F-value (1,63) = 7.522, Mean Score = 7.522 and p = 0.212 for presentation mode. This shows that there was no significant difference for posttest mean score between high anxiety research sample exposed to MSP mode and SSP mode. Posttest mean score for students with high anxiety level exposed to MSP mode ($x\square$ = 7.85) was lower than posttest mean score for students with high anxiety level exposed to SSP mode ($x\square$ = 8.89) as shown in Table 2.

Hypotheses Testing

Hypothesis 1

Students exposed to Multiple Simulation Presentation (MSP) will have significantly higher mean score in posttest compared to students exposed to Single Simulation Presentation (SSP).

$x\square_{MSP} > x\square_{SSP}$

Table 2 shows that posttest mean score for students exposed to SSP mode ($x\square$ = 9.27) was significantly higher than posttest mean score for students exposed to MSP mode ($x\square$ = 8.48). The results of ANCOVA in Table 3 shows significant difference between presentation modes at F-value (2,63) = 1.586, Mean Square = 7.522, p = 0.212 and η^2 = 0.025. This shows that there was no significant difference of posttest mean score between students exposed to MSP mode and students exposed to SSP mode. Therefore, this hypothesis was not supported.

Hypothesis 2

Students with low anxiety (LA) will achieve significantly higher mean score in posttest compared to students with high anxiety (HA).

$x\square_{LA} > x\square_{HA}$

Table 2 shows that posttest mean score for students with low anxiety level ($x\square$ = 8.65) was higher compared to posttest mean score for students with high anxiety level ($x\square$ = 8.37). The results of ANCOVA in Table 3 shows that there was no significant difference between anxiety levels at F-value (2,63) = 2.333, Mean Square = 11.061, p = 0.105 and η^2 = 0.069. Therefore, this hypothesis was not supported.

Hypothesis 3

Students with high anxiety (HA) exposed to Multiple Simulation Presentation (MSP) will achieve significantly higher mean score in posttest compared to students with high anxiety (HA) exposed to Single Simulation Presentation (SSP).

$x\square_{HA\text{-}MSP} > x\square_{HA\text{-}SSP}$

Table 2 shows that posttest mean score for students with high anxiety level exposed to SSP mode ($x\square$ = 8.89) was higher than posttest mean score for students with high anxiety level exposed to MSP mode ($x\square$ = 7.85). The results of ANCOVA in Table 4 shows that there was no significant difference of posttest mean score between students with high anxiety level exposed to MSP mode and students with high anxiety level exposed to SSP mode at F-value (1,63) = 1.586, Mean Square = 7.522 and p = 0.212. Therefore, this hypothesis was not supported.

DISCUSSION

The findings do not support Hypothesis 1, Hypothesis 2 and Hypothesis 3. Students who learned with SSP mode obtained higher mean score significantly compared to MSP mode. These findings are consistent with the research findings of Benshoof & Hooper (1993) which revealed that students' performance are better if they are exposed to 'single window' in the treatment.

The 'Probability' topic is abstract and procedural. Single Simulation Presentation (SSP) is found to be more effective for the learning of probability, especially for students with high anxiety level. Sweller, van Marrienboer

& Paas (1998) explained that cognitive load is higher when extensive information is displayed simultaneously on the same screen which causes learners confused. Therefore, SSP mode helps to simplify the process of information processing which directly improves the understanding and performance of students in the learning of probability.

Cognitive Load Theory employs the connections between the information structures and the human cognitive knowledge to establish an instructional design to reduce the redundant or irrelevant cognitive load (Jeroen, Enboer & Sweller, 2005). Human processing memory consists of multiple memory stores including a very limited working memory and an extensive-long term memory. The working memory is limited in capacity and in duration when dealing with novel information (Mayer & Moreno, 2003). Furthermore, the limitations of the working memory make it difficult for learners to understand multiple information elements simultaneously (Artino, 2008). The long term memory can hold all the knowledge which in turn can be processed as a single element by the working memory because all learning activities require the working-memory capacity. If the required working-memory capacity exceeds the learner's limit, the learning performance will be affected due to cognitive overload (June-xia, 2007).

A high cognitive load will occur when the learner's attention is split, that is the learner is required to process multiple sources of information at the same time (Cierniak, Scheiter & Gerjets, 2009). The split-attention effect is experimentally concluded by Sweller (2005). Therefore, in this study, the findings demonstrate that SSP mode with single window reduces the cognitive load and maximizes the learner's performance.

The research findings also show that there is difference of mean score among students with different anxiety levels using two different modes of presentation, MSP mode and SSP mode. Students with low anxiety level obtained higher mean score in comparison to students with high anxiety level. According to Elliot & McGregor (2001), low and medium anxiety levels help in learning whereas high anxiety level distracts learning. However, the differences found are not significant. This shows that anxiety level is overall not a hindrance towards students' performance in the learning of probability though it makes a difference. In addition, this study shows that students with high anxiety level using SSP mode obtained higher posttest mean score compared to students with high anxiety level using MSP mode. This precisely proves that using SSP mode effectively helps students with high anxiety level in the learning of probability.

CONCLUSION

The research findings illustrated that SSP mode is more effective in helping students with high anxiety level to understand the 'Probability' topic as it displays clearer pictures without confusing students in the process of understanding the concepts. This proves that SSP mode shows positive results if it is used accordingly by meeting the terms and conditions stated in the findings of Benshoof & Hooper (1993) whereby organized structure and appropriate amount of information are presented simultaneously. The presentation mode helps ease learning topic which is complicated and abstract. It enables students to visualize abstract information and subsequently improves students' understanding and performance.

Individual differences such as anxiety level have to be taken into consideration as the findings show that students with different anxiety levels achieve different results. The developer of interactive multimedia courseware needs to pay attention and give consideration to the target group in the process of designing presentation mode. The mode of presentation is to be tailored to the needs of students.

For future study, the research should be replicated to larger sample involving more schools, particularly schools in rural areas to increase precision in estimates. Besides, the effects of Single Simulation Presentation (SSP) should be investigated on students with different age range and socioeconomic status to determine the overall effects of SSP mode from various aspects. SSP mode needs to be designed and developed based on theories, principles, concrete research findings and consistency of the functions of human brain.

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EFFECTS OF THE PROFESSIONAL DEVELOPMENT PROGRAM ON TURKISH TEACHERS: TECHNOLOGY INTEGRATION ALONG WITH ATTITUDE TOWARDS ICT IN EDUCATION

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ABSTRACT
The purpose of this study is to analyze the impact of the professional development (PD) program on technology integration (TI) besides attitudes towards ICT in education of Turkish teachers. This study demonstrates the outcomes of one group pre-test and post-test design based on data, collected before, just after and six weeks after the PD program. The results of the study revealed that, the PD program had a positive effect on TI continuing still at the sixth week while little or no change was detected on the teachers' attitudes towards ICT in education.
Keywords: Professional development, technology integration, teachers' attitude towards ICT in education, teacher education, attitudes,

1. INTRODUCTION

In recent years, Turkish schools extensively invested in hardware and software facilities. Therefore, the access of students to computer technology became much easier (MoNE, 2009a, 2010b). However installing the technological facilities to schools does not necessarily mean that this facility is integrated into both teaching and learning processes (Hennessy, Ruthven, & Brindley, 2005). Most of the teachers in Turkish schools fail to integrate ICT into their courses (Göktaş, Yıldırım, & Yıldırım, 2008). Professional development (PD) programs can help teachers to integrate information and communication technologies (ICT) into their lectures. In various countries PD programs are widely used inorder to enhance technology integration in education (McCarney, 2004; MoNE, 2010a). The evaluation of the effect of PD programs on teachers might offer a route map for the new steps to improve these PD programs. The aim of this study is to investigate the effects of the PD program of teachers (Intel Teach Program -ITP- supported with Web 2.0. course) on both technology integration (TI) and teachers' attitude towards ICT in education.

1.1. Professional development and technology integration

Recently, since the investment in the educational technologies gained an increasing trend all over the world, the use of this technological facilities in learning environments also gained importance in Turkey so the teachers are supposed to perceive the use of technology as a natural part of their profession in order to be able to conjoin these investments for enhancing the learning of students. The book of Turkish Ministry of National Education (MoNE) for the standardization of teachers claims that the teachers have to integrate information and communication technologies with teaching and learning processes. Besides, the teachers should not only point out how they use ICT at their teaching and learning environments in their lesson plans, but also use these technologies to support the student centered strategies (MoNE, 2009c). However, integrating technology into teaching cannot be achieved overnight. Several researchers indicate that the teachers are supposed to overcome some stages (Mills & Tincher, 2003; Proctor, Watson, & Finger, 2004; Russell, O'Dwyer, Bebell, & Tao, 2007; Yang & Huang, 2008). A meta-analytic review by Hixon ve Buckenmeyer (2009) summarized these stages. At first stages, the teachers tend to use the technology almost not at all, however later on; they consider the technology as an instrument which necessities to be taught. As the use of technology increases, they tend to perceive it as an instrument to aid the instruction, rather than being a core educational topic (Hixon & Buckenmeyer, 2009).

There are voluminous studies regarding the effect of PD programs on TI. Some of these indicate that, PD programs increase TI (Giordano, 2008; Lavonen, Juuti, Aksela, & Meisalo, 2006; Voogt, Almekinders, van den Akker, & Moonen, 2005). Giordano (2008) found that, at the end of PD program, teachers began to use internet for instructional purposes and later on this usage became permanent. Lavonen et al. (2006) found that, after the PD program technology usage skills of science teachers have been increased and they managed to integrate the technology with the learning environments. Voogt et al. (2005) found that, after completing PD program, teachers' attitude towards using the computer was changed in a positive manner. Furthermore, at the end of this PD program the technology using skills of teachers increased and they managed to integrate ICT with teaching and learning environments.

On the other hand, some studies claimed that, while PD programs are increasing computer skills of teachers, the usage of ICT in education was effected still at a rather limited level (Brinkerhoff, 2006; Fragkouli & Hammond, 2007; Glazer, Hannafin, Polly, & Rich, 2009; Yurdakul, Yıldız, Çakar, & Uslu, 2010). Brinkerhoff (2006) found that, while a significant change occurred in both self-assessed technology skills and computer self-efficacy of participants, very little or no change was determined in self-assessed TI beliefs of these teachers. Frankoli and Hammond (2007) found that, the PD program induced a positive impact not only on developing the information technology skills of teachers, but also on their familiarity with ICT as a curricular tool to some degree. While, it had a very limited impact on the classroom practice. Glazer et al. (2009) found that, while most of the teachers who entered the PD program, expanded their knowledge, skills, ideas, and their lesson plan repertoire through these learning experiences; only one-third of them were considered as proficient apprentices at the end of the study. Meanwhile, Yurdakul et al. **(**2010**)** also revealed that, the PD program was capable of increasing the technology usage skills, whereas it failed to induce substantial change for the technology integration.

1.2. Teachers' attitudes towards ICT in education

Recent studies show that, the successful implementation of the educational technologies depends largely on the attitudes of the educators. Especially, Israel (Klieger, Ben-Hur, & Bar-Yossef, 2010), Australia (Pierce & Ball, 2009), USA (Glazer et al., 2009; Hixon & Buckenmeyer, 2009; Liu & Szabo, 2009), Turkey (Goktas, Yidirim, & Yildirim, 2008) and Asia/Far East (Sang, Valcke, Braak, & Tondeur, 2010) based studies still consider the attitude of teachers towards ICT as an important issue. Numerous researchers (Atkins & Vasu, 2000; Gbomita, 1997; Moore & Benbasat, 1991; Roblyer & Knezek, 2003; Sugar, Crawley, & Fine, 2004) point out that, a teacher's attitude or belief is one of the several important human factors which has a significant impact on the computer adoption and the implementation of the technology in classroom. Bullock (2004) found that, the attitude of teachers is a major enabling/disabling factor in the adoption of the technology. Similarly, Kersaint at al. (2003) found that, the teachers with positive attitudes towards the technology feel more comfortable while using it and they usually incorporate it into their teaching activities. Therefore, the teachers' attitudes towards computers are one of the significant factors in enhancing the quality of computer usage for instruction (Yuen, Law, & Chan, 1999).

Some researches (Bayramoğlu, 2007; Yildirim, 2000) point out that, the teachers' negative attitudes towards computers changed after training about computer use. Regarding this subject, Yıldırım (2000), pointed out that after completing the training, the teachers' anxiety towards the computers decreased significantly while their confidence and affiliation to computers increased prominently. Bayramoğlu (2007) claimed that the training created positive and significant differences on the attitude towards worldwide web of teachers participating this program .Moreover, there were also significant differences on their web self-efficacy and perceived web-usefulness scores after the training. In conclusion, there is a positive relationship between the teachers' attitudes towards ICT and PD. When the teachers perceive ICT as a beneficial, compatible instrument with their current activities, they will demonstrate positive attitudes towards ICT in education.

1.3. Technology integration, attitudes towards ICT in education and PD

Some models regarding technology integration such as reported by Sang et al. (2010) emphasize the importance of teachers' attitudes towards the use of ICT in education. Negative attitudes of teachers and the limited knowledge of teachers about technology integration are found to be the main barriers for the technology integration in education (Çakır & Yıldırım, 2009; Hew & Brush, 2007). Since teachers' attitude towards ICT is one of the impendent factors for the technology integration its investigation) is not only helpful for a better understanding of the effects of PD programs but also very useful for future plans in this area. For this reason, in this study, evaluation of the change of not only TI levelsbut also attitudes of teachers towards the use of technology in education was inspected after the PD program. Thus, the aim of this study is to assess the efficiency of the PD program in this manner.

In the literature, there are many studies evaluating the effect of PD programs on the attitudes of teachers towards ICT in education. Some of them indicates that PD programs had positive impact on attitudes of teachers towards using technology for education (Christensen, 2002; Galanouli, Murphy, & Gardner, 2004; Karagiorgi & Charalambous, 2006; Seels, Campbell, & Talsma, 2003). Although a quite number of studies were conducted on the PD programs regarding TI and its effects on the attitudes of teachers towards ICT in Western countries, limited number of attempts has been made to assess this situation in non-Western contexts (i.e. (Akpınar & Bayramoğlu, 2008; Aris, Abu, Elington, & Dhamotharan, 2000; Yildirim, 2000). Hence, there is a need of doing more research in this area in non-western context.

1.4. PD in Turkish Context

In Turkey, the professional teacher development activities are planned and executed by the Directorate for In-service Training department of MoNE at central level and by the Governorships at local levels (Eurydice, 2010) which were mostly delivered in the form of large seminars or convocations (Bümen, 2009; Eurydice, 2010). For these programs teachers claimed that they were not as effective for their PD as they expected (Büyüköztürk, Akbaba Altun, & Yıldırım, 2010). Thus, previous researches revealed that, these traditional seminars and workshops were relatively ineffective since they did not provide opportunity for practice, for follow-up, and for reflection. Similarly, the centrally planned PD programs were also decontextualized (Fullan, 1990) and did not take into consideration the preexisting beliefs and personal needs of teachers (Bümen, 2009).

Intel Teach Program (ITP) aims to help teachers for integrating the technology into their lessons. Hence, via integrating technology in training skills of teachers, ITP aims not only helping teachers in problem solving but also promotes, critical thinking and collaboration skills of their students. In 2009, 127.093 Turkish teachers entered this PD program (MoNE, 2010a). With the request of Province National Education Directorate, only in Izmir different from regions of country-wide sphere- the teachers were assigned to attend to Web 2.0. course, for five days before the ITP in order to improve their computer and internet skills.

MoNE's action plan (2009b) was arranged to develop and implement PD programs aiming TI for the period of 2010-2014. However organizing effective PD programs for the ICT integration is not an easy task. Incorporation of appropriate methods for adequate guidance and facilitating the PD for teachers are still unsolved issues in most countries (Lavonen et al., 2006). Therefore, the evaluation of PD programs intending TI has great importance in order to make evidence-based decisions and enhance our understanding what constitutes the best practice in TI programs (Lawless & Pellegrino, 2007).

1.5. Purpose of the study

The technologic capabilities offered by the schools in Turkey are constantly increasing. Therefore, the teachers are supposed to integrate these technologies in learning and teaching environments. In the TALIS report, Turkish teachers indicated their willingness to participate in the PD programs which were assembled for promoting the TI, however, they could not find appreciate PD programs for application to (Büyüköztürk et al., 2010). It is commonly suggested that the PD programs have the potential to improve the attitudes of teachers towards using ICT in a positive way and also to strengthen their integration capabilities of the ICT in to learning and teaching environments. (Bayramoğlu, 2007; Giordano, 2008; Kluever, Lam, Hoffman, Green, & Swearingen, 1994; Voogt et al., 2005; Woodrow, 1992). The aim of this study is to investigate the effects of the PD program (Intel Teach Program -ITP- supported with Web 2.0. course) on both technology integration and the attitudes of teachers towards ICT in education. Accordingly, it was probed the answers for the questions of: (a) Did the conducted PD program (ITP) induce positive effects on both the capabilities of teachers in regard to the technology integration and the attitudes of teachers towards ICT in education? (b) Did the aforementioned effects render themselves to be retained?

It is expected that the results obtained from this study would not only reveal the extent of the effectiveness of the aforementioned PD program but also inspect the functionality of the investment to the technology. Besides, evaluation of this PD program could offer significant contributions for understanding the technology integration processes, as well. Hence there are a lesser, limited number of studies that address the follow up of the teachers after PD programs in a non-western context; so it is assumed that this study would be supplemental to the field. This study may also provide feedback for the developers of ITP and for the decision makers. Besides, the studies related to the technology integration are considerably new in the Turkish context. Actually, the number of such studies has been increased during the last five years. The number of studies investigating the effects of the PD programs on both the attitudes related to the technology integration and the use of technology in education is quite a few. In this regard, it is considered that this study would contribute notably to the literature in the non-western context.

2. METHOD

This study represents one group pre-test and post-test (pre-experimental) design. Changes in the TI levels of teachers and their attitudes towards ICT in education among the participants in a five weeks schedule PD program (totally 90 hours), and their retention after six weeks were examined.

2.1. Setting and Participants

Although there were five instructors who conducted these programs at Izmir, only three of them accepted to join this study. The instructors who accepted to participate to this study were responsible of conducting maximum three courses at each semester. For each course, it was allowed maximum 15 teachers as trainees. Because of

these factors, the pre-tests and the post-tests were applicable for 56 participants during the 2009 – 2010 academic year. Schools were visited for conveying retention tests, and the test was fulfilled by the participant teachers who were at the school during the visits. It was tried to access via email to the teachers who were not at the school during the visits; however, not all of them replied the email correspondence. Consequently, the retention tests applied to 41 participants, as the rest of them were not accessible. In terms of subject, two of the instructors were 5–10 years experienced computer teachers and one of them was a more than 20 years experienced mathematics teacher. First of the instructors was participated in ITP since 2004, the second one since 2006, and the third one since 2008. One of them had an undergraduate degree, and the others had graduate degrees.

In terms of teachers, the 35 teachers self-identified themselves as female (62.5%) and 21 of them as male (37.5%). One-half of teachers were younger than 35 years old. With regard to teaching experience, seven respondents had 1 to 5 years of experience (12.5%), fifteen had 6 to 10 years of experience (26.7%), sixteen had 11 to 15 years (28.5%) of, eleven had 16 to 20 years (19.6%) of, three had 21 to 25 years of (5.3%) and three had more than 26 years of experience (5.3%). Thirty five teachers (62.5%) were class teachers and twenty one teachers were branch teachers. Schools of thirty four teachers have computers at many classrooms while schools of nine teachers have computers at a few classrooms. Only school of one teacher has computers at all of the classrooms. However, schools of sixteen teachers have no computers installed at their classrooms. All of the teachers had the availability of computer labs with internet access at their schools. Thirty five teachers were more than five years experienced computer users.

The two sessions of teacher PD program had been conducted in the computer labs of the teachers' own school, and the rest (n=2) had been implemented in computer lab of different schools. There were problems associated with the speed of internet connection in all settings, therefore, teachers and instructors complained about this problem during the program.

The ITP which is being carried on since 2003, in accordance with the protocol signed between MoNE and Intel Corporations, is being implemented in Turkey countrywide. Besides, in compliance with the demand of İzmir City Director of Public Education, the participants should take part in a five days (30 course hours) scheduled computer and internet skills training prior to the program. This training includes e-mail basics, file sharing via internet, presentation skills, web diaries, and wiki technologies topics. Thereafter, during the 20 work days (60 course hours) scheduled training the teachers were instructed about the technology aided project based learning. In accordance with these instructions, they were assigned to prepare unit plans and materials can be used with the students. The training was administered via hybrid method and the first five days (25 course hours) of it were delivered by face-to face. The following 13 days (25 course hours) of it was delivered by distance learning, and the rest two days (10 hours) of it was again delivered by face-to-face again. After completing upon the theoretical part of the training, the teachers were allocated as small groups and they were assigned to prepare technology aided-project based unit plans. The materials contained by the unit plan were conveyed in a portfolio. The unit plan and the portfolio were assessed by rubrics and then the successful participants were awarded with a MoNE stamped in-service training certification.

2.2. Instruments

In this study, the data were gathered by using three instruments: (a) teacher TI inventory, (b) teachers' attitude towards ICT in education scale, and (c) background questionnaire for being able to gain demographic information about the age, gender, educational background, teaching experience, and computer use & ownership of teachers.

The Technology Integration Inventory (TII) was developed by (Uslu & Bümen, 2010). They were benefited from several instruments on TI and there are many studies that mention about the different dimensions of the TI. Teachers' ICT use in the classroom (Hung & Hsu, 2007; Odom, Settlage, & Pedersen, 2002; Russell et al., 2007; Van Braak, Tondeur, & Valcke, 2004), encouragement of students to use ICT (Hung & Hsu, 2007; Russell et al., 2007), teachers' use of ICT for preparation (Odom et al., 2002; Russell et al., 2007), and influence of using ICT on students (Jamieson-proctor, Watson, Finger, Grimbeek, & Burnett, 2007; Proctor et al., 2004) are forming the four main dimensions of the TI Instrument (TII) of teachers in the literature.

Uslu and Bümen (2010) examined these instruments from the literature (Hung & Hsu, 2007; Koçak-Usluel & Demiraslan, 2005; Mills & Tincher, 2003; Proctor et al., 2004; Van Braak et al., 2004) and addressed the Turkish teachers and their context. Non-structured interviews were conducted with seven teachers to assess the aims of the computer use for teaching. The inventory was sent to six experts who were working in the field of ICT in education at different Turkish universities in order to determine its face and content validity. After some improvements, a pilot study was conducted with 447 teachers to establish its internal consistency and reliability.

Explanatory factor analysis along with a maximum likelihood was implemented. The outcomes revealed that the five sub-dimensions were responsible 56.53% of the total variance in the TII items. With a oblimin rotation, the four sub-dimensions were responsible for 57.84% of the total variance and two items were removed due to their similar factor loadings in different factors. Of these sub-dimensions, *teachers' use of ICT for preparation* had an eigenvalue of 11.5 and was accounted for 30.3% of the total variance. The second sub-dimension, *encouragement of the students to use ICT* (eigenvalue = 4.5) was accounted for 11.9% of the total variance. The third sub-dimension, influence of using ICT on students had an eigenvalue of 3.8 and was accounted for 10% of the total variance. The last sub-dimension was *teachers' ICT use in the classroom* (eigenvalue = 2.4) and it was responsible for 6.2% of the total variance. Reliability estimates for sub-dimension scores were α = .92, .90, .90 and .88, respectively. Appendix A shows factors and factor loadings of the TII.

The Teachers' attitude towards ICT in education scale (TATICTS) was developed by (Cavas, Cavas, Karaoglan, & Kisla, 2009). The TATICTS is a 31-item, 5-point Likert type self report instrument that assesses attitude of teachers towards ICT in education with two subscales: *effect of ICT on teaching and learning* and *obstacles to ICT implementation*. (Cavas et al., 2009) reviewed the literature and the scales used in different educational backgrounds guided by the theoretical base of their study and the scale was sent to seven experts who were working in the field of ICT in education at different Turkish universities to determine its face and content validity. The instrument was improved in the light of the feedback from these experts. A pilot study was conducted with participation of 1071 science teachers to establish its internal consistency and reliability. The Kaiser-Meyer-Olkin value was 0.95, exceeding the recommend value of 0.6 and the Barlett's Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix. An inspection of the scree plot revealed a clear break after the second component. In accordance with the outcomes of the scree test, it was decided to retain two components for further investigation. In order to aid in the interpretation of these two components, quartimax rotation was performed. The two factor solution explained a total of 39.7 % of the variance, with Factor 1 contributing 29 % and Factor 2 contributing 10.7. Reliability estimates for subscale scores were α = 0.92 for effect of ICT on teaching and learning and α = 0.79 for obstacles to ICT implementation.

2.3. Data collection and analysis

After getting the permission to use the TATICTS, a research package including the TATICTS, and TII was assembled through pre and post-test in four groups of ITP (n=56) between the dates of November 2009 and April 2010. Guskey (2000) and Giordano (2008) emphasized assessing the participant use of the new knowledge or the skills after PD program. However, measures of the use of newly acquired knowledge and skills must be made after participants have had sufficient time to reflect on what they learned and adapted the new ideas to their particular setting. Furthermore, affective changes occur more gradually and are based on cognitive experiences; efforts to collect information on the affective learning outcomes should come later (Guskey, 2000). Hence, in this study, the teachers' TI and their attitude towards ICT in education were measured for a length of time and these two instruments were reapplied (n=41) after six weeks of the PD program.

After recoding the negative items of TATICTS (n=11), data were analyzed for the assumptions of parametric statistics. Normality, homogeneity of variances, and linearity assumptions for each cell were tested and the outcomes confirmed that these assumptions were met. The univariate ANOVA was applied to investigate if there were significant differences between pre-test, post-test and retention test in respect to the two dependent variables (i.e. TI and attitudes towards ICT in education).

3. FINDINGS

Effect of the PD program on teachers' TI and attitudes towards ICT in education

The first research question asked was if PD program effected teachers' TI and attitudes towards using ICT in education. Table 1 displays the summary statistics for pre-test and post-test scores. Differences in mean rating of teachers' use of ICT for preparation sub-dimension scores were significantly different between pre-test and post-test, $F(1\text{-}55)=4.90$, $p<0.05$. The effect size was calculated as 0.30. According to Cohen, Manion, and Morrison (2007), it is a small effect size. Post-test mean score (M=3.89) was higher than the pre-test mean score (M=3.71). Besides, it can be said that the teachers' encouragement of the students to use ICT displayed an increase after the PD program. Comparing the pre and posttest measurement, teachers' encouragement of the students to use ICT was increased after PD program, $F(1\text{-}55)=4.48$, $p<0.05$. Mean difference was 0.19 with the effect size of 0.28. According to Cohen et al. (2007), it is a small effect size. Differences in mean rating of influence of using ICT on students sub-dimension scores were significantly different between pre-test and post-test, $F(1\text{-}55)=14.82$, $p<0.001$. The effect size was calculated as 0.51. According to Cohen et al. (2007), it is a medium effect size. Finally, teachers' ICT use in the classroom displayed an increase after PD program, $F(1\text{-}55)=18.59$, $p<0.00$. Mean difference was 0.32 with the effect size of 0.58. According to Cohen et al. (2007), it is

a medium effect size. On the other hand, there were no significant initial differences between the attitudes towards ICT in education regarding pre-test and post-test scores, $F(1\text{-}55)=1.03$, $p>0.05$. Post-test mean score ($M=4.00$) was lower than the pre-test ($M=4.10$) score. Referencing these data, it can be said that the teachers' attitudes towards ICT in education did not change after the PD program.

Table1. Pre-test post-test scores and ANOVA results (n=56)

	Pre-test		Post-test					
	M	SD	M	SD	F	Mean difference	p	Cohen's d
Teachers' use of ICT for preparation	3.71	0.77	3.89	0.68	4.90	0,18	<.05	0.30
Encouragement of the students to use ICT	3.63	0.85	3.82	0.80	4.48	0,19	<.05	0.28
Influence of using ICT on students	3.06	0.86	3.43	0.85	14.82	0.37	<.001	0.51
Teachers' ICT use in the classroom	2.72	0.93	3,04	,98	18.59	0,32	<.001	0.58
Attitudes towards ICT in Education	4.10	0.51	4.00	0.75	1.03	-0.10	.31	0.14

3.1. Post-test, Retention-test Analysis

The second research question asked was that, if there were differences in the teachers' TII scores and TATICTS scores between post-test and (after six weeks) retention test (n=41). Table 2 displays the summary statistics for the post-test and the retention-test scores. Differences in mean rating of teachers' use of ICT for preparation sub-dimension scores were not significantly different between post-test and retention test, $F(1\text{-}40)= 0.36$, $p>0.05$. Retention-test mean score (M=3,90) was higher than the post-test mean score (M=3,86). Comparing the post and retention test measurement, teachers' encouragement of the students to use ICT was not change after the post test, $F(1\text{-}40)= 0.74$, $p>0.05$. Differences in mean rating of influence of using ICT on students sub-dimension scores were not significantly different between post-test and retention test, $F(1\text{-}40)= 0.004$, $p>0.05$. Retention-test mean score (M=3,34) was higher than the post-test mean score (M=3,33). Comparing the post and retention test measurement, teachers' ICT use in the classroom was not changed after the post test, $F(1\text{-}40)= 1.95$, $p>0.05$. In addition, there were no significant differences between the attitudes towards ICT in education post-test and retention-test scores, $F(1\text{-}40)= 3.47$, $p>0.05$. Retention-test mean score ($M=4,01$) was lower than the post-test mean score ($M=4,13$).

Table2. Post-test retention test scores and ANOVA results

	Post-test		Retention-test*				
	M	SD	M	SD	F	Mean difference	p
Teachers' use of ICT for preparation	3,86	,71	3,90	,71	0.36	,05	,55
Encouragement of the students to use ICT	3,81	,86	3,72	,79	0.74	-,09	,40
Influence of using ICT on students	3,33	,89	3,34	,87	0.004	,01	,95
Teachers' ICT use in the classroom	2.95	,99	2,85	,99	1.95	-,01	,17
Attitudes towards ICT in Education	4,13	,51	4,01	,50	3.47	-,12	,070

*(n=41)

These findings revealed that the TI significantly increased after completing the PD program. Besides, the retention tests which were applied after six weeks of the termination of the PD program confirmed the increase between pre-test and posttest retained as there is no significant degrease at retention tests. No significant difference was observed related to the teachers' attitudes towards ICT in education. Figure 1 displays the pre-test, post-test and retention test scores for TII and the TATICTS.

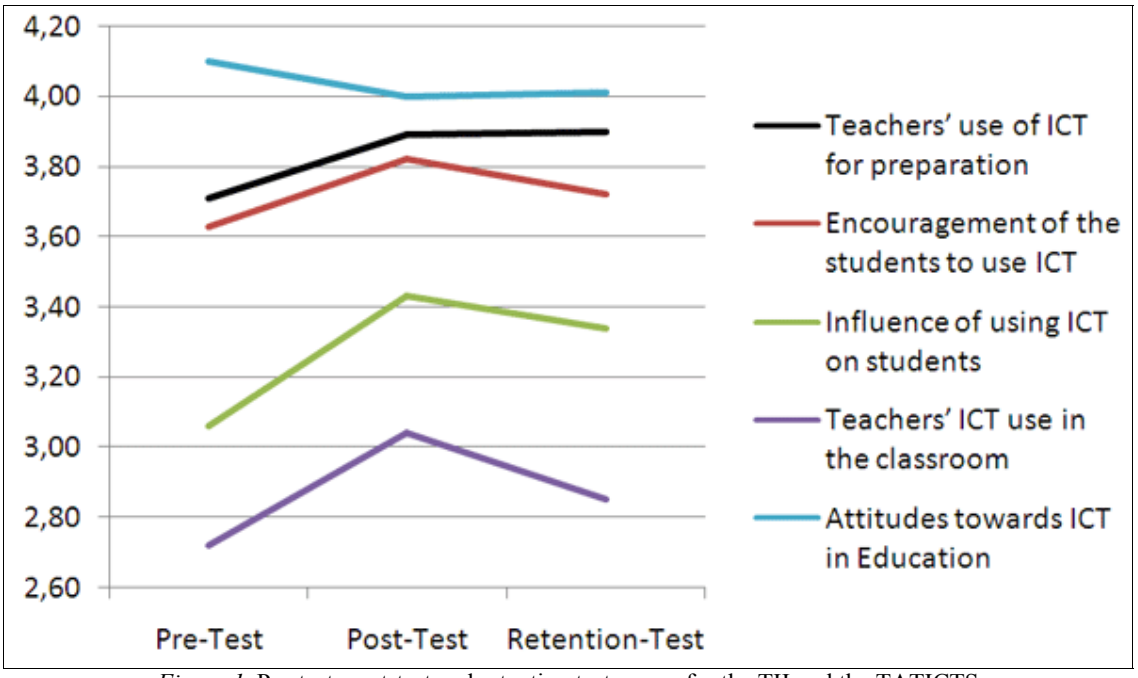

Figure 1. Pre-test, post-test and retention test scores for the TII and the TATICTS

4. DISCUSSION

In this study, the effects of the PD program (ITP - supported with Web 2.0. course) on the technology integration and the attitudes of teachers towards ICT in education were investigated. The findings revealed that TI scores of the teachers in all sub-dimensions were increased with the ITP implementation and this change was retained after six weeks. However, it was not observed any significant difference on the teachers' attitudes towards ICT in education that induced by PD program. The aforementioned significant differences related to the technology integration with the PD program are consistent with numerous studies which are suggesting that the PD program induced an increase in teachers use of ICT for instructional purposes (Brinkerhoff, 2006; Mitchem, Wells, & Wells, 2003; Rodrigues, Marks, & Steel, 2003; Voogt et al., 2005) and others that indicates that PD has limited effect on TI (Glazer et al., 2009; McGarr & O'Brien, 2007; Rye, 2001).

After the professional development program, the teachers' technology usage for preparation of education and instruction were increased, both in-classroom (sub-dimension -4)-and out-classroom (sub-dimension -1) settings. This result is parallel with the studies revealing that the in-service training programs increase the teachers' technology usage for preparation of education and instruction both in-classroom and out-classroom environments (Russell et al., 2007; Van Braak et al., 2004). The teachers who were attended to the assessed PD program, inclined to motivate their students for using information technologies in a greater degree (sub-dimension -2). Brinkerhoff (2006) stated that, the teachers who attended to the PD programs encouraged their students for technology usage. The increase of technology usage in ITP participant teachers was also transferred to the their students, according to consideration of teachers; the students technology usage were increased (sub-dimension 3). This result is parallel to the Brinkerhoff (2006).

In this study it was observed that the TI was increased and that was sustained after a six weeks period. Lavonen et al. (2006) indicated that the teachers didn't stop using ICT when they started to use it for instruction. Many factors may contribute to these effects. First of all, the long duration of PD program may have contributed to this increase in TI. The related literature implies the ineffectiveness of one-shot PD programs (Sandholtz, 2002). The PD program was scheduled as 30 hours for Web 2.0 course and 60 hours for ITP, a total of 90 hours timetable for five weeks. McGarr and O'Brien (2007) stated that the PD programs aimed only to increase the technology usage skills were ineffective for integrating with the technology. At this PD program it was aimed to increase both technology usage skills and also pedagogical skills for TI. During the first week for 30 hours, the teachers were instructed to learn the basic Web 2.0. technologies, which they would be able to use with their students. These activities might have contributed to enhance the teachers' skills and their confidence for using the ICT. Thereafter, the teachers discussed how to use these technologies for instructional purposes during the last 60 hours in the ITP. Glazer et al. (2009) examined which kind of interactions influenced the peer-teacher efforts for integrating the technology in their classrooms and they found; "sharing ideas", "giving and seeking advice",

"posing and responding to task based questions" were the most used ones. Correspondingly, during the ITP, the teachers were required to communicate, share documents, and to collaborate via internet with the other teachers and instructor of the course. These interactions may contribute TI level of teachers. Besides, the inscription of lesson plans by the participant teachers on a collaborative, team-work manner, explaining how the teachers would implement these technologies in their classes might have positively affected the TI too. O'murchu (as cited in Karagiorgi & Charalambous, 2006) indicated that the social and collaborative dimension of PD increased the effectiveness of program.

Retention tests were conducted six weeks later after completing the PD program. The findings of these tests demonstrated that, the teachers' increased level of integration with the technology as a consequence of the PD program was retained after six weeks. This result is consistent with the studies in the literature (Giordano, 2008; Lavonen et al., 2006), indicates that increment at the level of TI is sustainable. There might be several reasons associated with this. As stated earlier, most of the teachers were issued with computers installed at their classes (n=40), and computer labs with internet connection were available for all of them at their schools. These two factors may have been effective for sustaining the increment at the level of TI. Thereof, they may have tried to implement what they were instructed earlier. Numerous (n=35) of the teachers were more than five years experienced computer users, and all of them (n=56) were owner a computer at their households, and most of them had internet connection at their homes. The existences of these convenient skills and technology might have enormously facilitated to use the technologies in their daily lives and also to incorporate in their class settings for them, which they were accustomed via the PD.

The PD program increased technology integration of teachers, and this increment was retained for six weeks but technology integration did not increase after six weeks. It is thought that one of the prime reasons of this stagnant situation is the lack of providing the teachers with sufficient guidance and support after the fulfillment of the PD program. Besides, there is not any difference in regard of carrier advancement, rewarding or sanctioning at Turkish Public Education system for the teachers referring their compliance or noncompliance with the purposes of the PD program. This situation might be impeding to evolve a supportive school culture for change. However, organization culture has great importance to realize the change that aimed by the PD program (Guskey, 2000; Hew & Brush, 2007). Moreover, the control pressure induced over the teachers by the standard tests which are obligatory for students to be accepted by the upper educational institutions may be obstructive for the TI. Hew and Brush (2007) indicates that high-stakes testing can be a major barrier to TI. Furthermore in this study, the teachers were assigned to the PD program without screening their prior individual level relating to the TI. However, "one-size-fits-all" type of technology training is inadequate for TI as stated by (Hixon & Buckenmeyer, 2009). Teachers who had different ICT background and aspirations may need for more specialized needs-based training on ICT integration (Karagiorgi & Charalambous, 2006).

No changes were observed on the TATICTS scores neither between pretest and posttest nor between posttest and retention test. These results contradict with a number of other studies which are suggesting that the PD programs positively increased the attitudes of teachers towards the use of technology in education (Cavas et al., 2009; Christensen, 2002; Liu & Szabo, 2009; Sang et al., 2010; Sugar, Crawley, & Fine, 2005). Some authors indicate that when teachers try to start to use ICT for learning purposes, some degree of change is required in the field of beliefs, attitudes, pedagogical ideologies (Ertmer & Ottenbreit-Leftwich, 2010; Fullan, 2005). On the other hand, these findings may confirm the studies which are suggesting that the solitary PD programs are not sufficient to change the attitudes of teachers in a positive manner; for being able to achieve this, it is also required that the teachers should reflect the methods (which they were proposed in the PD program) at the classroom. And they also should experience the student achievement stemming from these methods (Guskey, 2000; Pierce & Ball, 2009). The attitudes of teachers may have withstood to change, because the teachers did not experience an immediate reflection of these applications over the student achievement. Besides, the participant teachers were not assembled among the volunteers. Instead, the assignment was compulsory. Consequently, some of the participants may have aimed to complete the course as soon as possible, and also they may have attended half-heartedly. These negative factors might have obstructed the attitudes to be increased positively. Volunteers are more motivated to learn, willing to change and willing to be risk takers than non-volunteers (Lawless & Pellegrino, 2007; Loughran & Gunstone, 1997). Furthermore, it is not available a follow-up system or a coaching subsequent to the PD programs in Turkey. The awareness of teachers about the nonexistence of such a follow-up program might have obstructed the attitudes of teachers to be increased positively.

According to subjective observations, most of the participants indicated that they were lack of organizational support at their schools. Another reason encountered for the failure to change in the attitudes might be the fact that, the PD program was designed separately without regarding the organizational context. As a matter of fact, attitudes are being influenced by the organizational context and it can be improved by social learning.

Organizational climate, organizational willingness to change, the attitudes of the managers (administrators); all of them are important factors for achieving the change which was aimed by the PD program. Without a supportive environment, 'even the ''strongest'' PD program aiming ICT integration would not bring the desired outcomes' (Tearle, 2003). Additionally, it is also thought that the five weeks duration for the implemented PD program was not long enough to induce changes on the attitudes. Guskey (2000), stated that the affective learning would improve after the cognitive and the psychomotor learning and would take longer time to be established.

Although, there are many researches about evaluation of professional development programs for technology integration in western context, it is very limited in Turkish context. Especially, the number of evaluating professional development studies has been increased during last five years. There is not enough study conducting retention test for the long term effects of professional development in Turkey. So this research contributes notably to the literature in the Turkish and nonwestern context about evaluation of professional development programs and their effects on technology integration.

This study was carried out under several limitations. First, it relied on self-report data from questionnaires. If there were existed interviews, direct observations of teachers and evaluations of the student products; they might had provided additional insights into the effects of the PD program on the teaching practice. Therefore, these results may best be interpreted as preliminary. For being able to fully assess the MoNE Intel Teach Program, a more comprehensive investigation with larger numbers of individuals is needed. PD course is just one single variable in a complex environment that influences ICT use in schools. The variables (i.e. organizational culture, the teachers' self-efficacy beliefs related to the technology) other than the PD program, which may influence the level of TI should also be included in a more diversified research context. Although it was suggested to involve if the professional development program benefited students in any way (Guskey, 2000), the reader should be cautioned that this aspect was not includet in the study. However, the student learning is being influenced by various factors via many different sources, not just by a direct link through PD program. Thus, it is difficult to evaluate the effects of PD programs on student learning. Another limitation is that this study is conducted with the limited number of participants. Studies with the more participants should be conduct to generalize the findings for country site. Although this study is conducted with limited number of participants the study can be a pilot for country site professional development evaluations.

Despite these limitations, certain suggestions might be offered. The ITP supported with Web 2.0. course, improved the TI levels of teachers. However, Web 2.0. support was introduced to ITP applications only at Izmir and a few other cities. Hence, it is not easy to distinguish and to state clearly the determinant of the observed positive effects was stemming from ITP alone, Web 2.0 course alone or a compound of both. Therefore, the ITP program that administered throughout Turkey may not induce the same effects. So that, implementing the evaluation studies of Web 2.0. course separately, ITP separately, and both together as diverse designs for comparative studies may contribute to reveal the effects of the aforementioned programs more clearly. In accordance with the results of such comparative studies, it may be decided to generalize the ITP with Web 2.0. course support.

The PD program (ITP - supported with Web 2.0. course) did not induce changes over the attitudes of the participants. For being able to find out the underlying reasons, it might be helpful to convey several qualitative studies which investigate the settings in depth. For being able to enhance the effectiveness of the PD programs aiming TI; instead of prescribing "one size fits all" models, it is advised to determine the teachers' current technology integration stage and then to implement PD programs which are aligned with teachers pre existing knowledge. Such an approach may increase the teachers' willingness to participate in PD programs about TI. Also, it may be recommended to carry out an appropriate follow-up system and coaching support, subsequent to the completion of the PD program. Encouragement of a school culture which promotes the change is recommended too. Thereby, the teachers might develop positive attitudes if they observe some certain improvements on the student achievement.

For being able to understand which determinants of the PD programs aiming the TI are the best operating ones; it is needed more studies to be conveyed, investigating the relationship between the PD programs and teaching practice. Moreover, the long term effects of the PD programs on the TI at the classroom should also be investigated. Likewise, the effects of the PD programs on the student achievement and their interactions with the attitudes of teachers should be taken in to consideration.

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Appendix A

Factors and factor loadings of the TII.

Item	F1	F2	F3	F4	Item	F1	F2	F3	F4	Item	F1	F2	F3	F4
22	,817				13		,797			38			,724	
30	,815				11		,764			39			,697	
28	,801				12		,748			32			,686	
21	,791				09	,304	,743			40			,681	
20	,775				08	,328	,714			33			,630	
19	,766				17		,677			06				,848
25	,729				16		,662			04				,784
24	,721				14		,656			01				,770
27	,655				10		,585			05				,754
29	,576				34			,780		02				,751
26	,544				36			,755		07				,741
18	,333				35			,748		03				,622
					37			,728						

Appendix B

Some Sample Items of Technology Integration Instrument

First Subscale
I show movie (VCD/DVD/DivX) with the help of projection in my classroom.
I use educational software for my students to learn better.
Second Subscale
I want my students to use computer in order to present their learning.
I encourage my students to use computer and Internet in order to collect information.
Third Subscale
I use Internet in order to communicate with my students.
I do research on the Internet in order to prepare homework that I will give to my students.
I write my exams on the computer.
Fourth Subscale
In my classroom students use computer and/or Internet in order to communicate with others.
In my classroom students use computer and/or Internet in order to collect necessary information for their homework.
In my classroom students use computer and/or Internet in order to do their homework.

Appendix C

Some Sample Items of Teachers' Attitudes toward Information and Communication Technologies in Education Scale

I believe that the usage of ICT is important in achieving the aims of curriculum.
It is luxurious to use ICT in schools in our country.
I would like to use audio-visual tools in my courses.
I believe that ICT improves the quality of education.
I think that all the teachers should be continuously informed about ICT.
I believe that course will be more efficient when ICT possibilities are implemented.
I believe that it is necessary to have knowledge and skills in order to use ICT tools.
I think that the usage of ICT restricts the creativity of the students.

EFFECTS OF USER AND SYSTEM CHARACTERISTICS ON PERCEIVED USEFULNESS AND PERCEIVED EASE OF USE FOR THE WEB-BASED CLASSROOM RESPONSE SYSTEM

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ABSTRACT
This study explores the effect of user and system characteristics on our proposed web-based classroom response system (CRS) by a longitudinal design. The results of research are expected to understand the important factors of user and system characteristics in the web-based CRS. The proposed system can supply interactive teaching contents, quizzes, and questions from its database. In addition, the system provides three playful classroom response modes--the individual assigned mode, the rush answering mode, and the pushing button mode--to increase computer playfulness, friendly interface, and interactivity for students. Both user and system characteristics are based on the external variables from the technology acceptance model (TAM). The results of the longitudinal empirical study indicate that the effect of user characteristic on perceived usefulness is more than that of system characteristic, while the effect of system characteristic on perceived ease of use is more than that of user characteristic. Furthermore, the difference between short-term use and long-term use is analyzed. In the user characteristic, the effect of long-term use on perceived usefulness is more significant than that of short-term use. The effect of system characteristic on perceived usefulness is insignificant for long-term use, but that is significant for short-term use. The effect of long-term use on perceived ease of use is more significant than that of short-term use. In addition, computer playfulness is positively related to perceived ease of use, while subjective norm affects directly on perceived usefulness.

INTRODUCTION

Classroom response systems (CRSs) have been widely used to assist students in learning. CRSs, capable of capturing student votes and transmitting data via communication networks, are designed to collect and aggregate student responses instantly, and display the aggregated results in the class. However, students are asked to purchase radio frequency key pads to communicate in both directions, thus creating additional technology cost for schools and students. Therefore, although some universities adopt CRSs to assist teaching activities, others rarely use it. Logistical difficulties for teachers and added cost to students mean that CRSs must have a clear benefit and allow easy creation of new client applications. Online learning provides the perfect environment for web-based CRSs as all students have computer and access to the internet. Among general studies about CRSs use are reviews of CRS literature, general recommendations of use, and technical descriptions and comparisons. However, CRSs applied in the technology acceptance model (TAM) is rarely explored.

TAM from information systems field has been widely applied in the use of educational information technology. The results of past studies (Chunga &Tan, 2004; Drave, 2000; Ha & James, 1998; Hasn & Ahmed, 2007; Hoffman & Novak, 1997) indicated that the variables of system characteristic could affect perceived usefulness and perceived ease of use. Although TAM was examined as a model to explain the influence of external variables on using e-learning systems, these systems rarely included classroom response mechanism. Thus, we have developed an innovative web-based CRS using web services to create the system with computer playfulness, friendly interface, and interactivity that enhance the teaching and learning experience and remain extensible and developer friendly.

According to TAM, perceptions of ease of use and usefulness are directly determined by external variables. Although these external variables pertain to user characteristic and system characteristic, most past studies have only focused on examining the role of individual characteristic of user or system for e-learning systems and information systems (Park, 2009; Liu, Liao, & Peng, 2005; Lee, Cho, Gay, Davidson, & Ingraffea, 2003; Ngai, Poon, & Chan, 2007). However, little attention has been given to examining the impacts of both user and system characteristics on web-based CRSs. In addition, the research design of most past studies adopted cross-sectional design to collect data at one point in time. It limited causal inferences because temporal priority was difficult to establish. When the problem is with the examination of a dynamic process that involves change over time, longitudinal design is the most appropriate. The questionnaires of our experiment in this study examined two points in time and are based on the longitudinal design.

The purpose of the study is to understand the effect of user and system characteristics on perceived usefulness, perceived ease of use, and attitude toward use for the web-based CRS. In addition, we want to explore the difference of students' grades between the group using the system and the one not using the system.

In the user characteristic of our research model, we examined three external variables--subjective norm, self-efficacy, and personal innovativeness--in the domain of information technology (PIIT) to understand the effect of them on our proposed web-based CRS. Subjective norm from the theory of planned behavior provides positive attitude to reduce the cognitive and mental effort. Self-efficacy from the social cognitive theory is a more powerful direct determinant of ease of use. PIIT, the willingness of an individual to try out any new IT, from the innovation diffusion theory plays an important role in determining the outcomes of user acceptance of technology.

In the system characteristic, we built interactive teaching contents, quizzes, and questions banks. The system provides learning track function, synchronous classroom function, assignment management function, questions management function, and teaching material management function. In the proposed CRS, we kept most functions typical of CRSs and added playfulness, friendly interface, and interactivity of answering questions into the system. Therefore, we also examine three variables in the system characteristic such as computer playfulness, interface style, and interactivity. Computer playfulness, which affects user acceptance, is an intrinsic motivator, which can be described as the most enjoyable experience possible. Interface style can affect the perceptions of ease of use and of usefulness. Interactivity plays a crucial role in knowledge acquisition and the development of cognitive skills, and that interaction is intrinsic to effective instructional practice and individual discovery.

The perceived usefulness and the perceived ease of use from TAM are determined by the theory of computer playfulness (Woszczynski, Roth, & Segars, 2002), the theory of planned behavior (Ajzen, 1991), the social cognitive theory (Bandura, 1997), the innovation diffusion theory (Rogers, 1995), and the system interface research (Hasn & Ahmed, 2007). Our proposed user and system characteristics are based on the aforementioned theories. Hence, our study provides a theoretical perspective on how user characteristic and system characteristic affect the intention of using the web-based CRS. In this paper, the contributions drawn are as follow: (1) A web-based CRS with computer playfulness, friendly interface, and interactivity is developed; (2) The impacts of both user and system characteristics for the web-based CRS are examined; (3) The longitudinal design is adopted for raising causal inferences; and, (4) Understanding the impact of system characteristic on users' perception of the system provides valuable implications for practice and improving web-based CRS acceptance.

LITERATURE REVIEW

According to our research goal, we first surveyed classroom response systems. Second, we explored two constructs, user and system characteristics, of external variables in TAM. Finally, we examined past studies on the relationships between web-based learning systems and TAM.

Classroom response systems

A recent analysis of 24 classroom network studies by Fies & Marshall (2006) indicated that there was good agreement in terms of benefits of use. Specifically, they found that indications of greater student engagement increased student understanding of complex subject matter, student interest and enjoyment, student awareness of individual levels of comprehension, and teacher insight into student difficulties and heightened discussion and interactivity. Preszler, Dawe, Shuster, & Shuster (2007) assessed the effectiveness of wireless student response systems in the biology curriculum. Their results indicated that students had favorable opinions about the use of classroom response systems and that the increased use of these systems raised student learning. Seletsky (2009) made a web-based system that could easily be written from a client for many input devices. The system was added a confusion meter feature to allow teachers to gauge the appropriateness of the teaching pace without continuously asking questions. In addition, it was added a set of features that allowed students to work with questions outside the class as a way of review and further discussions. Lowery (2005) described the components and operation of the two most common types of student response systems, wireless keypad and web-based input devices. The web-based systems offered far more powerful student input devices than typical keypad systems. Moss and Crowley (2011) indicated that these systems provided a highly flexible and transferable approach to the use of interactive technology for engaging learners of all ages as well as carrying out research. Gok (2011) proposed an evaluation method for student response systems. The results indicated that these systems were especially valuable tool for introductory courses and for monitoring peer learning methods in large lecture classroom. However, almost all of the studies were based on typical question format that required all learners to select from given options. Beyond traditional CRSs, all students were asked to indicate whether a statement was true or false, or to select an option. Therefore, three rare modes were developed in our proposed web-based

classroom response system in order to improve traditional CRSs with computer playfulness, friendly interface, and interactivity.

External variables in TAM

There are three variables in user characteristic, including subjective norm, self-efficacy, and personal innovativeness in the domain of information technology (PIIT). Subjective norm from the theory of planned behavior (Ajzen, 1991) has been defined as a person's perception of whether most people who are important to him think he should or should not perform the behavior in question. Schepers & Wetzels (2007) conducted a quantitative meta-analysis of previous research on TAM in an attempt to make well-grounded statements on the role of subjective norm. Subjective norm was directly related to intention to use in most studies. Schepers & Wetzels (2006) thought when people were in individual environment, subjective norm was included in an effort to enhance the understanding of user's adopted behavior.

The social cognitive theory (Bandura, 1997) posited that people were neither driven by inner forces, nor simply by external stimuli. Instead, human behavior was explained via a model of triadic reciprocity in which behavior, cognitive and personal factors, and environmental events all operate interactively as determinants of each other. A key regulatory mechanism in this dynamic relationship that affected human behavior was self-efficacy, people's judgments of their capabilities to perform a given task. Many empirical studies validated this proposition in a wide variety of settings. Hasan (2006) discussed extensions to previous research on computer self-efficacy (CSE) and systems acceptance by examining the impact of multilevel CSE on information system acceptance. The results of a field experiment indicated that system-specific CSE represented a stronger predictor of perceived usefulness and behavioral intention than general CSE. Prior research (Yi & Hwang, 2003) on technology acceptance behavior examined the effects of self-efficacy on ease of use. Goal orientation has been recognized as important in understanding individual differences in motivated behavior. The study demonstrated a more direct and powerful effect of application-specific self-efficacy on perceived ease of use. The results indicated that users regarded the system easier to use when their conviction in their own efficacy regarding the target system was higher and that application-specific self-efficacy was a more powerful, direct determinant of ease of use than general computer self-efficacy. Chen & Tseng (2012) indicated that the Internet self-efficacy of teachers with respect to using web-based e-learning systems for in-service education had a significant positive influence on perceived usefulness and perceived ease of use.

Personal innovativeness in the domain of information technology (PIIT) (Rogers, 1995), the willingness of an individual to try out any new IT, played an important role in determining the outcomes of user acceptance of technology. Within the context of IT adoption, Brancheau & Wetherbe (1990) found that, relative to later adopters, earlier adopters were involved in significantly more interpersonal communication. The earlier adopters typically had the ability to envision the potential benefits and advantages associated with an innovation in its early stage of diffusion. Lewis, Agarwal, & Sambamurthy (2003) found that PIIT was a significant determinant of perceived ease of use. Extending prior findings, we theorized a direct effect of PIIT on perceived usefulness and perceived ease of use.

The above three variables are based on user characteristic, reflecting the cognitive and mental effects of learners for perceived usefulness and perceived ease of use. Therefore, these variables assist in understanding the effect of user characteristic.

For system characteristic, there are three variables, including computer playfulness, interface style, and interactivity. Chunga & Tan (2004) found that computer playfulness had a significant positive relationship with attitude toward use. They concluded that it was important for developers to include intrinsic and extrinsic motivational factors in perceived usefulness and perceived ease of use, thus helping to improve users' attitude toward use. Sun & Cheng (2009) indicated that playfulness had a significant effect on perceived usefulness and ease of use. Shyu & Huang (2011) pointed out that perceived enjoyment positively affected perceived ease of use for adopting acceptance of government information system. Park et al. (2012) showed that enjoyment had a significant effect on perceived usefulness and perceived ease of use.

Hasan & Ahmed (2007) examined the influence of two interface styles (menu- and command-based) on the perceived ease of use, perceived usefulness, and behavioral intention of the users to use office automatic systems. Tucker (2008) applied the TAM to predict user attitude toward using electronic commercial systems by conducting a web-based survey. The results indicated that the interface style of system design had a significant positive effect on perceived usefulness, and attitude toward use. Davis (1992) compared the impact of direct-manipulation and command based interfaces. Their results revealed that interface style had no significant

effect on ease of use. However, perceived usefulness was not examined in the study. Similar results were proposed by Gururajan & Fink (2002), who compared the impact of icons and menu interface styles. Sun & Cheng (2009) indicated that the factor of interface style had a significant effect on perceived usefulness and ease of use.

Hoffman & Novak (1997) found that affecting the attractiveness of interactive systems was an important factor. Cawthon & Moere (2007) assessed the attractiveness of interactive systems. Dagiene & Futschek (2008) thought that the attractiveness of interactive tasks was important and the effort for implementing the interactive part was worth doing. Interactive multimedia is a strong feature and enables users a new environment that provides more services than traditional teaching. Several studies discussed interactivity in business websites and reported that it was useful for distance learning research and design. Ha & James (1998), in their baseline analysis of business websites' interactivity, defined interactivity as the extent to which the communicator and audience respond to each other's communication needs. Drave (2000) put together a list of interaction modes that included single thread asynchronous discussion forums, threaded bulletin boards, real-time synchronous chat rooms, and email. Siau, Sheng, & Nah (2006) examined the effects of a classroom response system on interactivity. The results all showed that a classroom response system could significantly improve classroom interactivity.

The three variables mentioned above are based on system characteristic, playing important roles in determining the outcomes of user acceptance.

Relationships between web-based learning systems and TAM

Technology acceptance model (TAM) has constructed acceptance of a system as a function of users' perceptions of the ease of use and usefulness of system (Davis, 1989). More importantly, it suggested that perceptions of ease of use and usefulness were directly determined by external variables. The influence of technology acceptance model on the use of e-learning system has been widely investigated in recent literature (Lee et al., 2003; Liu et al., 2005; Ngai et al., 2007; Park, 2009; Seal & Przasnyski, 2001; Sheremetov & Arenas, 2002). Seal & Przasnyski described an implementation of the continuous improvement philosophy in a graduate class by using web services to obtain immediate and systematic feedback from students on lectures and other course activities. The feedback obtained was analyzed to determine how the delivery and content of the course could be improved. Sheremetov & Arenas proposed a system based on web learning environment. All user interfaces were web pages, generated dynamically by servlets, applets, and agents. Park surveyed a sample of 628 university students to figure out the students' behavioral intentions to use typical e-learning system. Liu et al. proposed an integrated theoretical framework for users' behavior on web-based streaming e-learning. The study considered the e-learning systems user as both a system user and a learner. They designed three presentation types of e-learning course, including text-audio, audio-video, and text-audio-video to test their theory development. Lee et al. proposed a web-based application called advanced interactive discovery environment (AIDE). AIDE is a virtual environment containing application-specific content, application-appropriate simulation and software packages, distributed learning modules, expert systems, knowledge bases, and synchronous and asynchronous communication tools, including message boards, instant messaging, chat, and multi-point audio and video. Ngai et al. extended TAM to include technical support as a precursor and explored the role of extended model in user acceptance of web course tools.

In addition, Liu et al. (2010) took the TAM as a foundation to discuss the effect of extended variables on whether users adopt an online learning community. Shyu and Huang (2011) explained and predicted usage of e-government learning based on the TAM to examine how perceived ease of use and perceived usefulness and their antecedents influenced intention and usage of a system. Arenas-Gaitán et al. (2011) examined cultural differences and technology acceptances from students of two universities, one Spain and Chile. The results indicated that students were culturally different with regard to some dimensions, but their behavior of acceptance of e-learning technology matched globally according to the TAM model. Park et al. (2012) employed an extension of the TAM to investigate factors that influenced successful implementation of a web-based training system in the construction industry. Chen and Tseng (2012) used the TAM as a foundation to add into teacher's perspective and examine factors that influence intentions to use in-service training conducted through web-based e-learning. Lin (2012) integrated information system continuance theory with task-technology fit to extend the TAM for understanding the precedents of the intention to continue virtual learning system and their impacts on learning.

However, most past studies have focused on examining the role of individual characteristics of users, and few researchers have explored the impacts of both user and system characteristics on CRSs, especially on web-based

CRSs.

RESEARCH APPROACH

In the theoretical fundamental, we adopted the theory of technology acceptance model (TAM). We constructed the conceptual model of TAM to assess the relationships between system characteristic, user characteristic, usefulness, ease of use, and attitude toward use, as shown in Figure 1.

Over the last decade, substantial empirical evidence has accumulated to support TAM (Yi, Jackson, Park, & Probst, 2006). Attitude toward using a new system is determined by perceived ease of use and perceived usefulness.

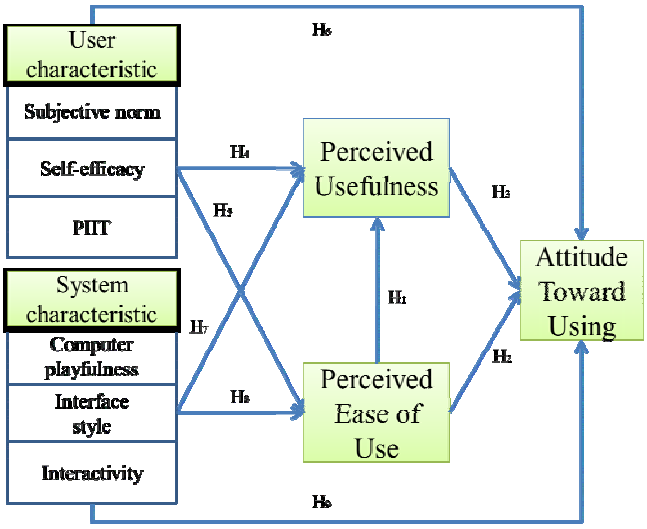

Figure 1. Research Model.

In addition, intention to use is also determined by attitude toward use. Our research model is adapted from prior research. In this study, we want to understand the effect of user and system characteristics on perceived usefulness, perceived ease of use, and attitude toward use for our proposed web-based CRS. Therefore, we test the relationships among user characteristic, system characteristic, perceived ease of use, perceived usefulness, and attitude toward use with the following hypotheses H_1 to H_9.

H_1. Perceived ease of use is positively related to perceived usefulness.
H_2. Perceived ease of use is positively related to attitude toward use.
H_3. Perceived usefulness is positively related to attitude toward use.

User characteristic

For the user characteristic, subjective norm represents the perception, by which way other people expect the person to behave. It is expected to play a significant role in forming their mental models. Therefore, the subjective norm that provides positive attitude to reduce cognitive and mental effort is expected to receive more favorable evaluations from users. We follow this trend and, consistent with existing research, hypothesize that subjective norm will have positive impacts on perceived usefulness, perceived ease of use, and attitude toward use.

Self-efficacy plays an important role in determining a person's behavior. Following similar reasoning, we hypothesize that self-efficacy is positively related to perceived usefulness, and attitude toward use.

Earlier adopters of innovative technology would feel more confident about the tangible results. Therefore, we hypothesize that personal innovativeness in the domain of information technology (PIIT) is an antecedent to perceived usefulness, perceived ease of use, and attitude toward use. Therefore, we test the relationships between user characteristic and perceived ease of use, perceived usefulness, and attitude toward use with hypotheses H_4 to H_6.

H_4. User characteristic is positively related to perceived usefulness.
H_{4-1}. Subjective norm is positively related to perceived usefulness.
H_{4-2}. Self-efficacy is positively related to perceived usefulness.
H_{4-3}. PIIT is positively related to perceived usefulness.

H_5. User characteristic is positively related to perceived ease of use.
H_{5-1}. Subjective norm is positively related to attitude perceived ease of use.
H_{5-2}. Self-efficacy is positively related to perceived ease of use.
H_{5-3}. PIIT is positively related to perceived ease of use.

H_6. User characteristic is positively related to attitude toward use.
H_{6-1}. Subjective norm is positively related to attitude toward use.
H_{6-2}. Self-efficacy is positively related to attitude toward use.
H_{6-3}. PIIT is positively related to attitude toward use.

System characteristic

Computer playfulness can affect user acceptance as an intrinsic motivator which can be described as the most enjoyable experience possible. Interface style of system design has strong effects on the determinants of system acceptance. Interactivity in web sites can be useful for distance learning. In our related work, the authors found that computer playfulness, interface style, and interactivity have a significant positive relationship with users' perceived usefulness, perceived ease of use, and attitude toward use. Therefore, perceptions of system characteristic are influenced by user perceptions of computer playfulness, interface style, and interactivity. There are other system attributes, such as system reliability, documentation, and functionality that have the potential to influence users' perceptions of usefulness and ease of use. We, however, chose to focus on the impact of computer playfulness, interface style, and interactivity for several reasons.

First, there has been little research in this area and several researchers, as described above in the section of literature review, have called for additional research to gain better insights into the role of educational information technology. Second, given the mixed and inconsistent results, knowledge of how system characteristic affects perceptions of user remains incomplete. Third, from a user's perspective, system characteristic represents a user's perception of using the system, not system functionality and documentation. Finally, since the system characteristic is completely under the control of system designers and developers, reliability is a basic requirement. Therefore, we test the relationships between system characteristic and perceived ease of use, perceived usefulness, and attitude toward use with hypotheses H_7 to H_9.

H_7. System characteristic is positively related to perceived usefulness.
H_{7-1}. Computer playfulness is positively related to perceived usefulness.
H_{7-2}. Interface style is positively related to perceived usefulness.
H_{7-3}. Interactivity is positively related to perceived usefulness.

H_8. System characteristic is positively related to perceived ease of use.
H_{8-1}. Computer playfulness is positively related to perceived ease of use.
H_{8-2}. Interface style is positively related to perceived ease of use.
H_{8-3}. Interactivity is positively related to perceived ease of use.

H_9. System characteristic is positively related to attitude toward use.
H_{9-1}. Computer playfulness is positively related to attitude toward use.
H_{9-2}. Interface style is positively related to attitude toward use.
H_{9-3}. Interactivity is positively related to attitude toward use.

CRS-based vs. traditional learning performance

To understand the difference between CRS-based and traditional learning performance, we selected two classes to experiment. One used web-based CRS materials, denoted as CRS-based group, while the other was taught in the conventional way, denoted as tradition-based group. Students of the two classes took a visualization programming course, a three-hour-per-week course lasting 18 weeks. The grades of CRS-based class are compared with those of traditional learning class. Therefore, we tested the difference between traditional and CRS-based learning performance with hypothesis H_{10}.

H_{10}. The performance of CRS-based learning is significantly different from that of traditional learning.

Items used in the questionnaire to operationalize the constructs in our research model are adapted from prior research in our related work with changes in wording appropriate for the system in the targeted context. All of the items shown in appendix A are measured on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

The Proposed Web-based Classroom Response System

We developed the web-based classroom response system to support instructional sequence and web-based instantaneous feedback aggregation. The architecture of the system consists of four main components: course entry, course management, test banks, and material management. The course entry provides component areas for assignment, bulletin, online classroom, learning track, reference material, and discussion. Figure 2 illustrates the main functions of course entry.

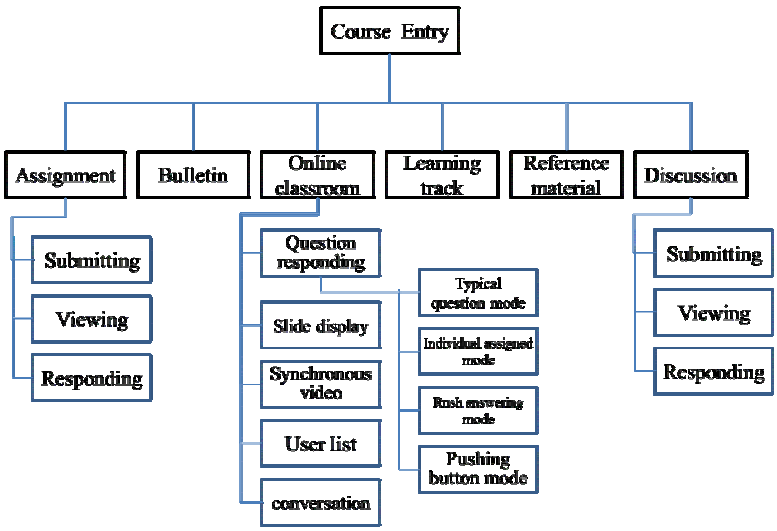

Figure 2. Main functions of the course entry for the proposed web-based CRS.

Figure 3. Online classroom of the proposed web-based CRS.

The online classroom provides students with online users list, question responding, synchronous video, online conversation, and slide display. Figure 3 illustrates the situation of online teaching. In the online users list, instructor can assign questions from test banks to online students and ask students to respond to the questions in "question responding". This question function has four modes for instructors to choose from. The first mode, typical question, is used to ask all online students to answer the question. The responding student is asked to

indicate whether a statement is true or false, or to choose an option among given choices predetermined by the instructor. Figure 4 illustrates the situation of the typical question mode. The system can provide reliable aggregation of students' responses with interpretable output in the form of a PI graph and keep the learning track.

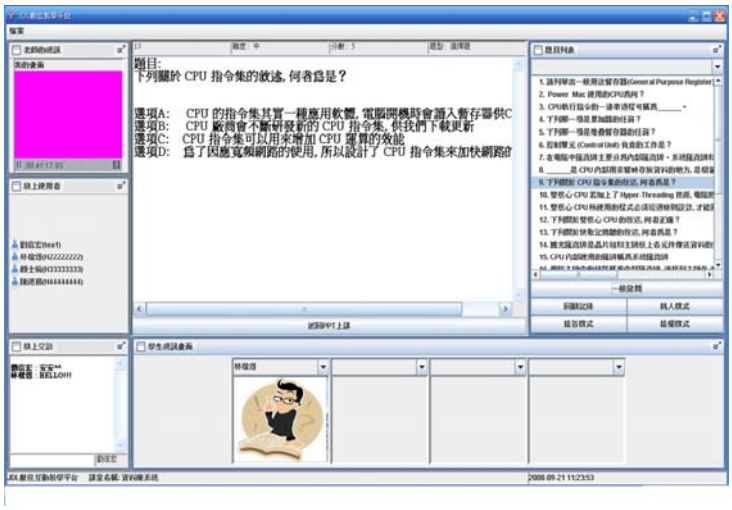

Figure 4. Typical question of the proposed web-based CRS.

In addition, three playful modes have been developed in this web-based classroom response system to raise computer playfulness, friendly interface, and interactivity. One, "individual assigned mode" allows instructors to assign a question to individual students. The "rush answering mode" encourages students to try to be the first to answer the question. Finally, "pushing button mode" is similar to traditional raising the hand to answer.

In the implementation, the Java Media Framework (JMF) application interface (API) was employed to enable audio, video, and other time-based media to be added to the applications. Therefore, a multimedia capturing device in the JMF API can act as a source of multimedia data delivery. For example, a microphone, capable of capturing raw audio input, and a digital video capture board might deliver digital video from a camera. Such capture devices are abstracted as data sources to provide timely delivery of data. The audio/video conferencing board is used to deliver both an audio and a video stream. The JMF enables the playback and transmission of real time protocol (RTP) streaming through the APIs defined in the javax.media.rtp, javax.media.rtp.event, and javax.media.rtp.rtcp packages. The JMF can be extended to support additional RTP-specific formats. We have implemented a video conferencing application to capture live audio and video. The system can transmit them across the Internet using the RTP API. The JMF API consists mainly of interfaces that define the behavior and interaction of objects used to capture, process, and present time-based media. By the intermediary objects, the JMF makes it easy to integrate new implementations of key interfaces that can be used seamlessly with existing classes.

Experimental Results

We examined the correlations among the study variables. The average inter-item correlation was .543. The correlation was within an acceptable range (i.e., less than .80), which indicated that multicollinearity was not present among the study variables (Hair, Anderson, Tatham, & Black, 1998). Table 1 illustrates the correlation between user characteristic, system characteristic, and TAM. The coefficient of system characteristic for perceived ease of use (i.e., .807) is greater than that of user characteristic (i.e., .599), while the coefficient of user characteristic for perceived usefulness (i.e., .706) is greater than that of system characteristic (i.e., .578). This implies that the effect of external variables of user characteristic on perceived usefulness is more than that of system characteristic, while the effect of system characteristic on perceived ease of use is more than that of user characteristic.

Table 1: *The correlation analysis*

TAM	External variables	correlation coefficient
Perceived ease of use	User characteristic	.599
	System characteristic	.807
	Perceived usefulness	.492
	Attitude toward use	.651
Perceived usefulness	User characteristic	.706
	System characteristic	.578
	Attitude toward use	.617
Attitude toward use	User characteristic	.729
	System characteristic	.731

Table 2: *The correlation analysis of user and system characteristics*

	Subjective norm	Self-efficacy	PIIT
Computer playfulness	.563**	.188	.235
Interface style	.487**	.648**	.518**
Interactivity	.694**	.500**	.619**

Note. **: p-value < .01 and *: p-value <.05

Correlation coefficients are presented in Table 2 to illustrate the relationship between user characteristic and system characteristic. Most variables from user and system characteristics have significant correlation between each other, except for computer playfulness vs. self-efficacy and PIIT. This implies that the relationship between user and system characteristics is significant.

Additionally, the internal reliability of multiple-item scales was measured by computing internal reliability alpha. Cronbach's alpha, .953, was within the acceptance range (i.e., greater than .7). We attempted to expand our explanatory ability and statistical efficiency by using structural equation model (SEM) to examine a series of dependence relationships. The set of relationships, each with dependent and independent variables, was the basis of SEM. Based on our research model, we constructed link relationships in path diagram shown in Figure 1. A series of causal relationships in a path diagram was translated into a set of equations for estimation.

Before evaluating the model, we assessed the overall fit of the model to ensure that it was an adequate representation of the entire set of causal relationships. The five measurements of goodness-of-fit were useful by absolute, incremental, and parsimonious fit measures (Hair et al., 1998). The first measure of overall model fit employed the goodness-of-fit index (GFI). The measurement was a good fit if the GFI value was close to 1 and greater than .9. The second measure of overall model fit employed the adjusted goodness-of-fit index (AGFI). The measure was good fit if its value was greater than .9. Third measure of absolute fit was the root mean square residual. This indicated that the average residual correlation was .004, deemed acceptable given the rather strong correlations. The fourth measure of overall model fit employed the root mean square error of approximation (RMSEA). The fifth measure of overall model fit employed chi-square. This indicated good fit if the value was less than 2. Table 3 shows all the goodness-of-fit measurements for our model. The overall situation is good except the chi-square divided by degree of freedom.

Table 3: *The goodness-of-fit measurements*

index	value	criterion	acceptability
GFI	.990	>.9	acceptable
AGFI	.886	>.9	acceptable
RMSR	.004	<.1	acceptable
RMSEA	.000	<.1	acceptable
Chi-square	.044	<.1	acceptable

We used a statistical tool, AMOS 6.0 (Arbuckle, 1995), to identify correlations of variables by the path diagram. The obtained coefficients representing the strength of each relationship were calculated by the parameter estimation of an ordinary least square method between any two paths. The β value can show the strength of each relationship, while the p value can illustrate the significance of each independent variable if it is less than .05. In our longitudinal design, the collected data of the first point in time are illustrated by the SEM, shown in Figure 5, for short-term use, which is the tested result using the system for one week. In the perceived ease of use (R^2= .54), it is with the explanatory ability of 54%. The system characteristic has a significant effect on

perceived ease of use (β= .74 and p=0.000). In the perceived usefulness (R^2= .73), it is with the explanatory ability of 73%. Both user and system characteristics (β= .38, .64 and p=.006, .000) have a significant effect on perceived usefulness. In the attitude toward use (R^2= .64), it is with the explanatory ability of 64%. The attitude toward use has a significant effect on perceived ease of use and perceived usefulness (β= .56, .35 and p=.000, .006). Thus, hypotheses H_2, H_3, H_4, H_7, and H_8 are supported.

The second set of data collected in the eighteenth week, showing the results of having used the system for 9 weeks, is illustrated by the SEM figure, as shown in Figure 6, for long-term use. The explanatory abilities for perceived ease of use, perceived usefulness, and attitude toward use are 65%, 51%, and 63%, respectively. Based on the analysis, user characteristic is positively related to perceived usefulness, while system characteristic is positively related to perceived ease of use. Hypotheses H_4 and H_8 are supported. We further analyze the variables of user and system characteristics to figure out the individual effects. In the user characteristic, subjective norm (β=.70 and p=.000) affects significantly on perceived usefulness. In the system characteristic, computer playfulness (β= .62 and p=.000) has a significant effect on perceived ease of use. In addition, computer playfulness (β= .35 and p=.020) affects significantly the attitude toward use. Short-term use is compared with long-term use in Figure5 and Figure 6 to observe the effect of the user and system characteristics. In the user characteristic, the effect on perceived usefulness for long-term use is more significant than that for short-term use. Subjective norm is an important factor for user characteristic. This implies that the perceived usefulness for students has a significant effect on the opinions of most classmates and teachers after long-term use of the system. The β value changes from .38 to .64. The system characteristic with short-term use has a significant effect on perceived usefulness, but that with long-term use has not. This is because students perceived the system to be interesting, novel, and useful in the first use. However, after having used the system for nine weeks, they do not think the system characteristic affects the usefulness.

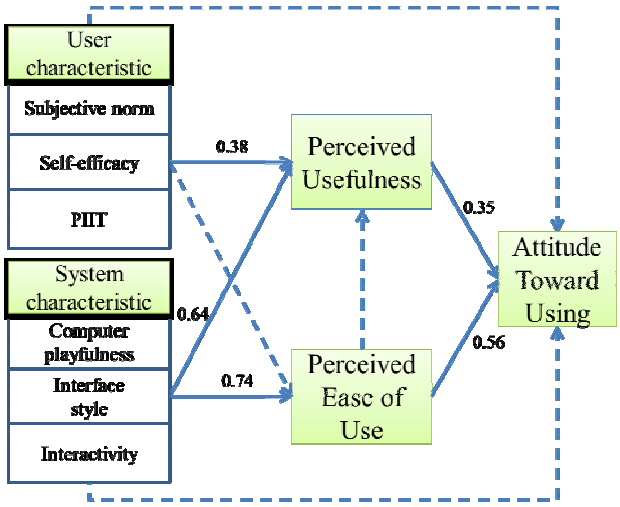

Figure 5. SEM of short-term use based on research model.

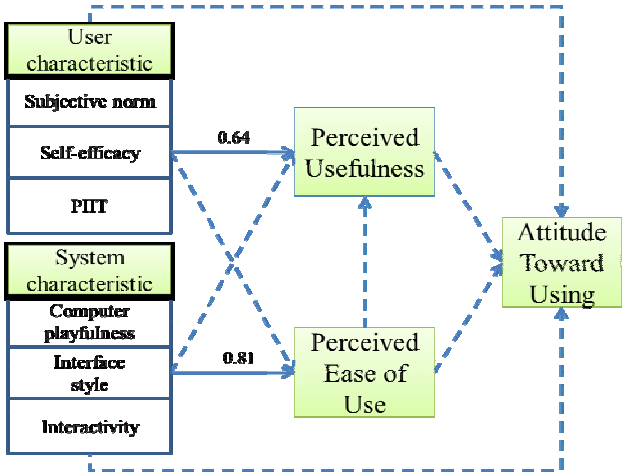

Figure 6. SEM of long-term use based on research model.

On the other hand, the effect on perceived ease of use for long-term use is more significant than that for short-term use. The β value changes from .74 to .81. The effect of system characteristic on perceived ease of use for both is significant, especially on the factor of computer playfulness.

To evaluate the effectiveness of the web-based CRS, we selected two classes to experiment. The survey was completely anonymous. Participants of CRS-based group were continuously taught with the classroom response systems from the tenth week to the eighteenth week. The questionnaires were given to the participants of CRS-based group twice during the study. Thirty-two questionnaires were obtained from CRS-based group in the tenth week, and thirty questionnaires were obtained in the eighteenth week. Those in tradition-based group were continuously taught in the conventional way from the first week to the eighteenth week.

Table 4: *The difference between two groups*

groups	midterm exam (mean, standard deviation)	final exam (mean, standard deviation)
CRS-based group	(84.32, 3.03)	(57.17, 4.08)
tradition-based group	(60.61, 4.81)	(32.17, 3.61)

Table 4 illustrates the difference in effectiveness between CRS-based group and tradition-based group. The average grades were normalized by Z distribution. The t-test is shown in equation (1).

$$T = \frac{\mu_1 - \mu_2 \times 1.4}{\sqrt{\frac{s_1^2}{n_1} + \frac{(s_2 \times 1.4)^2}{n_2}}} \quad (1)$$

where μ_1, μ_2, s_1, and s_2 are the average values and the standard deviations of final exams for CRS-based group and tradition-based group, respectively, and n_1 and n_2 are the number of students for the two groups. In the t-test equation (1), μ_2 is multiplied by 1.4 because the mean of midterm exam for CRS-based group is 1.4 times that of tradition-based group. When T is greater than 1.96, we can conclude that the average values of the two groups are significantly different under a Type I error level probability, denoted as significance level (.05). The computed value, T = 12.08, by the equation (1), is greater than 1.96. Therefore, the grade of CRS-based group is better than that of tradition-based group. Thus, hypothesis H_{10} is supported.

DISCUSSIONS AND CONCLUSIONS

We have implemented the web-based CRS to help instructors conduct their teaching activities. The system consists of course entry component, course management component, test banks component, and material management component. It also provides reliable aggregation of students' responses and easily interpretable output in the form of a PI graph, and keeps learning tracks. In addition, three playful modes have been developed in the system in order to increase computer playfulness, friendly interface, and interactivity for students.

In our empirical study, we have examined the effects of user characteristic and system characteristic on perceived usefulness, perceived ease of use, and behavior intention for the system. The findings indicate that computer playfulness of system characteristic has a significant effect on perceived ease of use and attitude toward use, while the subjective norm of user characteristic has a significant effect on perceived usefulness, thus supporting hypotheses H_2, H_3, H_4, H_7, and H_8.

For negative hypothesis H_1, for students using the web-based CRSs the perceived ease of use is no longer useful for the system. For hypotheses H_2 and H_3, previous research has successfully applied TAM in the context of general web-based learning systems (Yi et al., 2006). The findings strongly support the appropriateness of using TAM to understand the factors that influence attitude toward using the web-based CRS. Students are most likely to participate in the web-based CRS learning when they perceive it as a useful tool for improving learning performance. Additionally, students are willing to use the system to assist their course work if they find it easy to use. The results show that perceived ease of use has a stronger effect on attitude toward use than perceived usefulness in the context of web-based CRS. One possible explanation is that the web-based CRS is a relatively new approach to learning and perceived ease of use is a basic requirement for respondents. It is extremely important to make the system easy to interact with, such as through clear and simple navigation buttons of all the pages and personalized information search service, since such measures enhance student perceptions of the ease of use. For hypothesis H_4, many past studies have validated this proposition in a wide variety of settings (Hasan, 2006; Lewis et al., 2003; Yi & Hwang, 2003). User characteristic has a significant effect on perceived usefulness. For negative H_5, this means that user characteristic, including subjective norm, self-efficacy, and PIIT, has not a significant effect on perceived ease of use. For negative H_6, user characteristic also has not a significant effect on attitude toward use. For hypotheses H_7 and H_8, system characteristic, such as computer playfulness, interface style, and interactivity, has a significant effect on perceived usefulness and perceived ease of use. Prior research (Chunga & Tan, 2004; Dagiene & Futschek, 2008; Hasn & Ahmed, 2007; Siau et al., 2006; Tucker, 2008) in the effect of system characteristic also indicated that computer playfulness, interface style, and interactivity had significant positive relationships with perceived usefulness and perceived ease of use. For negative H_9, system characteristic has not a significant effect on attitude toward use. For hypothesis H_{10}, the learning performance of CRS-based group is better than that of tradition-based group. Previous studies (Gok, 2011; Preszler et al., 2007) indicated that the benefits of using the CRSs can support teaching and learning within lectures and increase learning performance.

The results of analyzing structural equation model illustrate explanatory ability and statistical efficiency between dependent and independent variables. In the empirical study of web-based CRS, the computer experience of subjects is positively related to perceived ease of use. On the other hand, computer playfulness from interaction between the subjects and the system is positively related to perceived ease of use as well. However, computer playfulness is not positively related to the perceived usefulness. This implies that computer playfulness is an important factor for the perceived ease of using the web-based CRS. In addition, subjective norm is not positively related to perceived ease of use, but it has a direct effect on perceived usefulness. This implies that the opinions of classmates and teachers are an important factor for perceived usefulness.

Although most past studies have been examining possible factors of technology adopting acceptance across several fields, such as information systems, education, government information systems, as external variables in TAM, few researchers aggregate these variables into two characteristic constructs--user characteristic and system characteristic. The advantage with separating two classifications is that it helps us understand the difference between two characteristics. For the past studies of CRSs, almost all of the CRS studies were based on typical question format that required all learners to select from given options. Beyond traditional CRSs, students are asked to indicate whether a statement is true or false, or to select an option. Our proposed system provides three playful classroom response modes--the individual assigned mode, the rush answering mode, and the pushing button mode--to increase computer playfulness, friendly interface, and interactivity for students. To understand the adopting acceptance for both user and system characteristics, the study examines the impact of these characteristics for the web-based CRS. The results of the empirical study indicate that the effect of user characteristic on perceived usefulness is more than that of system characteristic, while the effect of system characteristic on perceived ease of use is more than that of user characteristic. For the perceived usefulness, the finding implies that user's beliefs such as subjective norm, self-efficacy, and PIIT play an important role in system acceptance, especially on the web-based CRS. For the perceived ease of use, it implies that user's perception of using the system, including computer playfulness, interface style, and interactivity, is more important than user's beliefs.

In addition, the research design of most studies adopted cross-sectional design to collect data at one point in time.

This limits causal inferences because temporal priority is difficult to establish. The questionnaires of our experiment in this study are based on the longitudinal design and examined two points in time. It can raise causal inferences. Moreover, we selected two classes to experiment and compare with learning performance in order to understand the difference between CRS-based and traditional teaching. The result indicates that the grade of CRS-based group is better than that of tradition-based group. This implies that the benefit of using the CRSs can increase learning performance.

There are some limitations to our research. First, although the results of SEM analysis have shown the effect of user and system characteristics on perceived usefulness, perceived ease of use, and attitude of use, only one experimental system was investigated. Therefore, the effects of system characteristics may be weaker than those of user characteristics, due to the artificial effect of restriction of range. Second, the generalization of the findings may be limited to fewer number of subjects. Although there is no single criterion that dictates the necessary sample size, more typical is a ratio of five respondents for each estimated variable. Finally, the grades of students are regarded as learning performance. This lacks for subjective learning performance which is assessed by students.

In summary, the effect of user characteristic on perceived usefulness is more than that of system characteristic, while the effect of system characteristic on perceived ease of use is more than that of user characteristic. For user characteristic, efforts to improve perceived usefulness and perceived ease of use, like training, could be used, which will enhance self-efficacy of system users. For system characteristic, it is desirable to forecast user acceptance as early as possible in the design process. In an early stage of the systems development process, key decisions are made, a small fraction of development costs has been incurred, and greatest flexibility exists to modify the design. If sufficient user acceptance tests are performed early in the design, the risk of user rejection could be reduced and preventive and predictive measures could be applied to ensure future user acceptance.

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Appendix A. Questionnaire items

All of 28 items were measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). In addition to the study variables, the survey included questions about age, gender, and computer experience.

Perceived ease of use
1) I feel that this system is easy to use.
2) Learning to use this system would be easy for me.
3) My interaction with this system is clear and understandable.
Perceived usefulness
4) Using this system would enhance my effectiveness in learning this course.
5) Using this system would improve my understanding for the course.
6) I feel this system useful.

Attitude toward using
7) I dislike the idea of using this system to help me learn the course. (Reversed item)
8) I have a generally favorable attitude toward using this system.
9) I believe it is a good idea to use this system for learning the course.
10) Using this system is a foolish idea. (Reversed item)

Subjective norm
11) Most classmates whose opinions I value prefer me to use this system in my learning.
12) For the learning, my classmates who are important to me think that I should use this system.
13) For the learning, my teacher thinks that I should use this system.

Self-efficacy
14) I am able to use this system.
15) I have the experience of using Internet.
16) If my classmates are able to use the system, I am able to use the system as well.

PIIT
17) If I heard about a new information technology, I would look for ways to experiment with it.
18) Among my peers, I am usually the first to try out new information technologies.
19) I like to experiment with new information technologies.

Computer playfulness
20) I feel that this system is playful.
21) Using this system, I enjoy the entertainment.
22) I spontaneously use this system.

Interface style
23) I am able to use this input interface.
24) This input interface facilitates my interaction with this system.
25) Using this input interface, I can facilitate to control this system function.

Interactivity
26) I feel that this system increases more communication with teacher.
27) This system raises interaction with teacher.
28) This system makes me and teacher produce more interaction.

THE IMPACT OF ICT ON EDUCATIONAL PERFORMANCE AND ITS EFFICIENCY IN SELECTED EU AND OECD COUNTRIES: A NON-PARAMETRIC ANALYSIS

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ABSTRACT
The purpose of the paper is to review some previous researches examining ICT efficiency and the impact of ICT on educational output/outcome as well as different conceptual and methodological issues related to performance measurement. Moreover, a definition, measurements and the empirical application of a model measuring the efficiency of ICT use and its impact at national levels will be considered. For this purpose, the Data Envelopment Analysis (DEA) technique is presented and then applied to selected EU-27 and OECD countries. The empirical results show that the efficiency of ICT, when taking educational outputs/outcomes into consideration, differs significantly across the great majority of EU and OECD countries. The analysis of the varying levels of (output-oriented) efficiency (under the VRSTE framework) shows that Finland, Norway, Belgium and Korea are the most efficient countries in terms of their ICT sectors. Finally, the analysis finds evidence that most of the countries under consideration hold great potential for increased efficiency in ICT and for improving their educational outputs and outcomes.
Keywords: Information and Communication Technology (ICT), education, performance, efficiency, DEA, EU, OECD

INTRODUCTION

Information and communication technology (ICT) is one of the most important driving forces promoting economic growth in the economy. However, there is less of a consensus among economists on whether the impact of ICT also stems from higher total factor productivity (TFP) growth and improved efficiency of production (due to a better educated population). During the last two decades countries have invested heavily in ICT. Indeed, the use of ICT in education and training has been a key priority in most EU and OECD countries in the last decade, although progress has been uneven. ICT has had a major impact on the education sector, on organisation and on teaching and learning methods. Yet there are considerably different ICT expenditure levels within and between countries, as well as between institutions within countries. In some countries schools have embedded ICT into the curriculum, and demonstrate high levels of effective and appropriate ICT use to support teaching and learning across a wide range of subject areas. However, in other countries schools are in the early phase of adopting ICT, characterised by important enhancements of the learning process, some developments of e-learning (ICT-enabled learning), but without any profound improvements in learning and teaching (Balanskat et al., 2006).

One puzzling question concerns the effective impact of these technologies on educational outputs and outcomes. As ICTs are being increasingly used in education, indicators to monitor their impact and demonstrate accountability to funding sources and the public are ever more needed. Indicators are required to show the relationships between technology use and educational performance. There is also a need to show that education should be seen as using technology not only as an end in itself, but as a means to promote creativity, empowerment and equality and produce efficient learners and problem solvers. Many academic researchers have tried to answer this question at theoretical and empirical levels. They have faced two main difficulties. On one hand, student performance is hard to observe and there is still confusion about its definition. On the other, ICT entails evolving technologies and their effects are difficult to isolate from their environment. Consequently, the relationship between the use of ICT and educational performance is unclear, and contradictory results are presented in the literature (Youssef and Dahmani, 2008).

Accordingly, the paper's purpose is to discuss and review some previous researches on ICT efficiency and ICT's impact on educational outcomes as well as different conceptual and methodological issues related to measuring performance in education. Moreover, a definition, measurements and an empirical application of a model measuring the efficiency of ICT at national levels will be considered, with a special focus on educational variables as outputs/outcomes. In this context, the Data Envelopment Analysis (DEA) technique will be presented and then applied to selected EU-27 and OECD countries.

The paper is structured as follows: first, a brief survey of the literature relating to ICTs and their impact on education performance is presented, then the methodology is established and the specifications of the models are defined. The next section outlines the results of the non-parametric efficiency analysis and presents partial

correlation coefficients in order to assess the impact of ICT on educational performance. The final section provides concluding remarks and some policy implications.

LITERATURE REVIEW

Many theoretical and empirical efforts have been made to assess the impact of ICT on in educational performance in various settings. Recent approaches to evaluating ICT in education often only focus on a few aspects such as input, output and outcome/impact. The use of indicators can help assess how the input (e.g. monetary, infrastructure, resources) relates to the impact. However, an evaluation must consider different stages in the implementation process and analyse changes in the culture of the school system – at the micro level (pupils) as well as at the meso (institutions/schools) and macro (national) levels. At national and institutional levels, educational policies and regulations have been established to support the educational use of ICT. In school and classroom settings, teachers and school administrators are attempting to find the best ways to harness ICT technology to support their teaching and students' success. However, accomplishments that are convincingly the result of the direct causal impact of ICT use are not always easily identifiable (Kang et al., 2008).

Currently, there is a significant number of initiatives to assess and monitor the efficiency of ICT use and its impact on education. SITES (the second information technology in educational study), sponsored by the International Association for the Evaluation of Educational Achievement (IEA), is an exemplary study which identifies and describes the educational use of ICT across 26 countries in the world. The study explores the use of computers in teaching through sampling teachers, principals and ICT responsibility in schools. While it does not look into student achievement, it does look at the perceived impact of ICT on students from the teacher's perspective (Pelgrum and Anderson, 1999; Kozma, 2003). Moreover, Balanskat et al. (2006) reviewed several studies on the impact of ICT on schools in Europe. They conclude that the evidence is scarce and comparability is limited. Each study employs a different methodology and approach, and comparisons between countries must be made cautiously. In addition, in several other studies (see Yusuf, & Afolabi, 2010; Shaikh, 2009; Jayson, 2008; Shaheeda et al., 2007) it is argued that ICT helps to improve the quality of learning and educational outcomes. Some other surveys (e.g., Iqbal, and Ahmed, 2010; Hameed, 2006; Amjad, 2006; Khan, and Shah, 2004) argue that, in order to be successful, a country should improve its education system by implementing effective and robust ICT policies.

In contrast, Trucano (2005) reviews a series of studies on ICT's impact on schools and concludes that the impact of ICT use on learning outcomes is unclear. Moreover, Cox and Marshall (2007) point out that ICT studies and indicators do not demonstrate solid effects. Empirica (2006) also explores the access and use of ICT in European schools in 2006. It presents information for 25 EU member states, Norway and Iceland, but does not look into student results so it is impossible to study this important aspect of ICT impact. Machin et al. (2006) state that, while there is a clear case for using ICT to enhance the computer skills of students, the role of technology-enhanced learning (TEL) is more controversial (Machin et al., 2006). There is neither a strong and well-developed theoretical case nor much empirical evidence supporting the expected benefits accruing from the use of ICT in schools since different studies find mixed results (Kirkpatrick and Cuban, 1998). Indeed, while Becta (2002) and Kulik (2003) find a positive effect on the use of ICT and educational attainment, researches by Fuchs and Woessman (2004), Leuven et al. (2004) or Goolsbee and Guryan (2002) find no real positive effect of the use of ICT on educational results once other factors, such as school characteristics or socioeconomic background, are taken into account.[1]

A few previous studies on the performance and efficiency of the education sector (at the national level) applied non-parametric methods. For instance, Gupta and Verhoeven (2001) measure the efficiency of education in Africa, Clements (2002) does so for Europe, St. Aubyn (2003) for education spending in the OECD, and Afonso and St. Aubyn (2005, 2006a, 2006b) in OECD countries. Most studies apply the Data Envelopment Analysis (DEA) method, while Afonso and St. Aubyn (2006a) undertake a two-step DEA/Tobit analysis in the context of a cross-country analysis of secondary education efficiency. However, very few recent studies have examined the efficiency of countries in utilising their ICT resources for educational outputs and outcomes and the impact of ICT on education in a particular country, for instance in Turkey (Tondeur et al., 2007) and Belgium (Gulbahar, 2008). Since very insightful, cross-country analyses have rarely been used for ICT policy analysis, the present research addresses this gap in the literature.

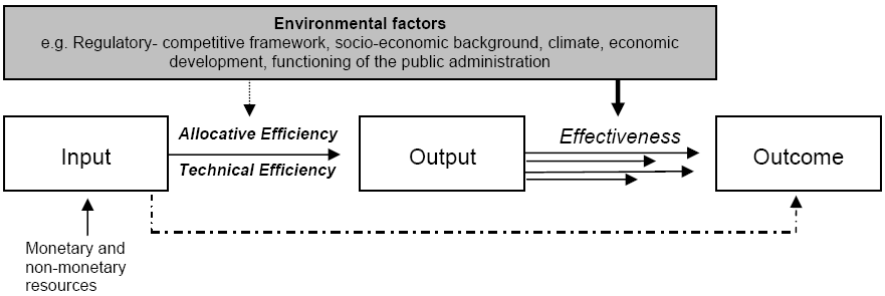
[1] Indeed, Kozma (2008) pointed out that 'some studies reveal a positive correlation between the availability of computer access or computer use and attainment, others reveal a negative correlation, whilst yet others indicate no correlation whatsoever between the two'.

METHODOLOGY AND DATA

The measurement of efficiency generally requires: (a) an estimation of costs; (b) an estimation of output; and (c) a comparison between the two. Applying this concept to ICT activities, we can say, for example, that ICT expenditure is efficient when, given the amount spent, it produces the largest possible benefit for the country's population.[2] Often efficiency is defined in a comparative sense: the relation between benefits and costs in country X is compared with that of other countries. If in country X the benefits exceed the costs by a larger margin than in other countries, then ICT expenditure in country X is considered more efficient. However, the measurement of ICT efficiency is relatively complicated since the comparison and measurement of both costs and benefits may be difficult.

Figure 1 illustrates the link between input, output and outcome, the main components of efficiency and effectiveness indicators. The monetary and non-monetary resources deployed (i.e. the input) produce an output. For example, ICT spending, investment in the broadband network or a baseline computer-pupil ratio (as possible inputs) affects the number of students completing a grade (as a possible output) and national test results (as a possible outcome). The input-output ratio is the most basic measure of efficiency.[3] However, compared to productivity measurement, the efficiency concept incorporates the idea of the production possibility frontier, which indicates feasible output levels given the scale of operations. The greater the output for a *given* input or the lower the input for a *given* output, the more efficient the activity is. Productivity, by comparison, is simply the ratio of outputs produced to the inputs used. On the other hand, effectiveness relates the input or the output to the final objectives to be achieved, i.e. the outcome. The outcome is often linked to welfare or growth objectives and may therefore be influenced by multiple factors (including outputs but also exogenous 'environment' factors). Effectiveness is more difficult to assess than efficiency since the outcome is influenced by political choices.

Figure 1: Conceptual Framework of Efficiency and Effectiveness



Source: Mandl et al., 2008.

A common non-parametric technique that has recently started to be commonly applied to expenditure analysis is Data Envelopment Analysis (DEA).[4] DEA is a non-parametric frontier estimation methodology originally introduced by Charnes et al. (1978) that compares functionally similar entities described by a common set of multiple numerical attributes. DEA classifies entities into "efficient" or "performers" versus "inefficient" or "non-performers." According to the DEA framework, inefficiencies are degrees of deviance from the frontier. Input inefficiencies show the degree to which inputs must be reduced for an inefficient country to lie on the efficient practice frontier. Output inefficiencies are the increase in outputs needed for a country to become efficient. If a particular country either reduces its inputs by the inefficiency values or increases its outputs by the amount of inefficiency, it can become efficient; that is, it can obtain an efficiency score of one. The criterion for classification is determined by the location of an entity's data point with respect to the efficient frontier of the production possibility set. The classification of any particular entity can be achieved by solving a linear program (LP).

Various types of DEA models can be used, depending upon the problem at hand. The DEA model we use can be distinguished by the scale and orientation of the model. If one cannot assume that economies of scale do not change, then a variable returns- to-scale (VRSTE) type of DEA model, the one selected here, is an appropriate choice (as opposed to a constant-returns-to-scale, (CRS) model). Furthermore, if in order to achieve better efficiency, economies' priorities are to adjust their outputs (before inputs), then an output-oriented DEA model

[2] The word benefit is used because economists often distinguish between output and outcome.

[3] When measuring efficiency, a distinction can be made between technical and allocative efficiency. Technical efficiency measures the pure relationship between inputs and outputs taking the production possibility frontier into account. On the other hand, allocative inefficiency occurs if the distribution of particular public sector outputs is not in accordance with personal preferences (Bailey, 2002).

[4] Originating from Farrell's (1957) seminal work, DEA analysis was originally developed and applied to firms that convert inputs into outputs (see Coelli et al. (2002) for a number of applications).

rather than an input-oriented model is appropriate. The way in which the DEA program computes efficiency scores can be explained briefly using mathematical notation (adapted from Ozcan, 2007). The VRSTE envelopment formulation is expressed as follows:

$$\mathbf{VRS_\rho\ (Y_l, X_l, u^l, v^l):\ min\text{-}(u^l s + v^l e)}$$

$$\mathbf{Y\lambda\text{-}s = Y_l}$$

$$\mathbf{-X\lambda\text{-}e = -X_l}$$

$$\mathbf{1\lambda = 1}$$

$$\mathbf{\lambda \geq 0,\ e \geq 0,\ s \geq 0}$$

For decision making unit 1, $x_{i1} \geq 0$ denotes the i^{th} input value, and $y_{i1} \geq 0$ denotes the r^{th} output value. X_1 and Y_1denote, respectively, the vectors of input and output values. Units that lie on (determine) the surface are deemed *efficient* in DEA terminology. Units that do not lie on the surface are termed *inefficient.* Optimal values of variables for decision making unit 1 are denoted by the s-vector s^1, the m-vector e^1, and the n-vector λ^1.

Table 1: Summary Statistics

	Average	St. Dev.	Min.	Max.
Inputs				
Information and communication technology expenditure (% of GDP)	6.0885	0.9366	3.702 (MEX)	7.722 (BUL)
Information and communication technology expenditure (per capita, in USD)	1,682.4	950.9926	247.416 (SLK)	3,152.654 (USA)
Internet users (per 100 people)	40.3071	18.4235	9.5133 (MEX)	68,43111 (SWE)
International Internet bandwidth (bits per person)	4,722.9	5,756.232	84.81889 (MEX)	21,214.81 (DEN)
Outputs				
School enrolment, primary (% gross)	102.972	4.0724	98.7438 (GRE)	119,6688 (POR)
School enrolment, secondary (% gross)	104.6418	13.0841	79.74 (MEX)	133.0922 (BEL)
School enrolment, tertiary (% gross)	59.2622	15.8078	22.7644 (MEX)	87.75778 (FIN)
Teachers per 100 pupils, secondary	8.5925	1.5601	5.2672 (JPN)	12.0387 (POL)
Outcomes				
PISA average (2006)	491.2264	34.6888	408.601 (MEX)	552.8498 (FIN)
Labor force with tertiary education (% of total)	24.7961	9.2459	10.7429 (POR)	50.475 (USA)

Sources: World Bank, 2011; UNESCO, 2011; OECD, 2010; own calculations.

Although DEA is a powerful optimization technique that can assess the performance of each country, it has certain limitations. When one has to deal with large numbers of inputs and outputs, and a small number of countries are under evaluation, the discriminatory power of the DEA is limited. However, analysts can overcome this limitation by including only those factors (input and output) that provide the essential components of "production", thus avoiding distortion of the DEA results. This is usually done by eliminating one of a pair of factors that are strongly positively correlated with each other.

In the majority of studies using DEA the data are analysed cross-sectionally, with each decision-making unit (DMU) – in this case a country – being observed only once. Nevertheless, data on DMUs are often available over multiple time periods. In such cases, it is possible to perform DEA over time where each DMU in each time period is treated as if it were a distinct DMU. However, in our case the data set for all the tests in the study includes average data for the 1999–2007 period (including PISA 2006 average scores) in order to evaluate long-term efficiency measures as the effects of ICT are characterised by time lags in 27 EU and OECD countries. The program used for calculating the technical efficiencies is the DEA *Frontier* software. The data are provided by the OECD, UNESCO and the World Bank's World Development Indicators database (for Summary statistics see Table 1).

The specification of the outputs and inputs is a crucial first step in DEA since the larger the number of outputs and inputs included in any DEA, the higher will be the expected proportion of efficient DMUs, and the greater will be the expected overall average efficiency (Chalos, 1997). Common measures of teaching output in education used in previous studies are based on graduation and/or completion rates (see Johnes, 1996; Jafarov and Gunnarsson, 2008), PISA scores (see Afonso and St. Aubyn, 2005; Jafarov and Gunnarsson, 2008), pupil-teacher ratios and enrolment rates (see Jafarov and Gunnarsson, 2008). Nevertheless, these studies also demonstrate that DEA is an effective research tool for evaluating the efficiency of ICT and its impact on the education sector given the varying input mixes and types and numbers of outputs.

In this analysis the data set to evaluate the efficiency of ICT includes input/output/outcome data, i.e. information and communication technology expenditure (% of GDP)[5], Internet users (per 100 people), teacher-pupil ratio (secondary), school enrolment, all levels (% gross), labour force with tertiary education (% of total) and the PISA 2006 average score. Up to 28 countries are included in the analysis (selected EU and OECD countries). Different inputs and outputs/outcomes are tested in four models (see Table 1). In addition, to evaluate the impact of ICT on education, we calculate partial correlation coefficients for different ICT and education variables.

Table 2: Input and output/outcome set for the DEA

Model	Inputs	Outputs/Outcomes
I	o Information and communication technology expenditure (% of GDP) [1]	o PISA average (2006) [2]
II	o Information and communication technology expenditure (% of GDP) o Internet users (per 100 people) [1]	o PISA average (2006) o Labour force with tertiary education (% of total) [1]
III	o Information and communication technology expenditure (% of GDP) o Internet users (per 100 people)	o PISA average (2006) o School enrolment, secondary (% gross) [1] o Teacher-pupil ratio, secondary [3]
IV	o Information and communication technology expenditure (% of GDP) o Internet users (per 100 people)	o PISA average (2006) o School enrolment, primary (% gross) [1] o School enrolment, secondary (% gross) o School enrolment, tertiary (% gross) [1]

Sources: [1]World Bank; [2]UNESCO; [3]OECD.

EMPIRICAL RESULTS

To see whether ICT has any impact on educational outputs and outcomes, we calculate the partial correlations between different variables, while controlling for the other(s) variable(s) (see Table 3). All educational output and outcome variables show a weak and positive (but not statistically significant) correlation with ICT expenditures (in % of GDP) when controlling for the number of Internet users. The impact of the number of Internet users is strong and positive as the partial coefficient ranges from 0.53 to 0.71. An important ICT variable which also influences PISA scores is ICT (per capita) as the partial coefficient reached 0.53. There are also some educational output variables which positively influence the PISA scores, such as the teacher-pupil ratio (primary and secondary). Nevertheless, the single most important related variable is the quality of the basic telecommunications infrastructure and broadband penetration. Indeed, a strong ICT infrastructure and its use alone already have an effect on perceived ICT-induced efficiency improvements but does not guarantee a good educational performance in itself. The government and policymakers should not be interested in simply introducing technology into educational institutions, but also in making sure that it is used effectively by teachers and students in order to enhance educational outputs and outcomes.

Table 3: Partial correlation coefficients

Output/outcome variables	Input variables		
Completion rate –primary (n=24)	ICT (GDP)	IU	
	0.012	-0.09	
Enrolment rate –	ICT (GDP)	IIB	

[5] ICT expenditures include computer hardware (computers, storage devices, printers, and other peripherals); computer software (operating systems, programming tools, utilities, applications, and internal software development); computer services (information technology consulting, computer and network systems integration, Web hosting, data processing services, and other services); and communications services (voice and data communications services) and wired and wireless communications equipment (World Bank, 2011).

secondary (n=27)	0.005	0.684***		
Enrolment rate - tertiary (n=27)	ICT (GDP)	IU		
	0.083	0.709***		
Labour force with tertiary education (n=27)	ICT (GDP)	IU		
	0.075	0.525***		
PISA score (n=28)	ICT (GDP)	IU		
	0.128	0.687***		
PISA scores (n=27)	ICT (p.c.)	T/P (secondary)		
	0.530***	0.292		
PISA scores (n=26)	ICT (p.c.)	T/P (primary)	T/P (secondary)	
	0.555***	-0.268	0.339*	
PISA scores (n=23)	ICT (GDP)	IU	T/P (primary)	COMPL (primary)
	-0.014	0.701***	0.410*	-0.1724

Note: ***, **, * denote significance at the levels of 1%, 5% and 10%, respectively. ICT (GDP) - Information and communication technology expenditure (% of GDP); IU - Internet users (per 100 people); ICT (p.c.) - Information and communication technology expenditure (per capita); T/P - Teacher-pupil ratio; IIB - International Internet bandwidth (bits per person); COMPL - completion rate (% of relevant age group).

Sources: World Bank, 2011; UNESCO, 2011; OECD, 2010; own calculations.

The results of the output-oriented VRSTE formulation of the DEA analysis (based on Models I–IV in Table 2) suggest a relatively high level of inefficiency of ICT in selected EU and OECD countries and, correspondingly, that there is significant room to improve educational outputs and outcomes (see Table 4). Indeed, the empirical results show that the total number of efficient countries varies significantly from one model to another. There are only two technically efficient countries in Model I, i.e. Finland and Slovakia. However, at 4.424% of GDP Slovakia has the lowest level of ICT expenditure (in % of GDP) among all countries in the sample. The least efficient nations are Bulgaria, Romania and Greece as a result of their relatively low PISA test scores, ranging from 410 (Romania) to 464 (Greece) (for instance, the EU/OECD group average is around 494). In order to enhance the reliability of the findings, additional inputs and outputs/outcomes were introduced, resulting in models II, III and IV (for details also see Table 2).

Adding another input and output in the form (Model II) of Internet users (per 100 people) and labour force with tertiary education (% of total), respectively, the results show Finland, Iceland, Norway, Slovakia and the USA to be the technically most efficient countries. Not surprisingly, increasing the number of outputs/outcomes in a relatively small sample leads to a higher number of efficient countries. In general, the rankings remain relatively stable in comparison to Model I (with the USA, Italy, Poland and Iceland being the only significant exceptions).[6]

Model III includes additional output/outcome variables to PISA scores, i.e. school enrolment (secondary) and teacher-pupil ratio (secondary). According to this model there are two additional efficient nations, i.e. Belgium and Poland. Interestingly, the biggest improvement in the ranking is shown by Denmark, with one of the highest levels of school enrolment (secondary) averages accounting for around 125% in the 1999–2007 period (the EU/OECD average is around 106%). In order to become an efficient nation, selected countries should significantly increase the level of their PISA scores (particularly in Romania), the level of their school enrolment (secondary) (particularly in highly populated countries, such as Korea and the USA), and the teacher-pupil ratio (secondary) (in Japan, Sweden and the UK).

Table 4: DEA results for ICT efficiency in selected OECD and EU countries

No.	Country	Model I		Model II		Model III		Model IV	
		VRSTE	Rank	VRSTE	Rank	VRSTE	Rank	VRSTE	Rank
1	Australia	1.06339	7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
2	Austria	1.10092	13	1.06040	13	1.05115	21	1.03784	22
3	Belgium	1.08288	9	1.01999	7	1.00000	1	1.00000	1

[6] These ranking changes resulted from the relatively high level of labour force with a tertiary education (in the USA and Iceland) and relatively small number of Internet users (in Italy and Poland).

4	Bulgaria	1.32790	27	n.a.	n.a.	1.00000	1	1.00000	1
5	Czech R.	1.10171	14	1.00869	6	1.00596	8	1.00258	13
6	Denmark	1.10320	16	1.10320	21	1.01339	10	1.02449	19
7	Finland	1.00000	1	1.00000	1	1.00000	1	1.00000	1
8	France	1.12181	19	1.03470	9	1.02663	18	1.01070	16
9	Germany	1.09520	11	n.a.	n.a.	1.02570	17	1.04204	23
10	Greece	1.19124	25	n.a.	n.a.	1.02556	16	1.00000	1
11	Hungary	1.12273	20	1.08677	19	1.02372	14	1.02153	18
12	Iceland	1.11989	18	1.00000	1	1.02275	13	1.01361	17
13	Italy	1.17995	24	1.05702	12	1.11064	25	1.07881	26
14	Japan	1.06834	8	1.08181	18	1.04171	20	1.03091	21
15	Korea	1.02025	4	1.06586	15	1.00656	9	1.00000	1
16	Netherlands	1.06163	6	1.06163	14	1.03030	19	1.00000	1
17	New Zealand	1.05411	5	1.04909	11	1.00000	1	1.02618	20
18	Norway	1.01909	3	1.00000	1	1.00000	1	1.00000	1
19	Poland	1.10506	17	1.00507	5	1.00000	1	1.00000	1
20	Portugal	1.17397	23	1.07200	16	1.05337	22	1.00000	1
21	Romania	1.31120	26	1.18268	22	1.10368	24	1.00293	1
22	Slovakia	1.00000	1	1.00000	1	1.00000	1	1.00000	1
23	Slovenia	1.09282	10	1.02316	8	1.02193	12	1.00473	15
24	Spain	1.16046	22	1.04906	10	1.01584	11	1.00000	1
25	Sweden	1.09620	12	1.09620	20	1.02507	15	1.00000	1
26	UK	1.10181	15	1.07618	17	1.07807	23	1.04406	24
27	USA	1.14787	21	1.00000	1	1.12480	26	1.05256	25
Number of efficient countries		2		5		7		12	
Mean		1.11199		1.04928		1.03103		1.01511	
Std. dev.		0.078309		0.045084		0.036037		0.021181	

Note: Relative efficiency scores (models I–IV; see Table 2). Twenty-seven countries are included in the analysis (Mexico is excluded as an outlier).

Sources: World Bank, 2011; UNESCO, 2011; OECD, 2010; own calculations.

In terms of the efficiency scores for ICT in Model IV, up to 12 of the analysed countries are labelled efficient (see Table 4). The average output efficiency score is 1.01511, meaning that the average country could increase its outputs/outcomes by around 1.5% if it were efficient. The worst efficiency performers are Italy, the USA and the UK, with the last two having well above-average ICT expenditures and Internet users (per 100 people) and well below-average PISA scores (in the USA), school enrolment (primary and secondary) (in the USA) and school enrolment (tertiary) (in the UK). On the other hand, Italy has below-average levels of its inputs and outputs/outcomes and therefore an increase in ICT expenditures and Internet users alongside a significant efficiency improvement is needed in the county. Indeed, all three countries should increase their outputs by 4.4% to 7.9 in order to become an efficient.

According to the above empirical analysis, it is obvious that the use of ICT in many of the countries considered suffers from relatively low technical efficiency. This inefficiency is particularly highlighted in some highly developed OECD members, i.e. the USA, the UK and Austria (see Table 5). Since all of these countries use significantly above-average ICT resources, it will be crucial for them to increase their educational outputs and outcomes. On the other hand, Italy, France and Hungary reveal low efficiency despite using a relatively low level of ICT inputs. Hence, an improvement of the efficiency of ICT, which could significantly contribute to a country's stronger development and growth should therefore be a top priority in the near future for most countries, particularly those in the third and fourth quartiles.

Table 5: Relative Efficiency of ICT in Selected OECD and EU countries
(Distribution by quartiles of the ranking of efficiency scores in three models)

1st quartile	2nd quartile	3rd quartile	4th quartile
Finland	Netherlands	Greece	Hungary
Slovakia	New Zealand	Denmark	France
Norway	Sweden	Portugal	Austria
Belgium	Bulgaria	Iceland	UK
Korea	Spain	Japan	USA
Poland	Czech R.	Germany	Italy
	Slovenia	Romania	

Note: Relative efficiency scores (models I - IV; see Table 2). Twenty-seven countries are included in the analysis.

Sources: World Bank, 2011; UNESCO, 2011; OECD, 2010; own calculations.

CONCLUSIONS

The empirical results show that the efficiency of ICT, when taking educational outputs/outcomes into consideration, differs significantly across the great majority of EU and OECD countries. The analysis of the varying levels of (output-oriented) efficiency (under the VRS framework) shows that Finland, Norway, Belgium and Korea are the most efficient countries in terms of their ICT sectors (when considering educational output/outcome). The empirical results also suggest that, in general, some less developed EU countries such as Slovakia and Poland show a relatively high level of ICT efficiency due to the low level of their ICT inputs. Therefore, a significant increase in ICT expenditures is needed in those countries. All in all, the analysis finds evidence that most of the countries under consideration hold great potential for increased efficiency in ICT and for improving their educational outputs and outcomes.

However, a few limitations of the presented empirical study should be pointed out. Firstly, the application of the presented techniques is hampered by a lack of suitable data. Quality data are called for because the techniques available to measure efficiency are sensitive to outliers and may be influenced by exogenous factors. Secondly, the precise definition of inputs, outputs and outcomes may significantly influence the results. Finally, it seems important to bear in mind that by using a non-parametric approach, and in spite of DEA being an established and valid methodology, differences across countries are not statistically assessed and this may be considered a limitation of the methodology. Hence, further research is clearly needed to eliminate the above deficiencies, in particular to test the influence of environmental factors on ICT efficiency.

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EXPLORING THE RELATIONSHIPS BETWEEN STUDENTS' ABILITY OF COMPUTER-BASED CHINESE INPUT AND OTHER VARIABLES ASSOCIATED TO THEIR PERFORMANCES IN COMPOSITION WRITING

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ABSTRACT
Computer-based writing is already a norm to a large extent in social communication for any major language around the world. From this perspective, it would be pedagogically sound for students to master the Chinese input system as early as possible. This poses some challenges to students in Singapore, most of which are learning Chinese as a second language, as inputting the non-alphabetic Chinese characters is not as direct as keyboard-based input. In this regard, an exploratory study that involved 419 students from three secondary schools was conducted. The aims of the study were three-folded, (1) To investigate if there is any differences between their performances in computer- and paper-based writing; (2) To determine the relationships between their Chinese input skills and their motivation in learning Chinese and using computers for Chinese assignments; (3) To recommend a cut-off level of pinyin input skill that students need to possess. The target students were first surveyed and then sat in two essay writing tests in the two different mediums. The collected data were quantitatively analyzed. The findings of this study will help to inform various strategies necessary to enhance students' ability to carry out computer-based writing, and provide additional ground for the adoption of Chinese input system in formal curriculum and assessments.
Keywords: Chinese Language learning; Composition writing; Computer-based Chinese input

INTRODUCTION

Computer-based word editing is already a norm in the workplace and to a large extent in social communication for any major language around the world. More and more, to be regarded as a proficient user of the Chinese language, one must master the skill of inputting Chinese characters on computers. From this perspective, it would be pedagogically sound for students to master the Chinese input system as early as possible. This poses some challenges to students in Singapore as inputting Chinese characters is not as direct as keyboard-based input. The students would need to choose among various input methods such as through special hand writing software or through the Hanyu pinyin system (see below).

In August 2008, the Minister for Education (MOE) of Singapore launched the third MasterPlan for ICT in Education (MP3), working towards the grand vision of "Harnessing ICT for Future Learning". The key focus of MP3 is on students' use of ICT for self-directed learning and collaborative learning with ICT (Teo & Ting, 2010). It is believed that engaging students' in self-directed learning (SDL) and collaborative learning (CoL) with ICT could better prepare Singaporean students to meet the challenges of the 21st century. However, in the context of Chinese language teaching, the actualization of the policy also demands Singaporean students to be proficient with the computer-based Chinese input system. Thus, both for the preparation of workplace performance and for their education, students' need to master Chinese input. Such need is recognized by the MOE's Mother Tongue Language (MTL) Review Committee which has recommended in January 2011 to phase in computer-based input for selected sections, such as essay writing, for national examinations within 2013-2015.

Hanyu Pinyin (or: pinyin) is a phonetic-based scheme to transcribe Chinese characters into the Roman alphabet. Published by the Chinese government in 1958, the scheme has later been adopted as the basis of a Chinese computer input method. Known as pinyin input method, it is now widely used in Singapore schools. Nevertheless, are Singaporean secondary school students proficient with the pinyin input method? Prior research (Wong, Chai, & Gao, 2011; Wong, Gao, Chung, & Chai, 2008) conducted among primary and secondary school students in Singapore seems to suggest that the students face multiple problems with Chinese input system.

Without adequate understanding about students' ability to use the Chinese input system, it would appear difficult to implement and evaluate the use of computers for Chinese learning, let alone ICT-mediated SDL and CoL in Chinese. Therefore, it is both essential and timely to conduct studies on related issues in order to inform the policy and the research community.

This paper reports on an exploratory study that involved 419 students from three public secondary schools in Singapore. All participants were first surveyed on their demographic particulars, computer and pinyin self-efficacies, and learning motivations. They then performed a pinyin input speed test based on a textbook passage that they had been taught before. The correct numbers of words typed per minute were computed to indicate students' Chinese word processing speed on computers. Next, they sat in two essay writing tests of similar difficulty on two different days, one with pen and paper, the other one on pinyin input. Finally, the researchers performed quantitative analysis that involved structural equation modelling, which will inform educators as to how the various variables are connected to the dependable variable. This study is intended to answer the following research questions,

1. Are there any differences between students' performances in Chinese Language writing when they use pen and paper versus when they use computers?
2. What are the relationships between students' Chinese input skills and their motivation in learning Chinese and using computers for Chinese assignments?
3. What is the recommended cut-off level of pinyin input skill (in terms of minimum average number of Chinese characters inputted per minute) that students need to possess so that there will be no significant difference in their performances in Chinese Language writing when they use pen and paper versus when they use computers?

LITERATURE REVIEW

Computer as the authentic medium for language workers

The proliferation of computers has essentially changed how we live and how we work (Lim, Chai, & Churchill, 2010). It is difficult to imagine today's worker who earn their living based on their language competencies to work without a computer. It is also obvious that any work that requires the use of language is likely to rely more on the use of word processing rather than hand-writing. Writing in the 21st century would largely mean electronic writing (Selfe, 1999). As such, the researchers would argue that basic language competencies has to be redefined as listening, speaking, reading, word processing and writing.

The emergence of social networking and Web 2.0 technology further enhances the importance of word processing skills. These technologies have altered the notion of authorship and the relations between people in a fundamental way. Literacy has to be redefined to accommodate digital literacies, which assumed user to have basic computer literacies (Lim, et al., 2010; Mills, 2008; Myers, 2006). Authoring for the purpose of connecting with people, shaping and maintaining online identities, and sharing knowledge are becoming part of a digital native's way of life and they exert subtle influences on a learner's holistic development (Greenhow, Robelia, & Hughes, 2009). For languages that cannot go online, there exists a risk of being perceived as inferior or obsolete language. In view of such threat, efforts in using Chinese Language portals, discussion forums and Web 2.0 tools to encourage students to write Chinese essays online has recently emerged with some positive learning outcomes reported (Tang & Wang, 2007; Wong, Chen, Chai, Chin, & Gao, 2011; Zhang, 2009).

Nevertheless, given the non-alphabetic nature of the Chinese script, it is found that learners who are not living in places where the Chinese language is the dominant language may face substantial problems in mastering the language (Fan, Tong, & Song, 1987; Shen, 2002; Wong, Boticki, Sun, & Looi, 2011; Wong, Gao, Chai, & Chin, 2011), especially for the purpose of reading and writing (Fu, 2005; Mori, Sato, & Shimizu, 2007). When it comes to word processing, the indirect (not alphabetic-based but phonetic-based) Chinese input method of pinyin would pose a greater challenge to the Chinese Language learners. The effort of Chinese input requires writers' additional mental processing, that is, recalling the pronunciations, mapping them into pinyin representations, recognizing the "shape" of the particular character from a potentially big list of homophones, and so on (Xie, 2001). Thus, many Singaporean students who were first trained in Chinese writing with pen and paper perceived writing with pinyin input as a significantly less intuitive and therefore unfavorable mode of writing (Wong, Chai, et al., 2011). This problem is not unique to Singapore students or any student studying Chinese as a second language. A considerable number of learners in China may be facing similar challenges due to other factors (e.g., Ding, 2002; Du & Crestani, 2005; Duan, 2004). As such, learners may devote too much effort in this aspect and neglect the other higher level writing processes such as planning and revising (Wong, Chai, et al., 2011). Therefore, it is crucial for learners to be adept in Chinese computer input skills up to a certain threshold level, before they could produce computer-based writing with compatible quality of paper-and-pen-based writing.

Using computers for language examination

Increasingly, computers are also employed as a medium of test and examinations (Liao & Kuo, 2011; Wolfe & Manalo, 2004). Important examinations such as TOFEL and GRE have computerized versions for years. There were also some studies that investigated the use of computers for the purpose of examination. The strength of employing computers for examination is that standardized items involving multiple-choice can be marked accurately and efficiently. Word processing can also help in terms of the presentation of the essay examination. Nevertheless, teachers often cite traditional paper-based examination medium as one reason for their reluctance to be engaged their students in using ICT (Somekh, 2008; Tan, et al., 2010). Changing the medium of examination would necessarily require teachers to change their instructional medium. However, there are multiple concerns in computer-based examination. The main concern is with regards to the potential threat to the validity of the assessment. Variables such as gender, ethnic groups, access to computers, experiences of and proficiency in using computers have all been identified as possible variables that could impact on the examinees' examination performances (Tan, et al., 2010). Students' motivation in learning the language and their general language competency are likely to influence their computer self-efficacy and their ability to input Chinese characters. Clearly, students do not have identical keyboard skills or feel equally comfortable using a computer, and it will be necessary to ensure that no systematic bias is introduced as a consequence of any move towards using computers in the examination process (Mogey, et al., 2008). However, the influences of these variables have been speculated by researchers to be diminishing as computers becomes more available, especially for standardized questions. For essay writing, word processing has been described as affecting the quality of writing as it eliminates the problems associated with illegible hand writing, results in better organized essay with neater appearance and a more formal tone (Goldberg, Russell, & Cook, 2003; Wolfe & Manalo, 2004).

Whether or not, and how the identified variables affect students' performances in using Chinese word processing for Chinese essay writing remains a knowledge gap to date. While some researchers have started to examine how word processing influence students' essay writing, such as the number of wrong characters being selected (e.g., Kang, 2011), formal investigation on students' writing performances cannot be located. Our search employing professional databases (Academic Search Premier, Education research complete, PsyInfo, Computer Source, ERIC) with Keywords "Chinese AND Writing AND Computers" yielded a return of 102 articles. Closer examination of the titles and then the abstract reveals that there is not any published research that answers to the research question directly.

RESEARCH METHOD

Sampling Strategy

This study involved three public secondary schools in Singapore with academic achievements that are average or above average. This sampling strategy is purposive in nature so that a fair representation of the typical students studying Chinese Language in secondary schools could be obtained. The participants were 419 Secondary 3 (15-year-old) students (57.8% male and 42.2 female, School X: 151 students; School Y: 104 students; School Z: 164 students). Among the participants, 94.3% were Singaporean, the rest were from other Asian countries (e.g., Malaysia and China). Most of the participants (83.8%) had access to a computer at home. Regarding the first language used, 60.9% of the participants preferred English, 36.3% favored Chinese, and the rest used Chinese dialects.

Data Collection

The study took place during September, 2010. The following three-step process was executed to collect the necessary data for subsequent analysis, (1) questionnaire; (2) pinyin input speed tests; (3) writing tests.

First of all, all participants were requested to fill in a questionnaire that comprised three parts: the demographic data, computer self-efficacy, and motivation questionnaire. The questionnaire mainly consisted of 14 statements on students' intrinsic motivation (IM) (4 items), Chinese self-efficacy (CSE) (5 items), and Pin-Yin self-efficacy (PYSE) (5 items). Participants were required to express their opinions to each statement on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The above three constructs and relevant items are shown in Appendix A. To validate the 14 items, a principal component analysis with varimax rotation method was conducted. Three factors with eigenvalues greater than 1.00 were identified and they explained about 69.26% of the variance. The Cronbach's α values of these factors were then calculated. As shown in Appendix B, the factor loadings of all items were larger than .50 and the Cronbach's α values of all factors were greater than .70. According to Hair, Black, Babin, Anderson and Tatham (2006), the validity of the instrument was acceptable at the item and construct level, respectively.

Besides, participants' Chinese grade in the Primary School Leaving Examination (a national examination that the participants sat in before they entered to the secondary level) was assumed to indicate their language competency

(LC). Specifically, LC was categorized into two groups namely high LC (e.g., a grade of A+, N = 284) and low LC (e.g., a grade of A, B, C, and D, N = 99). This indicator is the closet we can obtained as there isn't any other trustworthy standardised tests between grade 6 and grade 10.

Next, the participants took part in a two-minute computer-based pinyin input speed test based on a textbook passage that they have been taught before. This ensure that the students know the words they are typing. The correct Chinese character input per minute was calculated and it provides the score for participants Chinese input skills (CIS).

Finally, all participants were required to write two essays of different topics provided on two different days. One essay was written by using paper and pen, while the other using computers. An experienced Chinese teacher who was appointed national examination marker for more than a decade, was invited to score the two essays in terms of content and structure of the essay. The full mark of each essay was 50 points, with 25 points for both content and structure. The two essay scores were used to indicate pen-and-paper-based writing performance (PBWP) and computer-based writing performance (CBWP), respectively. One hundred essays (50 pens and paper and 50 typewritten) were randomly selected and marked by another qualified markers. A total of 71% of the essays were awarded marks with 0-5 marks differences. Disagreed cases were reviewed by one of the authors who was also a qualified marker. This is deemed acceptable for the local marking practices for Chinese essay writing. Furthermore, the numbers of errors in choosing the correct Chinese characters of the individual essays were also counted for additional analysis. Among the above seven variables, IM and CSE were perceived as exogenous variables, CBWP as endogenous variable, and the rest (e.g., PYSE, CIS, and PBWP) as intervening variables.

Data Analysis

To address the first research question, a paired samples t-test was conducted to examine any difference between PBWP and CBWP. The remaining stages aimed to answer the second research question. To answer the second question, the proposed path model was tested through assessing the path coefficients and their significance. To answer the third question, the cut-off value of the variable Chinese input skills (CIS) was investigated again through paired samples t-test to examine the difference between PBWP and CBWP based on the median of CIS.

RESULTS

In this section, the results of the statistical analysis are presented to answer the three research questions of the study.

1. Are there any differences between students' performances in Chinese Language writing when they use pen and paper versus when they use computers?

A paired samples t-test was performed to investigate the difference between students' paper-based writing performance (PBWP) and computer-based writing performance (CBWP). No significant difference was recognized between PBWP (M = 27.72, SD = 6.70) and CBWP (M = 26.99, SD = 8.54), t(405) = 1.90, p = .058.

2. What are the relationships between students' Chinese input skills and their motivation in learning Chinese and using computers for Chinese assignments?

Structural equation modeling (SEM) was employed to test the fit between the proposed model and the data collected (see Figure 1). This approach was selected for its ability to examine sets of dependence relationships concurrently, especially when there are both direct and indirect effects among the variables within the model (e.g., Kline, 2005). In this study, AMOS 7.0 (Arbuckle, 2006) was used and the SEM estimation procedure was maximum likelihood estimation. Following Hair et al.'s (2006) suggestion, multiple indices were used to assess the model-fit, such as $\chi 2$, Comparative Fit Index (CFI), Tucker Lewis Index (TLI), Normed Fit Index (NFI), and Root Mean Square Error of Approximation (RMSEA). Table 1 presents the recommended level of acceptable fit (e.g., Hair et al., 2006) and the fit indices for the proposed path model. All values of indices exceed the threshold, indicating a satisfactory model-fit.

Table 1: Fit indices of the proposed path model

Fit indices	Recommended level of acceptable fit	Proposed path model
χ^2	$\chi^2/df < 3$, $p > .05$	$\chi^2/df = 1.79$, $p = .056$
CFI	>.95	.98
TLI	>.95	.96
NFI	>.95	.97
RMSEA	<.08	.04

Figure 1 demonstrates the path coefficients of the proposed model. Except for the "LC→CBWP" path, nine out of the 10 paths were significant at the .05 level. As shown in Table 2 (in bold), PBWP was found to exert the largest standardized total effects (β = .48, p < .001) on CBWP. PYSE (β = .09, p < .05), CIS (β = .16, p < .001) and LC (β = .24, p < .001) all have significant total effects on CBWP. Besides, CBWP was also found to be significantly influenced by IM (β = .07, p < .05) and CSE (β = .07, p < .05). Overall, CBWP was found to be significantly determined by the two exogenous variables (IM and CSE) and four other intervening variables (e.g., LC, PYSE, CIS, and PBWP), resulting in an R2 of .30. These results can suggest at least two interpretations. Firstly, students' intrinsic motivation and Chinese self-efficacy influence their computer-based writing performance indirectly. Such an influence was mediated by other variables such as students' language competency, pinyin self-efficacy, Chinese input skills, and their pen-and-paper-based writing performance. Secondly, students' language competency does not have a direct effect on CBWP, but mediated by their Chinese input skills. Third, compared to other variables, students' PBWP seems to influence their CBWP the most. Fourth, about 30% of the variance in CBWP can be explained by the exogenous and intervening variables. This indicates a "moderate" effect size according to Cohen's (1988) suggestion.

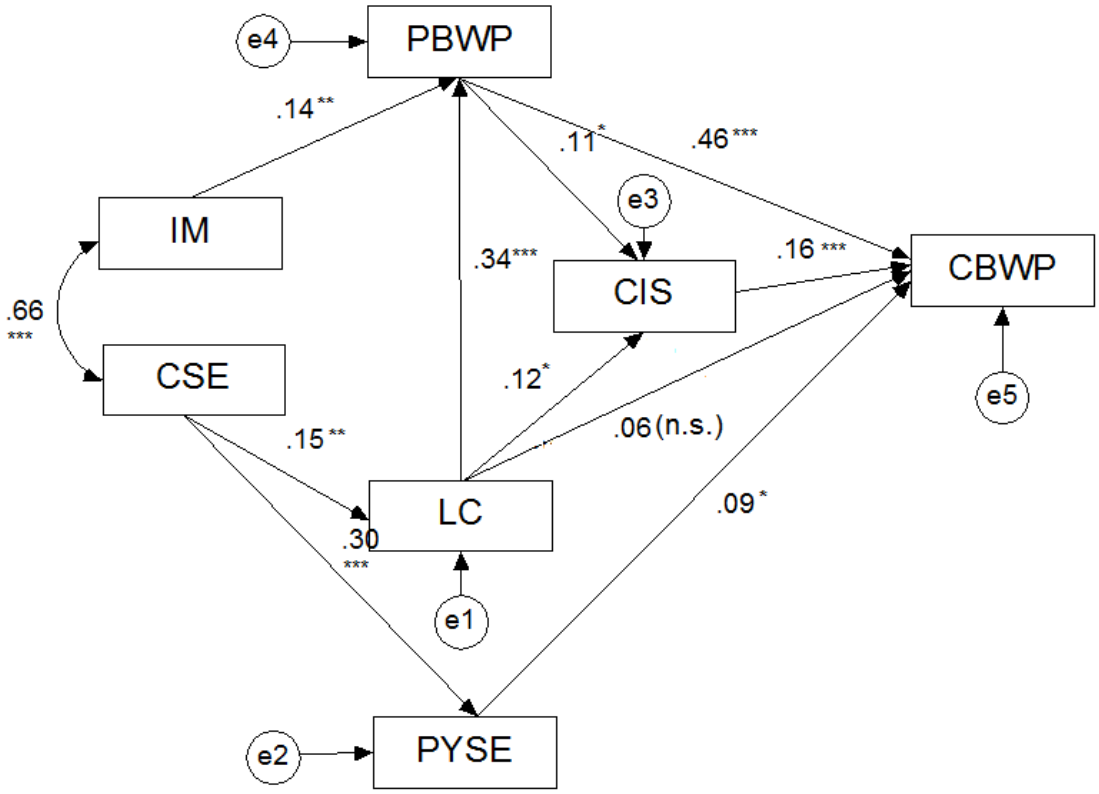

Figure 1 Model path coefficients. n.s., not significant; * p < .05; ** p < .01; *** p < .001

Table 2: Unstandardized and Standardized effects for the path model

Variable	CSE	LC	IM	PBWP	PYSE	CIS
LC						
Direct effect	.09 (.15)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
Indirect effects	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
Total effect	.09 (.15)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
PBWP						
Direct effect	-- (--)	5.24 (.34)	1.14 (.14)	-- (--)	-- (--)	-- (--)
Indirect effects	45 (.05)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
Total effect	45 (.05)	5.24 (.34)	1.14 (.14)	-- (--)	-- (--)	-- (--)
PYSE						
Direct effect	32 (.31)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
Indirect effects	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)
Total effect	.32 (.31)	-- (--)	-- (--)	-- (--)	-- (--)	-- (--)

CIS						
Direct effect	-- (--)	4.95 (.12)	-- (--)	.31 (.12)	-- (--)	-- (--)
Indirect effects	.56 (.02)	1.64 (.04)	.36 (.02)	-- (--)	-- (--)	-- (--)
Total effect	.56 (.02)	6.59 (.16)	.36 (.02)	.31 (.12)	-- (--)	-- (--)
CBWP						
Direct effect	-- (--)	1.10 (.06)	-- (--)	.59 (.46)	.97 (.09)	.08 (.16)
Indirect effects	.71 (.07)	3.58 (.18)	.70 (.07)	.02 (.02)	-- (--)	-- (--)
Total effect	**.71 (.07)**	**4.69 (.24)**	**.70 (.07)**	**.61 (.48)**	**.97 (.09)**	**.08 (.16)**

Note: Figures in parentheses show the standardized effects

3. What is the recommended cut-off level of pinyin input skill (in terms of minimum average number of Chinese characters inputted per minute) that students need to possess so that there will be no significant difference in their performances in Chinese Language writing when they use pen and paper versus when they use computers?

The cut-off value of the variable Word Processing Speed (indicating Chinese input skills, CIS) was also investigated through paired samples t-tests. Based on the Median and Mode of CIS (both are 21.50), 22.00 was used as a potential cut-off value to check the difference between PBWP and CBWP. When word processing speed (indicating Chinese input skills, CIS) is less than 22.00, students' pen-and-paper-based writing performance ($M = 27.11$, $SD = 6.54$) was significantly higher than their computer-based writing performance ($M = 25.76$, $SD = 8.62$), $t(199) = 2.42$, $p < .05$, effect size $d = .34$. According to Cohen (1988), the effect size was regarded as "small". When word processing speed equals to and exceeds 22.00, no significant difference was recognized between students' PBWP ($M = 28.68$, $SD = 6.58$) and their CBWP ($M = 28.57$, $SD = 7.91$), $t(191) = .21$, $p = .83$.

ADDITIONAL FINDINGS

Difference in the numbers of spelling errors. A paired samples t-test was performed to examine the difference between the two writing test regarding the numbers of errors in Chinese characters input. No significant difference was observed, $t(405) = .1.35$, $p = .18$. This indicates that using computer for writing test may not result in increasing or reducing error numbers.

Difference in PBWP and CBWP between HCL and CL students. Independent samples t-tests were conducted to investigate the differences between HCL and CL students regarding their PBWP and CBWP. Results suggested that HCL students ($M = 29.51$, $SD = 6.59$) performed significantly better than CL students ($M = 26.78$, $SD = 6.68$), $t(415) = 3.94$, $p < .001$. However, no significant differences in CBWP were found between HCL ($M = 28.04$, $SD = 8.82$) and CL students ($M = 26.37$, $SD = 8.49$), $t(406) = 1.85$, $p = .07$.

DISCUSSION AND CONLUSION

Changing the medium of examination is a major decision for any education system. Examination drives teachers' behavior and action, as revealed in many research papers (Lim & Chai, 2008; Tan, et al., 2010). A decision to open up the alternative of allowing computer-based Chinese language examination would definitely drive teachers to use more ICT in their classrooms instead of confining students' learning to paper-and-pen based activities. This is congruent to Singapore's effort in promoting the use of ICT. In addition, as students are spending more time on computers via social networking sites (Greenhow, et al., 2009), moves toward building students' capacity in using Chinese when working on computers is also more attune to students' lifestyle. Most importantly, students' competency is using Chinese input system prepare them better for their work life. In this study, the first encouraging finding is that the medium of input does not has statistically significant effects on students' composition scores for this group of students. This provides a basis to elevate fears that changing towards computer-based input may have adverse influence on students. Previous studies indicates that word processing improves the overall presentation of the essay by removing illegible hand writing and promoting a more formal tone (Goldberg, et al., 2003; Wolfe & Manalo, 2004). This however did not result in students obtaining better scores in this study. In addition, as indicated by the findings for the second research questions, the decision of adopting computer-based input for examination has to be made based on thorough studies of a collection of associated variables.

The structural equation model obtained in the study indicates that students' computer-based writing performance is related to a number of variables. The most important variable is their paper-based performances, follow by their input speed and their pinyin self-efficacy. These variables are in turn significantly associated to the general language competency, computer self-efficacy and students' learning motivation. As such, decision to change should be based on systemic studies of associated variables rather than isolated variables. This study contributes to research by exploring the relationships among the identify variables and it provides some initial picture of

which variables matter. Subsequent research can study how other variables such as students' learning strategies or conception of learning pertaining to the learning of Chinese language, students' views about the value of using computer for the learning of Chinese language; and how the teaching practices associated with Chinese language (teacher-centric versus student-centric instruction) are structurally related to students' performances. The variables investigated in this study accounted for 30% of the variances, indicating more variables need to be considered. Educational change need to be systemic rather than in a piecemeal manner (Sterling, 2001). Teachers' view about the matter has to be also carefully surveyed and considered. Without coordinated changes in especially teaching practice, and therefore the need for substantial professional development, abrupt changes is likely to be harmful and it adds difficulty to subsequent changes.

This study was able to identify the input speed of 22 words per minute as the tipping off point where computer-based composition would results in better test scores. This finding has to be replicated by more rigorous research where a larger sample of students and a more rigorous test scoring is put in place. The current research achieved inter-rater agreement of 71%. While the researchers would argue that the outcome is acceptable, ideally, it was preferred that all essays would be double-marked by qualified examiners following the exact procedures of the national examination. Funding situation prevented the researchers from being more ambitious.

The additional findings of this study inform educators that the use of computers do not result in more misspelled Chinese characters. This is important because some teachers may feel that students often choose wrong Chinese characters and that handwriting will help students to remember the correct words better. Such notion is not supported by this research but more studies on the types of misspelling that could occur for both handwritten composition and typewritten composition should be conducted for deeper understanding. Research in this area will help to inform the various strategies necessary to enhance students' ability to write in both modes. Lastly, the computer-based input does not seem to disfavor students with weaker language competency. This provides additional ground for the adoption of Chinese input system.

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APPENDIX A: THE 13-ITEM QUESTIONNAIRE

IM1 学习华文，对我来说是重要的。 (Learning Chinese is important to me.)

IM2 我对学习华文很有兴趣。 (I am interested in learning Chinese.)

IM3 我在华文课所学到的知识有用。 (The knowledge that I have learned in the Chinese lessons is useful.)

IM4 我喜欢上华文课。 (I like to study Chinese lessons.)

CSE1 我能在华文科考到好成绩。 (I can get better grades in Chinese exams.)

CSE2 我能学会华文课所教的语言技能。 (I can pick up the language skills being taught in Chinese lessons.)

CSE3 我能在华文课业和考试中，取得良好的表现。 (I can do an excellent job in Chinese lessons and exams.)

CSE4 我在华文课里会有好的表现。 (I can perform well in Chinese lessons.)

CSE5 我能掌握华文课所教导的技能。 (I can master the skills being taught in Chinese lessons.)

PYSE1 使用拼音输入法能帮助我把作文写好。 (Using pinyin input can help me in writing good essays.)

PYSE2 使用拼音输入法能帮助我在作文方面得到更好的分数。 (Using pinyin input can help me in getting better grades in essays.)

PYSE3 使用使用拼音输入法能减少我写作文的困难。 (Using pinyin input can reduce my difficulty in writing essays.)

PYSE4 使用拼音输入法时，我的作文写得更快。 (I can write essays faster when I use pinyin input.)

PYSE5 拼音输入法能减少我在作文时查字典的时间。 (Using pinyin input can cut short the time in checking the dictionary when I am writing essays.)

APPENDIX B: ROTATED FACTOR LOADINGS AND CRONBACH'S α VALUES FOR THE THREE FACTORS

Items	Factor 1	Factor 2	Factor 3
Factor 1: Chinese Self-Efficacy (CSE) (α = .90)			
CSE 3	.86		
CSE 1	.83		
CSE 4	.76		
CSE 5	.73		
CSE 2	.70		
Factor 2: Pin-Yin Self-Efficacy (PYSE) (α = .87)			
PYSE 3		.84	
PYSE 1		.83	
PYSE 4		.79	
PYSE 2		.77	
PYSE 5		.74	
Factor 3: Intrinsic Motivation (IM) (α = .87)			
IM 4			.81
IM 3			.78
IM 2			.77
IM1			.76
Eigenvalues	5.96	2.65	1.09
% variance explained	24.77	23.56	20.93

IMAGE OF SOCIAL STUDIES AT GOOGLE

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ABSTRACT
Social Studies Course is a lecture that ensures the students to recognize their society and the world, to involve into the social life actively towards the solution of the problems they have faced with in this respect. However, the researches indicate that this course is one of the least favorite courses by the students. Although there are various reasons for the fact that the status of social studies is low among the students, it is also important how the content of the course is reflected to them. It is a common knowledge that in 21st century, the students spend most of their time on computer and internet. As well as they explore the facts those are challenging and within their field of interest, the students also do their homework, which is asked from them, through internet. Therefore, the image of social studies, that is introduced them via internet, comes into prominence. When the permanence and effect of the images on the human memory is regarded, the said images gain more value. Also, the images of social studies over the internet are important with respect to reflect the point of view towards this course. In this respect, within the scope of document analysis in this research, by making restriction from the detailed search option of the Google search motor, 300 visual images those are involved under the headlines of "social studies" in United States of America and "social studies" in Turkey, have been subjected to analysis. As the result of the research, it has been recognized that mostly geographical aspects of the social studies are brought into prominence over the images, and subjects and interdisciplinary structures those are included in social studies have not been reflected so much.

INTRODUCTION

The "Social Studies" is a course that helps for developing the knowledge, skill, attitudes and values those are required for the students to participate into the public life within the society, nation and worldwide. Although some skills towards participating democratic society are also covered by other courses, the main objective of social studies is to develop skills and competencies with respect to citizenship (Wade, 1995; Berson, 1996; Banks and Banks, 1999; Shaver, 1992; Jones and et al, 2001; Martorella, 2001; Mindes, 2005). Social Studies have been identified in various ways by different people. For Example, Barth (1991) has defined the social studies as *"Social Studies is the interdisciplinary integration of the concepts those are related to the social studies for the purpose of implementing the skills with respect to citizenship, on the basis of important social subjects*". In this definition, the "citizenship" is being emphasized. This is because; the main objective of teaching social studies is to ensure the individual to become an active citizen in the society. Another emphasized concept is "integration". This is resulting from the fact that the social studies are a course that presents all data and concepts of social sciences together. The citizens approach to the social problems or facts as a whole rather then considering only their single aspect as a historian, sociologist or economist does (Barth, 1991).

The main logic of including social studies education at primary school education can be summaries within the frame of four articles:

- To get information regarding to the past, present and future experiences of the people,
- To develop the skills of thinking and gaining information,
- To develop the democratic values and attitudes,
- To enable social involvement (Chapin and Messick, 1999).

In 19th century, with the aim of generating a national society concept, the social studies course developed through the integration of the subjects of History, Geography and Citizenship Knowledge by USA National Education Council (Sözer, 1998, p.8) has been adopted also in Turkey, Japan and South Korean, following USA (Kaya, 2006). For training the citizens with the scientific idea required in respect to ensure the sustainability of the Republic regime and revolutions in Turkey, Science of Life and Social Studies courses, those have been involved in the program under different names until today, have been attached great importance (Akınoğlu, 2008). The expectations from social studies course are; to contribute to train active, productive, happy Turkish Republic citizens with the conscious of their rights and liabilities, who are equipped with the knowledge, skills and attitudes required in the modern century, accepted the principles and revolutions of Ataturk, and are able to benefit from the concepts and methods with respect to social sciences. Therefore, it is tried to gain skills for the students to be utilized within real life, through this course. In the Social Studies Education Program, restructured in 2004, the requirement of gaining the knowledge, skill and attitudes those cause the students to become active, responsible and creative citizens, such as: having knowledge about different cultures and humans; being conscious about the rights and liabilities in the family, working life and generally in the society; working with collaboration and scientific consideration, have been emphasized (Akınoğlu, 2008).

The students go on a world trip through the course of social studies in one sense. It is possible to get information about the Capital cities, natural environment, cultures and their residents. However, despite all these should have attracted the interests of the children, in the conducted researches (Goodlad, 1985; Joyce, 1986; Lounsbury, 1988; Hope, 1996; Governale, 1997; Chiodo and Byford, 2004), we face with a surprising fact that the students' attitudes towards social studies course is in negative direction. Lounsbury (1988) and Hope (1996) have stated that the main reason for the fact that the students do not enjoy with social studies course, is that the teachers could not introduce them meaningful experiences, related to their real lives. With respect to this, Hope (1996); has stated that he could not understand why the students have negative attitudes towards a course that provides the opportunity of travelling the world even virtually, knowing different cultures and meeting with people who live in various regions of the world.

Goodlad (1985) has attributed the fact that the social studies have been one of the least favorite to the education methods and techniques. He has expressed that these teacher-centered method and techniques are far away from directing the students towards the course. In addition, the conducted researches (Shug and et al., 1984; Shaughnessy and Haladyna, 1985) have shown that the students could not make a correlation between the information gained from social studies and their real lives. In this respect, it is important how the social studies course have been introduced to them. Since the social studies course, that is perceived as teacher-centered and as a course in which various information about social sciences have been conveyed to the students through traditional methods, it is required to question the method-technique and materials those are employed in the course. Whereas, it is known that in 21st century, the young people have obtained the information mostly through digital technologies and have delivered their own messages also by this way (Berson and Berson, 2003). Therefore, the importance of utilizing from different technologies for gaining knowledge, skill and attitudes under the scope of social studies, and also integrating the materials into the process, those are frequently used in the daily lives of the students, have emerged. Among these technologies, it is clear that the most interesting is Internet. It is clear that integrating internet into the process, which has an important place in daily lives of the individuals, will dynamise the process. Furthermore, it is known that the students utilize from Internet frequently while performing their homework. In a study carried out by Karadağ, Yılmaz and Aktay (2006) with regard to that fact, it is mentioned that the students are expected to reach the information in the current education programs, adopted in primary schools as of 2005 and based on the constructivism, therefore internet use has become widespread.

Internet takes the attention of the student through its presenting visual items. The researches show that the people can remember 10% of what they see, 20% of what they hear, 30% of what they see, 50% of what they both see and hear, 70% of what they say and 90% of what they do and say. The researches, which are conducted with regard to training, also show the effect of the visual descriptions (Seferoğlu, 2007). The images enable the complex facts and events to be understood more easily. The visual messages may include the side meanings those could not be recognized at the first sight (Akbaba, 2005). The visual items motivate the individuals by calling their attention, keep their attention alive, materialize the concepts, simplify the complex concepts (Seferoğlu, 2007), and so facilitate the learning. Therefore, it should be taken into consideration that the visuals used with respect to ant item should be selected carefully. In this respect, the importance of the visuals, those are included in Internet, where the students use in their lives intensely, has been increasing. Because, the visual items, presented via internet, have a

great impact over the students. Although the importance of the technology and especially Internet has been recognized in 21st century, the researches made for what kinds of messages are being conveyed to the individuals through such kinds of instruments, are limited (Hobbs, 2004; Kösebalan, Taşköprülü and Süha, 2008; Bek and Binark, 2009). Beside this, the fact that how the social studies have been represented in the minds of either the educators or the students has not been considered in detail except for some studies (Adler and Goodman, 1983; Stodolsky, Salk and Glaessner, 1991; Yaşar and Gürdoğan Bayır, 2010). Therefore, it is aimed to examine the visuals those are included in the web sites regarding to social studies. It can be said that the research has an importance in terms of showing how the social studies have been reflected at web sites. In this respect, the aim of the research is to examine the images of social studies reflected in the visuals in Google. Depending on this main purpose, it is aimed to answer the following questions:

1) What are the social studies images those have been reflected at the visuals in Google?
2) Under which categories can the images of social studies those are reflected at the visuals in Google, be collected?

THE STUDY

Document review, that is one of the qualitative research methods, is applied for collecting search data. The research data is obtained by gathering the ones under the names of "social studies" and "sosyal bilgiler" among the visuals included in the Google search engine. In the meantime, it is provided to limit the visuals by USA-based ones, in the search regarding to the title of "social studies". The scans have been made between the dates of 07.08.2010-14.08.2010. In this respect, 975 visuals with the title of "social studies" and 897 visuals with the title of "sosyal bilgiler" have been obtained. The visuals have been analyzed by every researcher and the common findings are reflected to the result.

Documents, those consist the data sources in the research, have been subjected to the content analysis. There are four phases in content analysis. These are: (1) selection sampling from the data subject to the analysis, (2) developing the categories, (3) determining the analysis unit, (4) digitization (Yıldırım ve Şimşek, 2008).

In line with the respective phases, the following steps have been taken in the search process. In the first phase of the analysis, the method of sample selection is employed and among the obtained visuals, a total of 300 visuals, 150 of which are "social studies" titled and 150 of which are "sosyal bilgiler" titled, those are considered as more convenient with the content of the social studies, have been examined. In the process of developing the categories, that consists the second phase of the analysis, three approaches have been taken as basis in social studies education, as "social studies as citizenship transfer", "social studies as social science" and social studies as reflecting analysis". In the third phase of the analysis, the items emphasized in the analyzed visuals have been selected as analysis unit and it is taken as the basis that which dimension of the social science do these items reflect and which of the social studies education approaches have been represented. At the last phase of the analysis, it has been preferred to apply for frequencies where digitization is deemed as required, however a presentation in prosaic type is preferred, in general.

FINDINGS

The findings obtained in line with the objectives of the research are listed as following.

Images for Social Studies, those are Reflected to the Visuals in Google

The primary aim of the research is the question of "what are the social studies images those have been reflected at the visuals in Google?" The data, obtained as the result of the scanning realized in this respect, is presented in Table-1.

Table 1. Images and frequences that used about social studies at Google

	USA	Turkey	Total
	f	f	f
Globe	41	10	51
Earth	23	16	39
Country map	1	33	34
Historical figures	13	19	32
Student (studying with map and)	19	10	29

World map	13	11	24
Book	19	4	23
Historical event	6	15	21
Geographical region	-	21	21
World and people (surrounding, holding, enclosing etc.)	18	5	23
Historical place	14	1	15
Geographical figure	-	13	13
Flag	6	5	11
Social studies class	4	2	6
Compass	3	2	5
Teacher (teaching on map or globe)	4	-	4
Historical image	3	1	4
Jobs	1	3	4
Money	2	1	3
Ship	1	2	3
Ceramic	2	-	2
School	2	-	2
Hourglass	2	-	2
Parliamentary	2	-	2
Plane	2	-	2
Sun	1	1	2
Eagle	2	-	2
Cup	1	-	1
Star	1	-	1
Family	1	-	1
Watch	1	-	1
Blood donation	-	1	1
Tape measure	1	-	1
Door	1	-	1
Mallet	1	-	1
Scales	1	-	1
Box	-	1	1
Total	**213**	**177**	**390**

When the pictures those are used with regard to the social studies in Google and included in Table 1, are analyzed, it can be seen that the most frequently used image with regard to the social studies in the web sites is “globe (51)”. The “earth (39)”, “country map (34)” and “historical figure (32)” are following the globe image, respectively. The respective image samples are provided in Table 2.

Table 2. Samples that the most frequently used images with regard to the social studies at Google

			
Globe (Figure 1)	Earth (Figure 2)	Country Map (Figure 3)	Historical Figure (Figure 4)

It is recognized that the least used images with regard to social studies are “box (1)”, “scales (1)”, “mallet (1)”, door (1)” and “tape measure (1)”. The respective image samples are provided in Table 3. It can be recognized that the

images used with respect to social studies are mostly related to geography and history disciplinary; therefore, social studies course is not correlated with the role of covering and integrating many fields.

Table 3. Samples that the least used ımages with regard to social studies at Google

			
Box (Figure 5)	Scales Mallet (Figure 6)	Door (Figure 7)	Tape Measure (Figure 8)

Reflection of the Social Studies Images of the Visuals in Google to the Social Studies Education Approaches

The second aim of the research is the question of "Under which categories can the images of social studies those are reflected at the visuals in Google, be collected? In line with this aim, the respective visuals have been considered in three categories as "social studies as citizenship transfer", "social studies as social science" and social studies as reflecting analysis".

Social studies as citizenship transfer

The main purpose of social studies education is to train good citizens (Thornton, 1994). Although the educators have different opinions regarding what the social studies have been, the common point in these opinions is to focus on the fact of citizenship education (Adler and Goodman, 1983). When it is considered that it was aimed to adopt the concept of American citizenship through this course, which was started to be trained for the first time in USA in 1916, it is possible to say that the tradition of social studies education as the citizenship transfer, has been developed to actualize the main reason of educating such lesson in the primary education (Tay, 2010).

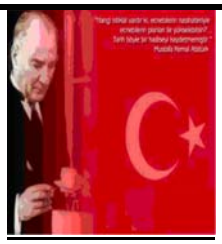
When the pictures with the theme of social studies on the internet sites, 7 pictures have been founded those are reflecting the social studies perspective as the citizenship transfer. 3 examples from these pictures and items exhibiting their relations with citizenship concept have been shown in Table 4.

Table 4. Pictures representing the tradition of social studies education as the citizenship transfer in USA websites

		
Flag (Figure 9)	Flag (Figure 10)	Flag Assembly (Figure 11)

There are 16 pictures representing this perspective at the internet sites in Turkey. It can be seen that Ataturk has been included in almost all of these pictures (14 pictures). Another item that is frequently met in citizenship-themed pictures is Turkish flag (5 pictures). It has been recognized that the assembly image, that is included at USA sourced internet sites, has not been included at Turkey-sourced internet sites. The items to be shown as example for the said pictures can be seen in Table 5.

Table 5. Pictures representing the tradition of social studies education as the citizenship transfer in Turkish websites



Atatürk Flag
(Figure 12)

Flag
(Figure 13)

Atatürk
(Figure 14)

When the beginning of the social studies education in USA is considered, it can be recognized that the main objective is to keep the individuals who have different cultures and are members of various nations under citizenship umbrella. This is exhibited in certain visuals those are included in USA sourced internet sites. When the persons who have been included in the visuals, are considered, it is remarkable that the blacks, whites and different cultures have been included all together. The examples regarding to these pictures are shown in Table 6.

Table 6. Samples representing blacks and whites have been included all together

(Figure 15)

(Figure 16)

(Figure 17)

As can be seen in Table 7, similar pictures are presented in Turkey-sourced internet sites without emphasizing such kind of association.

Table 7. Samples representing togetherness in Turkey

(Figure 18)

(Figure 19)

Social Studies as Social Science

Social studies is a course, which is consisted from various disciplinary of social sciences. Also in the definition made by MNE (2005) for the social studies education program, the social studies is indicated as a course that; reflects the social sciences such as history, geography, economy, sociology, anthropology, psychology, philosophy, political science and law and citizenship knowledge subjects for the purpose of supporting the individual to actualize his/her social existing; includes consolidation of the learning fields under a unit or a theme; where interaction of the human with his/her social and physical environment in terms of past, present and future; is developed from the point of collective education concept.

When USA and Turkey sourced internet sites are examined, it can be recognized that the most emphasized disciplinary is geography within the visual images those are involved in these internet sites. Among the 300 examined pictures, geography is emphasized in 114 of USA-sourced ones and 89 of Turkey-sourced ones. The distribution of the other disciplinary within the scope of social studies is included in Table 8.

Table 8. Frequencies of social science disciplines emphasized on visuals in websites

Discipline	USA	Turkey	Total

Geography	114	89	203
History	38	36	74
Economics	3	4	7
Sociology	1	2	3
Antropology	0	0	0
Psychology	1	0	1
Philosophy	0	0	0
Political Science	2	0	2
Law	2	0	2

With regard to the geographical aspect of the social studies, it can be recognized that sphere and child, examining the world over the sphere, world and country maps have been involved in the visuals. According to a research performed by Yazıcı (2006), it is stated that the most utilized visual materials in social studies course, that has an important role for the students in understanding the texts and in getting a criticizing perspective, are map-sphere, table and picture. Other objects following the sphere and map, those are included in the visuals at the internet sites are geographical shapes and locations together with boussole.

It is possible to emphasize the fact such that the children examining the world appear frequently in the visuals, since the social studies course is a lecture that enables the students to know the world. However, the fact that the children examine the world over a sphere in the said visuals, symbolizes the utilization of the sphere as a material within the consideration process of the subjects those are included within the content of social studies and related to the geography, and does not point out a meaning towards knowing different cultures and the people who live in different regions of the world by going beyond this.

It can be recognized that in the visuals those are involved at USA-sourced internet sites, the image of "people from different nations come together and surround the world" (9 pictures) is also included. It is possible to state that this image is correlated with the "Global Connections" learning field, which is included in social studies education programs both in USA and in Turkey. However, at Turkey-sourced internet sites, such kind of image has not been emphasized. The examples related to the said pictures are included in Table 9.

Table 9. Samples related to image of people form different nations come together and surround the world

(Figure 20)

(Figure 21)

The visuals, in which the world is in the hands of the people (5 visuals at USA sourced sites, 2 visuals at Turkey-sourced sites), have been included under the theme of social studies at the internet sites. It is possible to consider that such kinds of visuals reflect the aim of attaining the opportunity of knowing the world through social studies course. The examples related to the said visuals are included in Table 10.

Table 10. Samples Related to Image of the World in the Hands of the people

(Figure 22)


(Figure 23)


(Figure 24)

When the visuals those are included at the internet sites, have been examined within the scope of the perspective of social studies as social sciences, it can be recognized that another disciplinary that has been put into fore in both countries is "history". In 38 visuals in USA, and in 36 visuals in Turkey, history disciplinary is represented. While the history disciplinary has been emphasized through the visuals of the persons who had important roles in the history, of the historical places and works of arts, at USA-sourced internet sites; at Turkey-sources internet sites, as well as historical personalities, generally, wars in historical facts have been exhibited. This situation can be recognized when the examples regarding to these visuals in Table 11 have been examined.

Table 11. Samples of visuals that history discipline is represemted

USA	 (Figure 25)	 (Figure 26)
Turkey	 (Figure 27)	 (Figure 28)

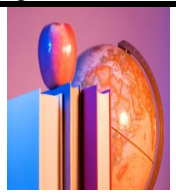
When the visuals are examined at the internet sites, within the frame of the perspective of social studies as social science, as it can be seen also in Table 6, disciplinary, other than geography and history, have been emphasized rather low or not considered any more. It is remarkable that the economy, existing at the third rank, is represented by money and professionals. It can bee seen that images, associating with the social solidarity such as blood donation have been in the visuals those are connected with sociology at Turkey-sourced sites, and mostly cultural items have been at USA-sourced sites. It is remarkable that while the political science is represented by the assembly visual at USA-sourced internet sites, GNAT has not been included at Turkey-sourced internet sites. This finding of the research can be deemed such that the social studies are still under the control of history and geography disciplinary and that integration with other disciplinary has not been succeeded sufficiently. When the impact of the visuals over the students is considered, it can be said that it should be taken into consideration to emphasize this connection between disciplinary in the visuals at the internet sites in order to understand the social studies concept and to reflect there over.

Social Studies as Reflecting Examination

The social studies course is a lecture that is developed over the interest and curiosities of the children towards the world. Not any other course is interested so much with the human and the relations among the humans. The information towards knowing the world and life skills are being gained for the students through this course (Chapin&Messick, 1999). The perspective of social studies as reflecting examination aims to identify the individual and social problems of the students and to develop the decision making processes. The standing out skills in this approach are reading-writing, use of information from different sources, determining and solving the problems, interpretation of the information, determining and solving the issues related to the values (Tay, 2010, p.15-16).

When the visuals, related to the social studies, included at USA-sourced and Turkey sourced internet sites, have been considered within the frame of social studies perspective as reflecting examination, the book image attract the attention. However there is no sign whether the books included in the pictures are course books, or source books of various disciplinary of social studies. The examples of the visuals, those can be associated with the reading-writing from the standing out skills in lien with the social studies perspective as reflecting examination, are included in Table 12.

Table. 12. Samples of visuals related to literacy skill

		
(Figure 29)	(Figure 30)	(Figure 31)

When the visuals in Table 12 are examined, it is remarkable that the image of book is presented together with the image of sphere. In this respect, it can be said that the fact that the books towards knowing the world should be read, has been emphasized. So, this is assumed as supporting the emphasize towards the fact of knowing the world through social studies course.

Social Sciences are the course including the skills and abilities those shall ensure the individual to know his/her residing country, society and the world, beginning from him/herself and his/her family and to find solutions for the problems by analyzing them. However, when the visuals under the social studies theme at the internet sites are being examined, it can bee seen that this fact has been disregarded and that only and in one picture family concept has been reflected. This picture is at one of USA-sourced internet sites, and any such pictures could not be found at Turkey-sourced internet sites.

CONCLUSIONS

The Social Studies is a field that had been included into course programs towards the ends of nineteenth century, that is presented in United Stated of America, at all class levels from the preschool education up to twelve classes, in Turkey between the fourth class and seventh class of the primary school education and that main target is citizenship education.

There are opinions in most of the works related to social studies that the origin of this field has been depending on history education program. However, it is not possible to say that social studies have been developed on the base of history course. Although it shows parallelism in between them, social studies field has a unique improvement line (Saxe, 1991). Beside this, when the visuals at USA-based and Turkey-based internet sites, have been examined, it can be seen that geography disciplinary is involved in the visuals those are involved under the social studies theme, and that history ranks number two following the geography. There are important connections between the geography, which examines the connections between the human and the environment, and social studies. When the requirement of the individual, for geographical knowledge in order to find solution to national and global problems, has been considered (Meydan, 2010), this connection emerges automatically. Although the role and importance of the geography in social studies have been accepted; it is regarded that the excessive emphasize over the geography at internet sites is not convenient in respect of going beyond of regarding the social studies as a course, presented in chapters separate from history, geography and citizenship and presenting how the different disciplinary have integrated. Beside this, it is certain that also the individuals who try to know his/her residing environment, examine the country and the world, not only in respect of physical geography, but also by including other branches of the geography such as human and economical geography should be included in the visuals at the internet sites. Although this is taken into consideration in the visuals in Turkey, the said visuals should also be included at the home-work sites those include the subject explanation of the said visuals or at the sites including the test for SBS exams with respect of, either the quality of the internet sites in Turkey, or reflecting the meaning, assigned to the social studies in Turkey. It can be recognized that the USA sourced visuals are included at the Internet sites of the primary schools.

It is known that through social studies, the individual has obtained skill and abilities towards knowing him/her self, his/her residing country and the world. However, it can be seen that there are no images those reflect the works especially towards knowing his/her own identity of the individual. Besides this, the values such as humanitarianism, entreneurship, scientific, nature love, responsibility, aesthetic and diligence those are existing among the values to be presented in social studies education program and can be provided through connection with other disciplinary, included within the content of social studies, those have not been reflected in the visuals.

The citizenship transfer, as the main target of social studies education, has been represented by the "flag" image in both countries. While, an eagle and assembly items are included to the flag image in USA, mentioning about Ataturk frequently is highly remarkable. Therefore, at the reflection point of the perspective of citizenship transfer, it can be said that the visuals are sufficient and meet this purpose. Beside this, it is an important finding that the visuals reflecting the citizenship responsibilities such as voting have not been included in both countries' internet sites.

It is remarkable that the social studies concept has not been mentioned as a reflecting examination in the examined visuals. The individuals who are examining, questioning, looking for solutions for the problems, have not been included in the visuals. However, it an be recognized that the image of child reading book, has been included in both countries' internet site. It can be possible to correlate this image with the fact of reading-writing, which is included in the skills within the frame of social studies perspective as a reflecting examination.

One of the important subjects that the social studies course is focused on is how the new generations can adopt to the changing society. Especially, thanks to the impacts of information communication technologies, the shift of the citizens activities towards internet, cause the social studies course to be reevaluated towards training citizens who may involve this environment effectively. However, it can be regarded as an important deficiency that the integration of technology and social studies has not been included in the examined visuals.
Consequently, it can be said that the social studies are not included as interdisciplinary according to its definition at the internet sites as the result of the search of the Google visuals, and that sphere and world visuals have been highly included by emphasizing over a disciplinary in both countries. Especially, it is certain that the internet sites in Turkey should direct towards presenting the social studies according to the actuality, rather than existing homework, lecturing and SBS based.

It is possible to make the following recommendations from the finding of the research:
1. The internet sites, existing in Turkey and related with the social studies, can lead for preparation of internet sites those citing and reflecting the social studies in real terms, rather than existing in the status of homework, lecturing and SBS preparation.
2. There might be searches which exhibit which visuals have been used for reflecting the social studies at the internet sites other than USA and Turkey sources.
3. There might be searches, which shall reveal the status of the students' utilization and examination of these internet sites.
4. Ensuring the primary school students to examine these visuals, there might be searches in order to reveal what these visuals mean for them.

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IMPORTANCE OF THE VARIOUS CHARACTERISTICS OF EDUCATIONAL MATERIALS: DIFFERENT OPINIONS, DIFFERENT PERSPECTIVES

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ABSTRACT
The article addresses the issues related to the use and evaluation of educational materials during the teaching process and independent learning. The first part defines the didactic function of educational materials, placing particular emphasis on the optimum explicitness of the educational contents under discussion, the improved rationalization and efficiency of the organization of the teaching process, and increasing students' activity during school instruction and independent learning. The authors argue that the selection of educational materials is influenced by a variety of factors, including educational goals, the educational contents under discussion, the developmental characteristics of learners and, last but not least, the design and availability of educational materials. They also discuss some of the *main criteria* according to which the didactic quality of educational materials can be assessed.

The second part of the article presents the findings of the empirical research study conducted in Slovenia in 2010 and 2011. The research – which consisted of a random sample of 370 teachers and 552 students of three selected and reformed educational programs of vocational education and training – studied the importance that the teachers and students attach to the structural and content characteristics of the educational materials they work with during school instruction and learning.
Key words: educational technology, educational materials, vocational education and training, criteria for the assessment of the quality of educational materials, characteristics of educational materials

INTRODUCTION

Educational materials are one of the key components of *educational technology*. From the general didactic aspect, educational materials can be defined as the didactically adapted materials that the teacher can use during the teaching process as *teaching materials*; for the students who are acquiring or revising their knowledge with the help of the materials, these materials are *learning materials* or *learning sources* (cf. for example Apple & Christian-Smith, 1991). Consequently, educational materials must be prepared in such a way that they help *the teacher* with quality planning and carrying out of the teaching process and *students* with their independent learning, that is, gaining, revising, reflecting on, valuing and using knowledge.

Educational materials are therefore all the specially prepared materials intended to be used during the processes of teaching and learning, in other words, when studying specific educational contents and achieving specific educational goals defined in syllabuses. For that reason, they are appropriately didactically adapted. Educational materials consist of books, encyclopedias, atlases, dictionaries, textbooks, etc.; that is, mostly written materials, which can be either printed or available in electronic form (on digital media or on-line). Both printed and electronic educational materials are indispensable in the teaching process, since they are – in addition to the teacher's direct explanation and other learning activities – an important source for students.

But what does the requirement for a suitable didactic adaptation of educational materials actually mean? To put it otherwise, what characteristics of educational materials have the most decisive impact on their didactic quality, effectiveness and functionality during the processes of teaching and learning? These are the issues addressed in this article; the first part (i) defines the *didactic functions* of educational materials, (ii) defines the *factors influencing the selection* of educational materials during instruction, and (iii) discusses some of the *main criteria* according to which the didactic quality of educational materials can be assessed.

The second part of the article presents the results of the empirical study we conducted in order to find out what level of importance is ascribed to the individual characteristics of educational materials by the teachers and students of vocational education and training (VET) in Slovenia.

The population attending vocational education and training was chosen for two reasons: first, VET programs typically prepare students for entry into the labor market, where employers expect them to possess appropriate work-specific competences; and second, this population is generally less inclined and motivated to acquire academic knowledge. As for educational materials, this means that they have to be didactically designed in a particularly careful way. They have to encourage the acquisition of the knowledge and skills that lead students to

effective vocational competence, while also integrating a high degree of the motivational elements that are effective in attracting students to cooperation during school classes and to independent learning.

In the last decade the area of Slovene vocational education and training has been undergoing fundamental legal and curricular reform processes: new frameworks for national curricula have been adopted, which have a modular structure and are based on competences evaluated in terms of credit points (credit transfer system). Some 20% of the curriculum is flexible, depending on local needs. Learning outcomes are specified in terms of obtaining professional competences (linking theory and practice) and building on key competences and general knowledge (Vocational Education and Training in Slovenia …, 2008, p. 16). The modularly structured and competence-based programs, a closer connection with labor market needs, the openness of curriculum planning and, in this respect, a greater autonomy of educational institutions are the characteristics of VET that undoubtedly have an effect on the expectations for appropriately designed educational materials.

The didactic functions of educational materials and educational technology

In 1970, Gagne wrote about the functions of educational media as an important part of educational technology. For him, the key functions of educational media primarily include presenting the stimulus, directing attention, furnishing external prompts, guiding the direction of thinking, inducing transfer of knowledge and assessing learning attainments (Gagne, 1970, p. 230). The functions that are ascribed to educational technology as a whole are, of course, valid when discussing educational materials as an important part of educational technology, as well. They enable higher explicitness; they help organize instruction more rationally and effectively (thereby realizing the didactic principles of effectiveness and rationality); they stimulate students' activity and effectiveness; they make the process of learning easier; they help acquire knowledge of better quality; they encourage students' independence and critical thinking when selecting/collecting information and so on (cf. also Akhtar, Munshi, & Naseer Ud Din, 2010; Fleischman, 2004; Means & Olson, 1995; Prensky, 2008). As Saglam also emphasizes, "Teaching materials provide a great deal of convenience in teacher's ability to convey a message to students in an accurate, proper, clear and understandable manner; in making abstract knowledge concrete and in enabling students to comprehend complex ideas through simplification. When properly used, printed materials, audio-visual materials and experience-giving methods help make the learning process easy and enduring. Studies concluded that the number of sensing organs activated by the teaching materials used in learning–teaching process is directly proportional to an easy and enduring learning process. In other words, the higher the number of sensing organs activated by the teaching materials employed in learning–teaching process, the better and more enduring the learning process is" (Saglam, 2011, p. 36).

A Slovene author, Jana Kalin (2004), adds some further functions of educational technology and educational materials: the functions of instruction, control, evaluation and organization. She places an especially strong emphasis on:

- *the rationalization and effective organization of the teaching process*: with the use of educational technology we increase students' motivation for learning, stimulate their thinking and illustrate educational contents better, which enables gaining quality knowledge within available (i.e. always limited) time (cf. ibid., p. 212);
- *increasing students' activity*: educational technology can help activate students' sensory channels through which they receive information. This – with a more optimal explicitness – can also help kindle students' interest in the content under discussion and increase their learning *effectiveness* (ibid., pp. 211–212). In this respect, various educational media can help students gain a more comprehensive knowledge of educational contents.

We should not overlook, however, that the role of the professionally well qualified and educated teacher is crucial for a didactically good-quality use of educational materials during instruction. As Valenčič Zuljan et al. assert, a significant factor influencing effective instruction and learning is "the extent to which the teacher manages to stimulate the learner's activity in the process of instruction, especially with learning tasks that aim at achieving the planned educational goals" (Valenčič Zuljan, Peklaj, Pečjak, Puklek, & Kalin, 2012, p. 51).

The use and implementation of good quality educational materials in teaching and learning processes is, without doubt, one of the key components of the teacher's didactic efforts. In this aspect, too, Kalin (2004, p. 212) stresses the importance of the teacher's role when developing and specifying (predominantly operational) educational goals; choosing suitable educational media; preparing, organizing and conducting instruction; and evaluating instruction as well as students' knowledge. In her view, this calls for "a different qualification of the teacher, for innovativeness, creativity and openness to new media" (ibid.).

What are the key factors in selecting educational materials for teaching and learning processes?
Various authors (cf. for example Dowling & Harland, 2001; Ertmer, Ottenbreit-Leftwich & York, 2007; Parker, Bianchi & Cheah, 2008; Wang & Reeves, 2003; Csomai & Mihalcea, 2007) write that the teacher should choose the educational materials to be used during instruction according to educational objectives and planned learning outcomes. Some authors specifically emphasize that the effectiveness of educational materials significantly depends on the already existing (that is, prior) knowledge of learners: "According to studies in cognitive science, an important aspect of the understanding and learning process is the ability to connect the learning material to the prior knowledge of the learner. /…/ The amount of background knowledge necessary for a satisfactory understanding of an educational material depends on the *level of explicitness* of the text. However, it is almost impossible to create pedagogical materials that simultaneously serve the needs of both low- and high-knowledge users" (Csomai & Mihalcea, 2007, p. 557).

Teachers' didactic practice, that is, their anticipation as to how to achieve the objectives (didactic strategies, teaching methods, forms of class organization) is another important factor. Briggs, relying predominantly on Gagne's functions of educational media (Gagne, 1970), maintains that the teacher's decision about the selection of educational media should be primarily deduced from the goals of the practice (i.e. the desired output), learning types, the functions of teaching and the modalities of sensory perceptions (Briggs, 1970).

To summarize, the following factors should be taken into account when deciding on the use of educational materials in the teaching process: the objectives and goals of instruction, the characteristics of educational contents, the intended didactic strategies, the characteristics of the social environment, the characteristics of students and teachers, and the characteristics of the materials themselves (cf. also Kalin, 2004, pp. 213–214). The factors influencing the teaching process are, undoubtedly, intertwined and should therefore be addressed as a synchronous whole.

The objectives and goals of instruction are the starting point for the selection and structuring of materials during instruction. They make up a framework for the selection of the materials that will enable the achievement of specified educational goals (ibid.). According to Gagne (1970), the teacher should not start only from the goals themselves; rather, he/she should establish a connection between educational goals and appropriate ways of learning (such as classical conditioning, operant or instrumental conditioning, psychomotor-chain learning, verbal-associative learning, discrimination learning, learning concepts, laws, principles and rules, and learning as solving problems). Identifying the learning method suitable for a specific goal also makes it easier to identify an appropriate educational medium through which the goals that different ways of learning lead to can be achieved.

Educational contents, as Jana Kalin (2004, p. 213) writes, also define the selection of materials, as the teacher should choose such a medium that will allow for a systematic treatment of the educational content and its credible representation and will take into account learning steps.

When selecting educational media/materials, the teacher should also bear in mind the *didactic strategies* that he/she will use during the teaching process. Kalin (ibid.) distinguishes the media in terms of methods. They can be a means of assistance in learning and teaching, a means of independent learning or a source and transmitter of information. When choosing materials, this is especially important since an appropriate selection of materials will improve motivation, readiness to learn and students' activities, which are, as Radovan emphasizes, the key factors of learning achievements. "In other words, motivation to learn was identified as the most important factor for the interpretation of individual achievement in the learning task" (Radovan, 2011, p. 216).

Considering *the characteristics of students and teachers*, we have to be aware of and take into account students' abilities, gender, age, experience, prior knowledge, working tempo and learning progress (Kalin, 2004). Great importance should also be placed on *the teacher's attitude toward educational media, his/her experience in using educational technology, qualification for its use* and the professional judgment on the manner and frequency of its use (ibid.).

And, finally, *the technical and didactic characteristics of the media/materials* are also highly relevant. The materials have to be didactically adapted, that is, suited to the needs of the teaching process. They should contain and transmit information as well as allow students the attainment of educational goals (ibid., p. 214).

The criteria for the assessment of the quality of educational materials
Within the Institute of the Republic of Slovenia for Vocational Education and Training we have prepared the criteria for the assessment of the quality of educational materials. The criteria applying to the general-didactic suitability, quality and variety of educational materials are the following: the clarity and coherence of the

materials' structure, the quality of multimedia elements, the goal-oriented design of educational materials, the promotion of the development and acquisition of key competences, the use of the inductive approach, the methodical and didactic adaptation of the materials for the needs and characteristics of the target group, the inclusion of motivational elements in educational materials, the provision of stimuli for active learning, the incorporation of the activities that lead to the attainment of goals at different taxonomic levels, and the inclusion of recommendations for establishing connections with other program units (see Table 1 below).

Table 1*:* Criteria for the assessment of the quality of educational materials.

Criteria	Criteria's descriptions
The clarity and coherence of the **materials' structure**	Educational materials are clearly and coherently structured if, among other things: - the title and designed use of the materials are clearly marked at the beginning (the program, module/course, competences), - there is a clear table of contents, - the goals of each individual unit are clearly identified, - the content of the materials is logically arranged, - the conclusion provides a summary or activities for summarizing the content, and - the sources are consistently cited.
The quality of **multimedia elements**	Multimedia elements are suitably integrated in the materials in terms of design and didactics; their didactic (particularly illustrative) role and functionality are easily recognizable. In addition, they are technically and graphically sufficient to fulfill their purpose.
The **goal-oriented design** of educational materials	The materials' contents originate in educational and functional goals, not in systemic sciences or scientific disciplines or areas of expertise. The materials lead to the attainment of goals and allow their users to achieve vocational competences, both generic and occupation-specific.
The promotion of the development and acquisition of **general/key competences**	The materials' contents reveal the author's consideration and integration of the possibilities of acquiring key competences for lifelong learning: • communication in the mother tongue, • communication in foreign languages, • mathematical competence and basic competences in science and technology, • digital competence, • learning to learn, • social and civic competences, • sense of initiative and entrepreneurship, and • cultural awareness and expression.
The use of the **inductive approach**	The materials' contents originate in practical problems, which are subsequently associated with appropriate professional–theoretical and general knowledge. Theoretical knowledge is related with practical knowledge, which makes sense of theoretical knowledge and/or illustrates it.
The **methodical and didactic adaptation** of the materials for the needs/characteristics of the target group	The materials are adapted to the difficulty and level of the educational program. They are structured so as to enable the individualization and differentiation of teaching/learning the contents, and it takes into account students' different learning styles.
The inclusion of **motivational elements** in educational materials	The materials include the elements that strengthen motivation for learning, such as the presentation of goals in the introduction, pictures, graphical illustrations, small icons for easier orientation, interesting facts, real-life examples, life stories, links to other sources, problem-solving, etc.
The provision of stimuli for **active learning**	The materials encourage the user to take the active role at all times; they also expect a response to the presented contents. They offer different activities to practice, revise and test knowledge, as well as questions for thinking and suggestions for project work.

The incorporation of the activities that lead to the attainment of goals at **different taxonomic levels**	The activities planned in the materials lead to the attainment of goals at different taxonomic levels (the revised Bloom taxonomy): • level 1 – remembering • level 2 – understanding • level 3 – applying • level 4 – analyzing • level 5 – synthesizing • level 6 – creating, generating new knowledge • level 7 – evaluating The instructions for doing exercises and performing tasks are clear and allow independent work. The tasks are doable. When reasonable, the materials include keys to exercises or suggestions on how to do them.
The inclusion of recommendations for establishing **connections with other program units**	The so-called cross-curricular connections or recommendations and guidelines for them are included when/if reasonable and didactically justified by adding quality to the materials.

Based on the criteria described above and the processes of rational evaluation, it is possible to assess the quality of educational materials and their suitability for a quality implementation in the processes of teaching and learning. The presented criteria were the basis for the development of the instrument for the identification of the importance that teachers and students ascribe to the various characteristics of educational materials in the programs of vocational education and training in Slovenia. The methodological design and findings of the research are presented in the text below.

The importance of the characteristics of educational materials: the results of the empirical research study[1]
In 2010 and 2011 we conducted a research study in Slovenia in order to achieve two main goals in relation to the students and teachers of three selected, reformed educational programs: we inquired *how often* the students and teachers *use* particular educational materials and *what importance they attach to the structural and content characteristics* of the educational materials they work with during school instruction and learning. The first aspect was examined particularly due to the still persisting school practice that sees the teacher's explanation as the primary – and all too often the only – source from which students gain new knowledge. On the other hand, we were interested in the students' and teachers' views on what characteristics of educational materials they see as more or less important, which can form a basis for the conclusion on what materials they see as being of good quality and would perhaps use on a more regular basis.

THE METHODOLOGY
The descriptive and causal non-experimental method was used for the research. The data were gathered with a questionnaire, which mainly consisted of opinion scales and evaluation scales. The data are presented in frequency and structural tables. Certain variables, although ordinal in nature, were treated as interval variables, and arithmetic means as well as standard deviations were calculated for them. The hypotheses on arithmetic means were tested with the independent T-test, having previously run Levene's Test of Equality of Variances. For testing some of the hypothesis we used Pearson's chi-squared test for independence.

The sample
The questionnaire on the characteristics and use of educational materials was completed by 370 teachers (29.6% of them were men and 70.4% were women) and 552 students (50.4% of them were male and 49.6% were female).

The random sample included the *teachers* working in the reformed programs of *the mechanical technician* (37.5% of those participating), of *health care* (32.3%) and of *the economic technician* (30.2%). More than half of the teachers surveyed (53.0%) taught general education subjects, a good four tenths (41.5%) taught technical subjects or modules, and a negligible few (5.5%) taught both general education and technical subjects. The teachers surveyed had an average of 15.12 years of working experience; those with less than six years of experience amounted to 13.5%, those with six to fifteen years of working experience totaled 42.1%, and the rest had more than fifteen years of experience. It can, therefore, be concluded that the majority of the sample

[1] The research was conducted within the European Social Funds project *The effective implementation of educational programmes and the assuring of quality 2010–2012* as part of *The evaluation of the effects of the implementation of new educational programmes and the assuring of the quality of the pedagogical process.*

consisted of experienced teachers, who can be assumed to be competent enough to give a reliable, professional assessment of educational materials.

The sample of the *students* also randomly included the students from the aforementioned educational programs (the majority, 40.8%, attended the program of *health care*, 32.2% that of *the mechanical technician* and 27.0% the program of *the economic technician*). A third of the students surveyed (33.0%) attended the third year of secondary school, 29.3% attended the fourth year, 23.2% the second year and 14.5% attended the first year of their educational programs. The majority of the students completing the questionnaire (62.3%) thus attended the third and fourth years of educational programs, which can lead us to presume that they were quite experienced in regards to secondary-school educational materials.

The teachers' and students' views on the characteristics of educational materials

An important part of the research carried out among the teachers and students of the three secondary school technical programs referred to their views on the importance of the *characteristics* that educational materials should contain. The aspects relating to the characteristics of educational materials were developed on the basis of the criteria for the assessment of the quality of educational materials discussed above and created within the central Slovene institution responsible for with the development of vocational education, the Institute of the Republic of Slovenia for Vocational Education and Training. The characteristics of educational materials were divided into three groups, called *general* characteristics, *content* characteristics and the characteristics of the *questions and tasks* contained in the materials.

General characteristics predominantly consist of those concerning the structural and design elements of educational materials and the characteristics that were not easily included in either of the two remaining categories. *Content characteristics* concern the quality of the treatment (explicitness, comprehensiveness, understandability, logical correctness) of concrete educational contents, whereas the characteristics of *questions and tasks* mostly refer to the appropriate arrangement, content, understandability, level of difficulty and differentiation of the tasks, which require students to be independent in their learning.

How do the teachers and students assess the importance of the general characteristics of educational materials?

Initially, the teachers and students used a four-point scale[2] to assess the importance of the individual *general* characteristics of educational materials. At first sight, the comparison of the mean values of importance shows that both groups assessed individual elements similarly. Both groups of respondents list the following as the two most important characteristics: (1) the dynamism and diversity of educational materials, that is, the intertwining of various elements (basic texts, more demanding texts, pictures, tasks, questions, interesting facts, practical examples, etc.) and (2) the furnishing of educational materials with the photographs, illustrations and other graphic representations that bring explicitness to the text. These are the only two general characteristics of educational materials whose importance the students assessed with a mean value above 3.40 and the teachers with a mean value above 3.50. These two mean values stand out significantly above the remaining mean values in both groups of the respondents. The third place in terms of importance is given by the teachers to a clear and coherent link (agreement) between educational materials and the goals in the catalog of knowledge, giving it the mean value of 3.37. The students, however, follow the first two characteristics in order of importance with the inclusion of a clear table of contents, giving it the mean value of 3.09 (see Table 1). Likewise, there are statistically significant differences between the values that the teachers and students attach to different characteristics of educational material for almost all the elements, except for the recognizable graphic symbols that mark individual sections of materials and the value they place on interesting covers.

Table 2: The comparison of the mean values assessing the general characteristics of educational materials between teachers and students.

Educational materials …	M Teachers (N = 370)	SD Teachers	M Students (N = 552)	SD Students	α[3]
… are dynamic and diverse, with different intertwining elements (basic texts, more demanding texts, pictures, tasks, questions,	**3.66**	.556	3.41	.725	.000

[2] The variable values were: 1 – completely unimportant, 2 – slightly important, 3 – important and 4 – very important.

[3] In all the cases where the null hypothesis on the differences of population arithmetic means was tested with the T-test, the values of Levene's Test of Equality of Variances were statistically significant.

interesting facts, practical examples, etc.)					
… are furnished with the photographs, illustrations and other graphic representations that bring explicitness to the text	3.56	.574	**3.47**	.707	.024
… include a clear table of contents	3.20	.689	3.09	.872	.039
… have additional e-materials	3.17	.643	2.61	.915	.000
… list the goals that the use of the materials will help achieve in the introduction	3.03	.715	2.65	.853	.000
… contain recognizable graphic symbols that mark individual sections of the materials	3.02	.656	3.00	.818	.589
… cite the sources that the author used when creating the materials and which can provide me with more information on the content under discussion	2.90	.770	2.23	.893	.000
… have an interesting, attractive cover	2.52	.829	2.61	1.020	.115

The mean values that the *students* ascribe to the importance of the individual characteristics of educational materials are generally *lower* by a couple of tenths than the mean values attached to the same characteristics by the *teachers*. The teachers' values given to individual characteristics are also more homogenous, whereas the students' are much more dispersed.

Teachers, being professionals in the area of education, are certainly more aware than students of the importance of the characteristics and their impact on the quality acquisition of knowledge and the carrying out of other activities related to the attainment of educational goals. This is revealed by the frequency distribution, that is, the frequency of the choice of individual values on the four-point scale: while the share of the responding teachers selecting "completely unimportant" as their response remains all but negligible (below 5%) in practically all of the listed characteristics, the share among the students reaches significantly higher values in some characteristics, and in two of them it even exceeds 15%: 15.7% of the students think it is completely unimportant whether materials have an attractive cover or not and as many as 21.9% of them believe it is completely irrelevant whether materials contain the sources that the author used and which can give them more information on educational contents. The high share of the students who believe that citing the sources used is not important (together with those thinking this is only slightly important the share reaches almost two thirds) probably means that during school instruction or independent learning students only rarely turn to other, didactically not adapted sources that the authors of educational materials quote in their lists of references. It does not necessarily mean that they do not use other sources at all; however, it does show that they do not use the educational materials used during school instruction and independent learning as a reference point when searching and choosing other learning sources. It is another matter how much teachers encourage the use of such sources, since the share of the teachers who agree with the students on the (un)importance of the inclusion of sources in educational materials is almost 30%.

Two further points stand out among the responses given by the students on the importance of the general characteristics of educational materials. As regards educational goals, it was expected that the students would find them less important than teachers; it is, therefore, not surprising that 42.2% of them responded it was slightly or not at all important if the introduction lists the goals that the use of the materials help achieve. In general, students, quite understandably, do not consider the categories of educational goals, standards and competences when using educational materials; rather, they focus on educational contents, that is, the knowledge they have to acquire. Educational goals (especially if they are copied from curriculum documents without any appropriate didactic transformation), therefore, do not mean much to many students. It is perhaps a bit more surprising that a relatively high share of the students think it is only slightly or even not at all important if printed materials are supplemented with e-materials – the share almost reaches half of the students (48.8%), whereas the share of the teachers is significantly lower (12.9%; see Table 3).

Table 3: The importance of including e-materials. Comparison between students and teachers.

Students/ Teachers	The importance of including e-materials								Total	
	Very important		Important		Slightly important		Completely unimportant			
	f	f%	f	f%	f	f%	f	f%	f	f%
Students	107	19.6	173	31.7	210	38.5	56	10.3	**546**	**100.0**
Teachers	112	30.6	207	56.6	46	12.6	1	0.3	**366**	**100.0**
Total	**219**	**24.0**	**380**	**41.7**	**256**	**28.1**	**57**	**6.2**	**912**	**100.0**

This is open to more than one interpretation: on the one hand, the data reveal that the use of e-materials is not yet common enough among the students for them to attach any considerable significance to them[4] and, on the other hand, they show that e-materials still do not function in a complementary fashion in relation to the more widespread printed sources. On the assumption that in the future the conditions for the use of e-materials during instruction will become more favorable and that materials in electronic form (e.g. with the use of modern, reasonably priced, but most of all functional e-readers) will become an increasingly more frequent part of the educational process, students will probably attach higher values to them as well.

How do the teachers and students assess the importance of the content characteristics of educational materials?

In addition to general characteristic, the teachers and students also assessed the importance of the *content characteristics* of educational materials. Here, too, they were asked to use the four-point scale to express their views (cf. footnote 2). Both the teachers and students assessed the importance of eleven content characteristics of educational materials (see Table 4).

Table 4: The comparison of the mean values assessing the content characteristics of educational materials between teachers and students.

Educational materials …	M Teachers (N=370)	SD Teachers	M Students (N=552)	SD Students	α[5]
… contain concrete examples illustrating the content under discussion practically	**3.65**	.512	3.17	.737	.000
… contain logically arranged chapters, so that the content of each chapter sensibly follows the content discussed in the previous chapter	3.57	.548	3.30	.727	.000
… contain comprehensive explanations of the topic, which allow independent learning at home, even if the student could not follow the explanation of the topic during school instruction	3.52	.553	**3.47**	.680	.242
… contain a special section that explains new or more difficult concepts	3.26	.664	3.22	.772	.334
… are not too detailed, that is, they do not contain too much information	3.19	.690	2.94	.882	**.**000
… address educational contents cross-	3.14	.634	2.72	.825	.000

[4] This can, furthermore, be concluded from the responses they gave on the frequency of the use of e-materials during school instruction and individual learning, the question that was asked in the second part of the same research study. As many as 73.2% of the students thus said they only rarely (32.2%) or never (41.0%) use e-materials during technical subject classes, with similar answers provided when asked about the frequency of the use of e-materials when learning independently at home: as many as 58.5% of the students never use e-materials at home, and 28.6% of them claimed they only rarely use them. In the context of the otherwise widespread availability and use of computers, the Internet and IT technology in general, these percentages seem extremely high. Yet, they are logical as well: since schools are not equipped with ICT well enough to allow a functional use of e-materials during instruction, students consequently turn to them less often when learning independently at home, too.

[5] In all the cases where the null hypothesis on the differences of population arithmetic means was tested with the T-test, the values of Levene's Test of Equality of Variances were statistically significant.

curricularly as well					
… contain interesting facts and/or anecdotes that make educational contents more interesting	3.13	.772	2.89	.875	.000
… contain a special section after each chapter that briefly summarizes the content discussed by the chapter	3.12	.676	3.20	.803	.108
… contain an introduction that presents the content of the materials in a way which is attractive to students	3.02	.670	2.79	.922	.000
… have specially marked more demanding/additional contents	3.02	.649	2.86	.858	.001
… contain keywords or key thoughts on each page margin recapitulating the content of the chapter or paragraph	2.99	.735	2.83	.850	.002

Both the teachers and students place the highest importance on the logical arrangement of chapters, whereby the content of each chapter sensibly follows the previous one and on comprehensive explanations of the topic, which allow independent learning at home, even if the student could not follow the explanation of the topic during school instruction. This leads to the conclusion that teachers and students primarily expect educational materials to provide them with a clear explanation of educational content, with the authors taking into account the general didactic principles such as explicitness, structural and systematic organization, etc. In the students' view, this was the content characteristic that they attached the greatest importance to.

If we compare the teachers' and students' responses, we see that the mean values that the students ascribe to the importance of the specific content characteristics of educational materials are generally lower by a couple of tenths than the average values ascribed to the same characteristics by the teachers. Again, there is only one exception: on average, the students attach higher importance than the teachers (3.20 vs. 3.12) to the special section after each chapter that briefly summarizes the content discussed by the chapter. There are statistically significant differences between the teachers' and students' values for the majority of characteristics.

The difference between the teachers and students, however, is especially prominent concerning the importance of the presence of concrete examples that illustrate the content under discussion practically (see Table 5).

Table 5: It is important for educational materials to include concrete examples that illustrate the content under discussion practically. Comparison between students and teachers.

Students/ Teachers	**The importance of concrete examples illustrating the content under discussion practically**								**Total**	
	Very important		**Important**		**Slightly important**		**Completely unimportant**			
	f	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**	**f**	**f%**
Students	193	35.7	253	46.8	88	16.3	7	1.3	**541**	**100.0**
Teachers	244	66.3	118	32.1	6	1.6	/	/	**368**	**100.0**
Total	**437**	**48.1**	**371**	**40.8**	**94**	**10.3**	**7**	**0.8**	**909**	**100.0**

Although we might expect the illustration of educational content with concrete examples to be equally, if not even more important for the students, it is obviously not true. If we concentrate on the share of the respondents choosing the response "very important" for this characteristic, we will see that the share of the teachers is almost twice as large as that of the students. Among the latter, only a good third think that the inclusion of concrete examples concerning educational contents in educational materials is very important, whereas the view is shared by a great majority of the teachers – almost two thirds. There are a negligible few teachers who think that the characteristic is only slightly important, but the share of the students is as high as 16.3%, with some thinking that the inclusion of concrete examples is completely unimportant. We also inquired if the students' view on the importance of the characteristic of educational materials depends on the frequency of the use of textbooks during general subject classes, technical modules and independent home learning, but we were unable to confirm any statistically relevant interdependence between the variables. The reasons for the fact that almost one fifth of the students do not attach any special importance to the illustration of educational contents with concrete examples is, therefore, a relevant issue worthy of further empirical investigation.

Statistically significant differences between the teachers' and students' views also appear with relation to some other characteristics. Here, we will focus on two more, namely, the view on the importance of cross-curricular treatment of educational contents and the view on the importance of the presence of interesting facts and anecdotes that make the educational content more interesting.

On average, cross-curricular treatment of educational contents is *the least important* content characteristic of educational materials in the students' view (M = 2.72). As Table 6 shows, almost 40% of students think that the characteristic is only slightly important or completely unimportant.

Table 6: It is important for educational materials to address educational contents cross-curricularly as well. Comparison between students and teachers.

Students/ Teachers	It is important for educational materials to address educational contents cross-curricularly as well								Total	
	Very important		Important		Slightly important		Completely unimportant			
	f	f%	f	f%	f	f%	f	f%	f	f%
Students	98	17.9	233	42.6	183	33.5	33	6.0	**547**	**100**
Teachers	102	27.8	218	59.4	45	12.3	2	0.5	**367**	**100**
Total	**200**	**21.9**	**451**	**49.3**	**228**	**24.9**	**35**	**3.8**	**914**	**100**

Perhaps we could assume that the students are not familiar enough with the concept of cross-curricularity to be able to assess the importance of this characteristic of educational materials in the same manner as the teachers. From the students' point of view, the attached importance seems understandable and expected. It can be assumed that students expect educational materials to address the educational content that is directly associated with the aims of the particular subject or module. Knowledge assessment, too, is generally done by teachers assessing students' knowledge of the subject area they teach, with cross-curricular links being the exception rather than the rule. Thus, what may be surprising is the share of the students (60.5%) who nevertheless think that a cross-curricular approach to educational content is important or even very important. In comparison with the teachers (87.2%), the share is significantly lower, but the very high value among the teachers was expected.

Less expected, however, was the difference appearing between the students and teachers when responding to the question about how important they find the presence in educational materials of interesting facts and/or anecdotes that make educational contents more interesting.

Table 7: It is important for educational materials to contain interesting facts and/or anecdotes that make educational contents more interesting. Comparison between students and teachers.

Students/ Teachers	The importance of interesting facts and/or anecdotes								Total	
	Very important		Important		Slightly important		Completely unimportant			
	f	f%	f	f%	f	f%	f	f%	f	f%
Students	149	27.4	217	40.0	145	26.7	32	5.9	**543**	**100.0**
Teachers	116	31.7	185	50.5	60	16.4	5	1.4	**366**	**100.0**
Total	**265**	**29.2**	**402**	**44.2**	**205**	**22.6**	**37**	**4.1**	**909**	**100.0**

Since interesting facts and anecdotes are primarily added to educational materials in order to motivate students to use the materials – authors thus include them, thinking they are of special importance to students – the percentage of the students thinking that interesting facts and anecdotes are slightly important or completely unimportant (32.6%) seems relatively high, especially when compared to the teachers, among whom more than 80% think that it is an important or very important characteristic of educational materials. The data could, perhaps, also be understood through the fact that at least some students use educational materials more or less with the intention of successfully preparing for exams; consequently, they find the characteristics that help them achieve the goal crucially important. Knowing interesting facts and anecdotes, however, is probably not the topic of knowledge examination and assessment in the majority of the subjects of vocational educational and training.

How do the teachers and students assess the importance of the characteristics of the questions and tasks contained in educational materials?

The responding teachers and students were also asked to express their views on the four-point scale on the importance of certain characteristics of the *questions and tasks* contained in educational materials. In terms of importance, this category of the characteristics of educational materials was also given lower mean values by the students than the teachers. Moreover, while only one of the characteristics of questions and tasks was given a

value lower that 3.00 by the teachers, as many as five (out of seven) characteristics were given lower values by the students.

Table 8: The comparison of the mean values assessing the characteristics of the questions and tasks contained in educational materials between teachers and students.

Educational materials …	**M Teachers**	**SD Teachers**	**M Students**	**SD Students**	**α**[6]
… contain understandable and unambiguous instructions for completing tasks	**3.61**	**.536**	**3.21**	**.816**	.000
… contain the questions and tasks that are closely related to the explanation of the educational content and appear in the materials regularly during explanation, not only at the end of chapters	3.28	.652	**3.22**	.757	.181
… contain the tasks which require completing in practical circumstances, e.g. during practical classes	3.23	.733	2.99	.795	.000
… contain the questions/tasks that require students to evaluate the topic under discussion and reflect on it critically	3.16	.619	2.68	.852	.000
… contain the questions/tasks that require the use or at least recall of the knowledge that students gained in other subjects (or modules/units)	3.16	.606	2.83	.841	.000
… contain the questions and task that are clearly arranged at various levels of difficulty	3.09	.650	2.98	.774	.002
… contain the tasks that require the mutual cooperation of two or more students	2.96	.713	2.73	.899	.000

The differences between the teachers' and students' values for almost all the characteristics are statistically relevant. Moreover, the teachers are more homogenous in their assessments when compared to the students, whose values are much more dispersed. However, the order of importance of the characteristics of educational materials does not differ substantially between the teachers and students. In both target groups, the respondents' mean values place understandable and unambiguous instructions for completing tasks and a close relation between the questions and tasks and the explanation of the educational content at the top of their lists of importance.

Practically all the teachers (97.6%) think that understandable and unambiguous instructions for completing tasks are very important or at least important. On the other hand, "only" 80.6% of the students think so; it would be really interesting to know what the 20% of the students who responded by saying that for them the characteristic is only slightly important or completely unimportant (a good 2%) had in mind. We could assume that the latter predominantly include the students who hardly ever or never use educational materials – in which case it is logical that even such essential characteristics as the understandability of instructions is irrelevant for them. This

[6] Except for the characteristic "*Educational materials contain the tasks which require completing in practical circumstances, e.g. practical classes,*" the hypothesis on the equality of variances was rejected in all points.

is partly (although not completely) confirmed by the cross-tabulations of the responses to the question about the frequency of the use of textbooks and the responses to the question about the importance of understandable and unambiguous instructions – in terms of the frequency of the use of textbooks during technical module classes the interrelatedness could not be confirmed. However, there were statistically significant differences between the assessments of the importance of understandable and unambiguous instructions and the frequency of the use of textbooks during general subject classes ($\chi 2 = 49{,}910$, $g = 9\alpha = 0{,}000$) and independent learning at home ($\chi 2 = 19{,}085$, $g = 9$; $\alpha = 0{,}024$). Thus, for instance, among the students claiming they do not use textbooks for any general subject, there are "only" 63.2% of those who find understandable and unambiguous instructions to be important or very important, whereas the share of those saying they use textbooks for all, most or at least some subjects was around 80%.

The teachers and students agree on another extremely important characteristic of educational materials: the interrelatedness of questions and tasks with the explanation of the educational content, appearing in the materials regularly during explanation, not only at the end of chapters – as many as 90.0% of the teachers and 83.2% of the students believe this is very important or important. Since currently used educational materials often place questions and tasks separately from the explanation of educational contents (e.g. at the end of each chapter in the form of revision questions), the respondents' high shares could be an incentive for authors to conceive their educational materials more dynamically in this respect, by intertwining various functional–didactic elements.

Generally, not many teachers – similarly to what we observed when discussing their assessments of the importance of the general and content characteristics of educational materials – express a view saying that any of the characteristics of questions and tasks is entirely unimportant. Approximately one tenth, however, do assess certain characteristics as only slightly important. As for the share of the teachers who selected the responses "slightly important" and "completely unimportant," three characteristics stand out to a certain degree: 15.2% of the teachers say that it is slightly important or unimportant if educational materials contain the tasks that require completing in practical circumstances (e.g. during practical classes). The percentage is not so high after all, because it is important to take into account the fact that the questionnaire was completed by the teachers who teach different subjects and modules, including those who require a more theoretical and those who require a more practical knowledge.

A good 15% of the teachers also believe it is not terribly important whether the questions and tasks in the materials are clearly arranged at various levels of difficulty. The share, again, does not seem too high – a certain share of the teachers would probably insist that secondary school programs are no place for the differentiation of tasks according to difficulty, as all students should acquire both less and more demanding knowledge. Some school subjects or modules, furthermore, are also less extensive, being only taught in one or two school years and in fewer lessons, which consequently means that there are fewer educational contents being discussed and less need for an explicit delineation of the tasks and questions according to their levels of difficulty.

The biggest share of the teachers (22.9%) chose the responses "slightly important" or "completely unimportant" when describing the importance of the inclusion of the tasks that require the mutual cooperation of two or more students. To put it another way, a good fifth of the teachers – if we go by their assessments of importance – perceive facing tasks and questions in educational materials as first and foremost an individual activity of each individual student. In a sense, of course, they are right – to an important degree, *learning* is an explicitly *intrasubjective activity*, and it would be counterproductive if the majority of the questions and tasks expected the cooperation of more students. On the other hand, completing more extensive and more demanding tasks or looking for answers to more complex questions (say, at the highest taxonomic levels) can be more efficiently accomplished in mutual cooperation between two or more students.

The share of the students who think that the tasks requiring mutual cooperation between two or more students are not very important is also relatively high – 40.3% of them selected the responses "slightly important" and "completely unimportant."

An even bigger share of the students think that it is only slightly important or completely unimportant if educational materials include the questions and tasks that require students to evaluate the topic under discussion and reflect on it critically – as many as 42.7% of them share the view. This is also the characteristic where the opinions of the teachers and students differ the most (see Table 9).

Table 9: The importance of the inclusion of the questions/tasks that require students to evaluate the topic under discussion and reflect on it critically. Comparison between teachers and students.

Students/ Teachers	The importance of the inclusion of the questions/tasks that require students to evaluate the topic under discussion and reflect on it critically								Total	
	Very important		Important		Slightly important		Completely unimportant			
	f	f%	f	f%	f	f%	f	f%	f	f%
Students	97	17.8	216	39.6	192	35.2	41	7.5	**546**	**100.0**
Teachers	103	28.1	223	60.8	39	10.6	2	0.5	**367**	**100.0**
Total	**200**	**21.9**	**439**	**48.1**	**231**	**25.3**	**43**	**4.7**	**913**	**100.0**

The share of the teachers who do not place any special importance to this characteristic of educational materials is a good 11%. The share of the students, however, comes close to half of the respondents, with only a good 17% thinking that this characteristic is very important. The data most likely demonstrate that both during school instruction and independent learning students only rarely come across the tasks which didactic theory would place at the highest taxonomic level. Another question would be: How much attention and consideration do teachers pay to such tasks? If teachers are mostly satisfied with tasks at the lower taxonomic levels, it is probably pointless to expect students to attach a high importance to tasks requiring them to evaluate educational contents and reflect on them critically.

The teachers' views on the importance of the characteristics of educational materials that the students did not assess.

As subject and pedagogical experts the teachers were also asked to assess the importance of certain characteristics of educational materials that the students did not assess, since they would, in general, be unable to do so competently. They were the following structural and content characteristics of educational materials:

Table 10: The mean values of the importance of certain structural and content characteristics of educational materials that only the teachers assessed.

Educational materials …	M Teachers (N=370)	SD Teachers
… cover an entire and complete area (module/content unit/subject), not only a specific content section or chapter	3.40	.623
… are structured so that the links (harmonization) with the goals in the catalogue of knowledge are transparent and clear	3.37	.728
… discuss educational contents on the basis of the inductive approach, that is, they start from concrete, practical examples (the learning situation), to which technical-theoretical and general knowledge is then related	3.36	.625
… take into account the fact that students learn in different ways, that is, they have different learning styles	3.30	.680
… contain tasks at all taxonomic levels	3.23	.628
... are supplemented with additional materials for teachers, which contain didactic recommendations for the use of the materials during the teaching process	3.13	.748
… allow good quality internal learning differentiation and the individualization of the teaching process	3.11	.686
… contain the information about what vocational competences can be developed with the use of the materials	2.93	.772
… contain the information about what key competences can be developed with the use of the materials	2.92	.761
… contain the information about what educational program and what program unit the materials are intended for	2.89	.758

As Table 10 shows, the teachers find it fairly important for educational materials to cover an entire and complete area, that is, a technical module or subject as a whole, not only a specific content section or chapter; for the links with the goals in the catalog of knowledge (the national curriculum for each subject) to be transparent and clear; and for the discussion of educational contents to be based on the inductive approach, which starts from concrete, practical examples to which technical–theoretical and general knowledge is subsequently related.

Let us consider this in some more detail: practically all the teachers (94.3%) think that it is important or very important for educational materials to cover an entire and complete area, that is, a module or content unit or subject of a school year; we can, therefore, conclude that they do not favor the materials that only discuss a specific content section or chapter at all. An exceptionally high share of the teachers (92.1%) also believe that it is important or very important for educational materials to be based on the inductive approach, which starts from practical work situations to which technical–theoretical and general knowledge is related. We should not overlook the fact that, at the same time, an extremely high share of the teachers (97.2%) also believe that it is important or very important for educational materials to contain comprehensive explanations of the topic, which allows independent learning at home if, for instance, the student could not follow the explanation of the topic during school instruction. Thus, *both at the same time* are important: educational materials should (at least partly) be based on the inductive approach, since especially in the programs of vocational education and training this can encourage a more effective attainment of vocational competence but, *at the same time*, the educational contents in them should be addressed thoroughly, clearly, comprehensively, systematically and explicitly. This makes the task of the authors of educational materials a particularly challenging one.

On the other hand, the results reveal an important share of the teachers who think that it is only slightly important or even completely unimportant whether educational materials contain the information about what vocational and key competences can be developed with the use of the materials (this is the view of a good quarter of the respondents on both competence types) or the information about what educational program and what program unit the materials are intended for (30.4% of the respondents). Given the fact that as many as 89.1% of the teachers see the structure of the materials where the links with the goals in the catalog of knowledge are transparent and clear as important or very important, it is reasonable to conclude that quite a large share of the teachers do not perceive key or vocational competences to be closely related with the educational goals and knowledge standards defined in the existing curriculum documents. The conclusion, however, would require further analyses, especially in the light of the fact that competence-based design is one of the key characteristics of the reformed VET programs.

CONCLUSION

The article presents the results of the empirical research study we conducted to find out what level of importance is ascribed to individual characteristics of educational materials by the teachers and students of vocational education and training (VET) in Slovenia.

Although the comparison of the mean values of the importance does reveal some degree of similarity in the values given to individual characteristics by both groups, the mean values that the *students* ascribed to the importance of the specific characteristics of educational materials were generally *lower* by a couple of tenths than the average values ascribed to the same characteristics by the *teachers*. The values given by the latter to individual characteristics are also more homogenous, whereas the students' are much more dispersed.

A finding that probably requires further investigation is the one showing that the students attach a relatively low importance to the inclusion of e-materials: almost half of the students responded it is only slightly or even not at all important if printed materials are supplemented with additional e-materials. As we have shown, this leads to the conclusion that the use of e-materials is not yet common enough among the students for them to attach any considerable significance to it, which could be either the cause or consequence of the fact that e-materials are still not complementary to the more widespread printed sources.

We have also established the high importance that both the teachers and students place on the logical arrangement of the contents whereby each unit sensibly follows the previous one, and on comprehensive explanations of the topic, which allow independent learning at home, even if the student could not follow the explanation of the topic during school instruction. In addition, the respondents' mean values place understandable and unambiguous instructions for completing tasks and a close relation between the questions and tasks and the explanation of the educational content at the top of their lists of importance. On the other hand, however, we have found that the students attach a rather low importance to the tasks that require mutual cooperation between two or more students or the evaluation and critical reflection on the topics under discussion. This may suggest that the students do not attach a high importance to the tasks that could be placed at the highest taxonomic levels (e.g. Bloom's evaluating). When looking for the answer to why this is so, we would probably have to turn to the teachers, too: the question, namely, is how much attention and consideration teachers themselves pay to such tasks. If during knowledge examinations or the teaching process they are mostly satisfied with tasks at the lower taxonomic levels, it is probably pointless to expect students to attach a high importance to the tasks that require them to evaluate educational contents and reflect on them critically.

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IMPROVING STUDENTS' CHINESE WRITING ABILITIES IN TAIWAN WITH THE "CONDITIONED WRITING SYSTEM"

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ABSTRACT
This research investigates students' performance while writing Chinese essays using an interactive online writing system. Participants include students from two seventh-grade classes of a junior high school in Taoyuan County, Taiwan. The experimental group uses the conditioned writing interactive online system, while the control group receives traditional paper-and-pencil writing instruction. Findings show that this writing system makes a significant difference in students' writing performance in the areas of "argumentation" and "organization and structure", two essential elements of Chinese essay writing. This study proposes practical applications of the online interactive writing system for junior high school students' Chinese essay writing.
Keywords: Conditioned Writing; Computer-Assisted Writing; Online Writing System.

INTRODUCTION

This study examines students' Chinese essay writing performance by utilising an online interactive system based on the "conditioned writing" approach. "Conditioned writing" is a new approach for teaching Chinese essay writing develops by Chen, head of the "National Examination Chinese Subject Project Taskforce" in Taiwan (Chen, 2002). Chou (2005) explains conditioned writing approach:

> "[It] provides explicit instructions to the students for composing a Chinese essay. It clearly outlines requirements and helps students to a particular direction for the target performance. Therefore, it works better than simply guided writing for focusing on specific writing skills; it helps students to upgrade their overall writing skills more effectively."

Professional and academic pursuits owe a great part of their success to writing performance (Cho & Schunn, 2007). Consequently, Chinese essay writing is an important part of Chinese language learning. Since 2001 the basic competence test in Taiwan, the junior high school Chinese language test has abandons the writing element and includes only multiple-choice questions. As subject examinations continue to lead teaching and learning in Taiwan, Chinese essay writing is no longer valued, and the skills of junior high school students are gradually deteriorating. According to the news about Taiwan's national exam in 2009, 7,884 of 310 thousand students get "zero" in Chinese writing test. The amount of students who get "zero" in 2009 is much more than in 2008, and almost thousands of students plus than before. (Jiang, Y., 2009)

Chen (2006) claims that the cancellation of the Chinese essay writing test and the rapid development of high-tech media have progressively undermined students' reading and critical thinking abilities and their grasp of Chinese language. This situation also occurs in the Units States, where several documents report the decline of writing skills among American students, and students show limits success with writing tasks involving higher-order thinking and reasoning (Lohr, Ross & Morrison, 1996; Walton, 1990). The influence of cyber-speak further contributes to the degeneration of students' language skills. Writing is a basic communication skill of all citizens. It is also a fundamental tool for the study of all other subjects (Huang, 2001) and a means to further learning, thinking, and discovery (Emig, 1977). There is also a view that high tech media can also be a beneficial revolution to language and writing development. (Crystal, David, 1999)

The Internet can free students from the limits of time and space. Network technology and communication media thrive in an information society. Students can instantly and conveniently obtain the information they need while writing and receive feedback and different perspectives for mutual communication, discussion and interaction. As a result, students can experience a new way to practise writing (Yang & Chan, 2008). In recent years, Web-based educational systems have contributed to the emergence of new research and development to prepare highly qualified teacher candidates (Calandra, Lai & Sun, 2004).

A study by Ligorio, Talamo, & Pontecorvo (2005), for example, notes that an interactive mode motivates students to write. Similarly, Jang (2008) reports that the integration of writing and network technology benefits knowledge construction. Vilmi & Malmi (1996) also indicate that students could learn better by creating, writing, and playing games. In their study, participants found that learning language with computers is exciting and worthwhile. Finally, Lohr, Ross & Morrison (1996) explain that the success of the hypertext-writing environment relates to teachers and students' perceptions of its efficiency.

PURPOSE

This research is located in Taiwan and its purpose is to investigate students' Chinese essay writing performance under two different conditions. In both conditions, students are under instruction of conditioned writing approach. The main differences between two groups are the access way to online interactive system during writing phase. Control group has to complete the writing task using a traditional paper-and pencil format under instruction, whereas the experiment group access the conditioned writing instruction through an online interactive system, which provides reference links and timely feedback for students' writing—resources that are not as feasible in traditional paper-and-pencil formats.

This study explores whether the online interactive system would assist students with Chinese essay writing and influence students' writing performance or not. The convenience of computer networks may help students retain better control of their writing process and reflect on their work. This will encourage students to have something to say when they need to express themselves rather than just stringing words together for the sake of saying something.

Conditioned Writing: A New Approach to Teaching Chinese Essay Writing

This study employs conditioned writing to enhance Chinese essay writing skills. Chou (2005) explains that conditioned writing is one of the new approaches to teaching Chinese essay writing. It differs from guided writing in explaining questions by both directions and conditions for instruction. This approach can use on to focusing on one or more important writing skills and it requires students to respond accordingly. Details and specific guidance is offers for systematic practices, making it possible for students to develop their writing skills steadily. The style of questions designs for conditioned writing draws students' attention to writing effectively.

Chou (2005) claims traditional essay writing about a single subject only focuses on the result. The requirements of traditional essay writing are very difficult for students of limits abilities. In contrast, by combining sample reading and writing, conditioned writing can help students develop their Chinese essay writing abilities progressively, from phrases to sentences and from paragraphs to the entire essay. M. M. Chen (1994) takes "sample" as a best model and guidance for students to read and write, and to learn vocabulary, interpretation to the title, material selection, and structure arrangement. Conditioned writing instructions are more suitable and effective than traditional guided writing.

This study adopts the cognitive process theory of writing, presents by Flower & Hayes (1981). The emphasis in this research is on how to instruct students using the conditioned writing approach during the various processes of writing, such as planning, translating, reviewing, and monitoring. This research also assumes that students' Chinese essay writing skills would be enhanced by embedding conditioned writing into the process of writing, offering students a greater sense of achievement from essay writing.

Three Essential Elements of Chinese Essay Writing Performance

This study recognizes three essential standards of Chinese essay writing performance, based on the research of Tseng (2007). She proposes four main categories of Chinese essay writing assessment standards, such as argumentation, text organization and its structure, Chinese language use, accuracy of Chinese character writing, format, and punctuation. Three of these standards are identified as the essential elements of Chinese essay writing, according to the evaluation below.

1. **Argumentation:** Use of genre features, compliance with the topic and specific presentation of

author's argument and viewpoints
2. **Text Organization and Structure:** Overall text organization and structure, consistency, and depth of the materials
3. **Chinese Language Use:** Word choice, sentence structure, and accuracy

These essential elements of Chinese essay writing are similar to a major scoring protocol for writing identified by Englert, Yong, Dunsmore, Collings, & Wolbers (2007). The scoring protocol is based upon one originally develops by Englert (2003). The overall holistic quality of a personal narrative essay is evaluated on a scale from 0-3 points, where 3 = proficient; 2 = developing; 1 = emerging; 0 = undeveloped. It is according to the primary trait rubric for proficient writing (a score of 3), shown below (Englert et al., 2007):

1. **Introduction to the paper's topic:** Clear introduction to the topic, purpose, and structure in a well-defined sentence that launches the topic in a general way and stages the details that follow
2. **Introduction to the Category:**
   - **2.1** Introduction to the paper's subtopics and categories
   - **2.2** Clear and consistent introduction to all categories
   - **2.3** Details adhere to the specific topic sentence or main idea
3. **Depth of Categories:**
   - **3.1** Adequate depth of sub-topical coverage through the inclusion of relevant details
   - **3.2** Details are connects and consecutive and link to categories in clear terms
   - **3.3** Main ideas are solidly backs with sufficient evidence
4. **Breadth of categories:**
   - **4.1** Breadth of content coverage through the inclusion of several subtopics that are fairly well developed
   - **4.2** Covers nearly all primary categories to provide coherent, complete information
   - **4.3** Clear and details sub-topical coverage
   - **4.4** No obvious gaps or extraneous categories
5. **Conclusion:** Clearly stats conclusion that wraps up the sub-topical presentation and returns to the original topic
6. **Overall organization:** Includes all three parts of paper, including an introduction to topic, body of paper with 2-3 related details, and conclusion

Although the conventions of Chinese essay writing differs from Western essay writing, the criteria of good work, to some extent, are analogous. For instance, overall organization, argumentation and writing conventions are the assessment standards for writing good papers. This study identifies "argumentation, organization, and language use" as the essential elements of Chinese essay writing performance and designs a "Conditioned Writing-Based" (abbreviated as "CWB" latter in the article) online interactive system for seventh-grade students.

The Influence of Computer Networks and Technology on Writing

Computer networks have plays an instrumental role in the teaching and learning of essay writing. Kulik (1999) claims that using computer-based instruction programs could raise student examination scores by 0.30 standard deviations significantly, and it also produces small but positive changes in student attitudes toward teaching. Studies have proven that writing practice through computer networks is more effective than conventional paper-and-pencil practice. Liu, Moore, Graham & Lee (2003) find that the computer is an efficient tool in helping pupils with language studies. Snyder (1994) notes that when students write with a computer, the teacher can more easily function as a facilitator, allowing students to be more independent. Suhonen (2006) recommends a book for teachers about using common technology to support everyday teaching activities. It gives practical ideas to instructors for enhancing their teaching with technology.

Good instruction and direction are needs to help students to experience effective network-based learning. Nancy (2006) confirms that the Internet could offer students more assistance with writing, especially when instruction from teachers is added. The convenience of computer networks enables students to search for answers and receive timely feedback as they practise writing in their own style. Lan, Hung & Hsu (2011) teaches younger students Chinese writing through web-based environment, and find that providing a learning system with high richness media online could improve their motivation and guide them to write more positively.

Yang, Ko & Chung (2005) claim that elementary students' writing performance is significantly enhanced by an interactive online writing system that includes peer review, topical prompts and comments from readers. Even without specific teaching activities, their study indicates that challenging subjects, mutual evaluation mechanisms and the frequency of writing on the computer network are important factors to improve students'

Chinese essay writing performance.

Englert et al. (2007) also observe that Web-assists writing gave students three advantages.

1. Students are able to look up words in the online dictionary.
2. The computer has an automatic correction function that helps students to spot questionable words and phrases.
3. By engaging students in Web-assists writing, the teacher can give students timely feedback on their work.

Students' writing performance shows significant improvement with the use of Web-assists writing practices. Goldberg, Russell & Cook's (2003) study indicates that students tend to write more and correct their work better when writing with a computer. The writing ability of students—especially less skilful students—progresses remarkably. Kuteeva (2010) uses "wiki" to teach writing, and the results indicate that wiki for writing activities causes students more concentrate on grammar correctness, structural coherence and being aware of "audience" in writing. Englert et al. (2007) employ Web-assists writing with a structural framework that allows flexible organization to help students connect their thoughts and free them from the constraints of memory, thereby enhancing students' organizational ability.

With better programming for teaching and learning, good instruction can be very effective. This study takes advantage of networking technology and the Internet's freedom from time and space to give writing instructions through interactive guidance, thereby providing students with real-time interaction and feedback during the writing process. This setup makes it easier for students to revise their work and gives their work a more presentable appearance. The design gives students helpful reference information through hyperlinks to outside resources, so students are no longer confined to the setup of the page (Hsieh and Liu, 2008).

This study integrates Internet-based technology into the approach of conditioned writing for the teaching and learning of Chinese essay composition. Hence, this study constructs a CWB online interactive system to give students guided questions and progressive practice. Through the program, they receive feedback on their work and use the system to review the work of their peers. The flexibility of the system design enhances students' performance. Consequently, the educational function of the writing program is maximized to make writing instruction more effective.

THE STUDY

Participants. Students (total=67, age: 7th grade) were drawn from two classes of a junior high school in Taoyuan County in Taiwan. They were divided into experimental group (n=32) and control group (n=35), see [Table 1].

Table 1: Grouping of participants.

Type of Group	Conditions	Number of participants	Gender of participants
Experimental group	online interactive system	32	male: 15 female: 17
Control group	traditional paper-and-pencil print formats	35	male: 18 female: 17

Study design. This quasi-experimental study investigates the differences in students' Chinese essay writing performance under two conditions. One group completes writing tasks using a traditional paper-and-pencil print format with conditioned writing instructions. The other group accesses the Internet through the CWB online interactive system. To test the level of the participants' Chinese essay writing skills, a pre-test is conducts on the three dimensions of the assessment standard: argumentation, text organization and structure, and language use. (The material and content of the pre-test will be fully explains in a later section.) The formal experiment continues for ten consecutive weeks. The participants of both groups then took a post-test upon completion of the writing program.

To identify the influences on students' essay writing performance while integrating with the CWB online interactive system, different instructional modes are adopts as independent variables. Control variables that had no bearing on the outcome of the experiment are also taken into account. Changes in students' writing performance are included as dependent variables, see [Figure 1].

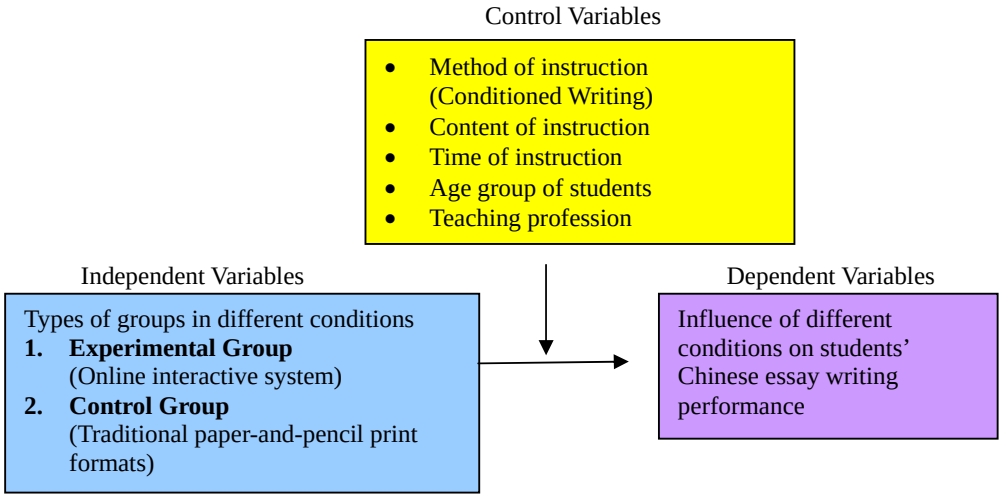

Figure 1: Study design, illustrated

Writing test sheets for pre-test and post-test. Writing sheets are designs for the pre-test and post-test to collect data on students' Chinese essay writing performance under the three assessment standards. Students of both groups are asks to take the writing test during one 45-minute class session. The teacher and students in the CWB interactive system group follows the same instructions and writing process as the control group. The students in the experimental group are familiar with the navigation of the CWB browser, so they did not require additional time to write their essays. The time is not a deciding factor because students participate in the same activities across both groups.

The content of the writing pre-test and post-test are different in terms of content but at the same difficulty level. The writing topics and examination questions of the post-test are topics that students had not encounters in the pre-test or during the experiment so that students would not be affects by prior practices. This formulation of test sheets allows the collection of valid data. This data is assessed after the quasi-experiment to determine whether the CWB interactive system results in a significant difference between the groups in terms of student performance.

Rubric for Chinese essay writing assessment. The rubric for Chinese essay writing assessment in this study includes 20 elements, which is divided into three major areas. Elements 1-8, Argumentation, focuses on students' ability to address the main issue and select appropriate materials to express the main idea. Elements 9-14, "organization," focuses on students' ability to write a coherent, well-organized essay. Elements 15-20, "language use," focuses on students' ability to use the Chinese language accurately and effectively to write sentences.

The overall quality of the papers is evaluated on a scale from 1-5 points (based on the three essential elements of good papers), where 5 = very good, 4 = good, 3 = fair, 2 = poor, and 1 = very poor.

Because the rubric is verified by Chinese literature experts to ensure its validity, the scorer could objectively rate pre-test and post-test writing according to the standards of Chinese essay writing assessments.

CWB online interactive writing system.
The CWB online interactive system is designs for the students in the experimental group. It is called "May's Writing Meadow," after its creator. On the left menu bar, the first section, "Writing Garden," is where Chinese essay writing activities took place. Students need to become members to participate in the practice.

Site content

1. ***Page of "Writing Garden:"*** This Web site had two subsections: "Writing Principles and Evaluation Standards of Basic Competence Test for Junior High School Students in Taiwan" and "Writing Practice Zone," see [Figure 2].

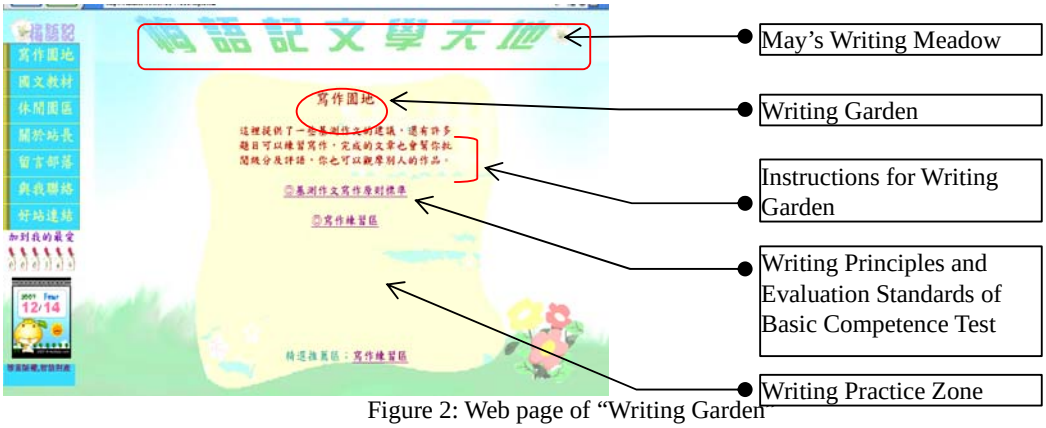

Figure 2: Web page of "Writing Garden"

2. ***Writing practice zone:*** This is where interactive questions for conditioned writing are given. Students are required to enter their account number and password before entering the Writing Practice Zone or changing their account information.
3. ***Writing exercises:*** Upon entering the Writing Practice Zone, students see a list of the writing exercises, divided into five units of question sets.
4. ***Curriculum for writing exercise in writing practice zone:*** This study utilises the approach of "conditioned writing" to design question sets for interactive instructions. Following the integrate design, effective instructional interaction and guidance is used to gradually guide students through the writing process. As mentions earlier, "argumentation," "text organization and structure" and "language use" are identified as the target assessment standards in this study, see [Table 2].

Table 2: The curriculum for the writing practice zone

Writing Practice Zone				
Duration	**Category of Writing Exercises**	**CWB Question Sets**		**Target Assessment Standards for Chinese Essay Writing Performance**
		Basic Guidance	**Advanced Guidance**	
Week 1-2	Writing Exercise I	2	6	• Argumentation • Text organization and structure • Language Use
Week 3-4	Writing Exercise II	1	6	
Week 5-6	Writing Exercise III	1	4	
Week 7-8	Writing Exercise IV	1	5	
Week 9-10	Writing Exercise V	1	5	

4.1 *Each writing exercise is conducts for two weeks during the ten-week experiment:* one week for students to complete the writing exercise, and one week for teachers to rate the writing. After a brief introduction from the teacher, the question sets in each writing exercise are assigns to students to complete in sequence; that is, students finish a complete piece of writing for each exercise.

5. ***The first page of instructions for the writing exercise:*** The first page presents two sections of instructions, basic guidance and advanced guidance, with questions designs according to the conditioned writing approach. Students could write ideas about their chosen topic and form a plan for the text using the cognitive process theory of writing (Flower & Hayes, 1981), see [Figure 3].

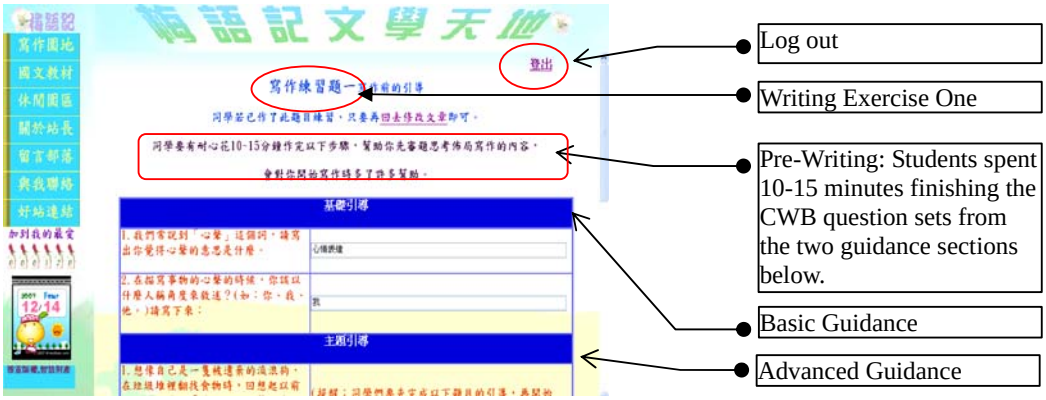

Figure 3: The first page of institutions for the writing exercise.

6. ***The second page of instructions for the writing exercise:*** After using words, phrases and sentences to answer the questions from the two guidance sections, students began their writing based on the topic. If they became stuck, they could access tips and references provided by a Chinese writing expert in the bottom right column. Thus, students could progress to "translating" and "reviewing" in the cognitive process theory of writing (Flower & Hayes, 1981), see [Figure 4].

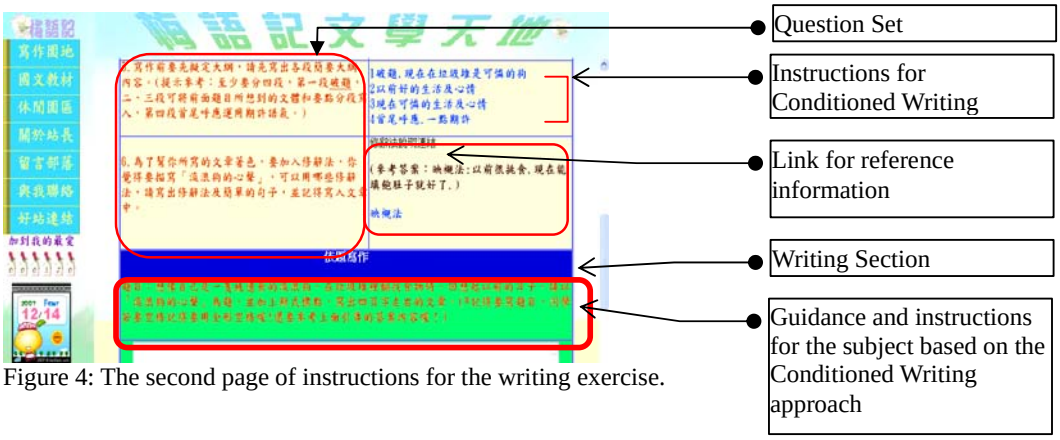

Figure 4: The second page of instructions for the writing exercise.

7. ***The Completion Page of the Writing Exercise:*** After completion, students click a button to view their own work on the Web page, see [Figure 5].

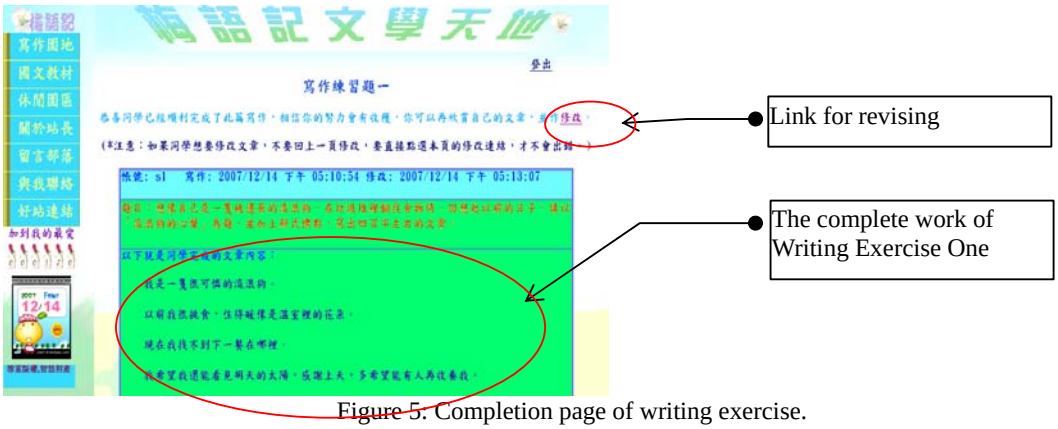

Figure 5: Completion page of writing exercise.

8. ***The Web Page for Revision:*** This Web page provides students with a link to revise and proofread their own work. The convenience of Internet technology allows students to reread for new ideas or to evaluate and revise the physical text in the "reviewing" stage of the cognitive process theory of writing (Flower & Hayes, 1981), see [Figure 6].

Figure 6: Web page for revision

RESULTS

After the pilot study, there is a high correlation between the writing test sheet of the pretest and post-test. The Pearson product-moment correlation value of the total score is .997, and the significance is .000<.05. In "argumentation," "organization" and "language use," the correlation is also significant, meaning that the content of the writing test sheets in the protest and post-test are significantly correlated. Therefore, the writing test sheets could be used reliably in the protest and post-test of this study.

The scores of two groups of students in the pro-test and post-test. From the protest to the post-test, the scores of students in the two groups, processed by an independent sample *t*-test, are significantly different. As shown in Table A.4 (below), prior to the experiment the *t*-value of the protest score of both the experimental group and the control group in "argumentation" is 1.278 and the *p*-value is .206>.05, which did not indicate a significant difference. Furthermore, no significant difference is found for "organization" and "language use." According to the statistical analysis of the scores, there is no significant difference between the protest scores of the two groups of students in "argumentation," "organization" and "language use."

Table 4: the scores of students' Chinese essay writing performance

Major Dimensions	Protest/ Post-test	Group	Numbers of Students	Mean	SD	*t*	Significance
Argumen-tation	Protest	Experiment	32	24.00	4.635	1.278	.206
		Control	35	22.43	5.359		
	Post-test	Experiment	32	28.44	4.899	4.675	.000***
		Control	35	21.97	6.266		
Organiza-tion	Protest	Experiment	32	18.06	3.636	1.686	.097
		Control	35	16.49	3.988		
	Post-test	Experiment	32	20.59	3.500	4.302	.000***
		Control	35	16.20	4.708		
Language Use	Protest	Experiment	32	18.22	3.358	1.289	.202
		Control	35	17.03	4.119		
	Post-test	Experiment	32	18.53	3.818	1.630	.108
		Control	35	16.80	4.770		

*** p <0.001

As shown in Table A.4, the *t*-value after the experiment in the area of "argumentation" is 4.675 and the *p*-value is .000<.05, indicating a significant difference. The *t*-value in "organization" is 4.302 and the *p*-value is .000<.05, also indicating a significant difference. However, the *t*-value in "language use" is 1.630 and the *p*-value is .108 **>** .05, indicating no significant difference.

Based on this statistical analysis result, the experimental group writing with the CWB online interactive system shows a significant difference in "argumentation" and "organization" but no significant difference in "language use." The three dimensions are discussed as 5.1 to 5.3.

DISCUSSION

Discussion of the result of "argumentation." The experimental group shows significant improvement in "argumentation" on the post-test, see [Table 4]. Using the online interactive system together with the "conditioned writing" question sets may have helps students with pre-writing thinking, so the "planning" stage of the cognitive process theory of writing (Flower & Hayes, 1981) is more comprehensive. This system offers assistance while students think and try to answer the questions.

When the writing is completed, students who use the CWB online interactive system receive timely feedback from the teacher, including scores and suggestions for revision. As the students continuously revise their work, the teacher simultaneously offers suggestions. The pace of the interaction is faster, and students receive direct feedback on the mistakes they made in argumentation. Revising writing on the computer is also more expedient, so students did not easily tire of the task. They had more opportunities to practise argumentation in the revising process. Even when both groups receive instruction through the conditioned writing approach, students in the experimental group tends to be more attentive to the "planning," "translation" and "reviewing" stages in the cognitive theory process of writing (Flower & Hayes, 1981) while working on the interactive system with timely feedback. This advantage came from the convenience of computer typing and from online communication with the teacher. From the logging record in the "Writing Garden" section, it could be inferred that students cars about the scores and comments given by the teacher.

Discussion of the result of "organization." The experimental group shows more progress in the post-test in the area of organization, see [Table 4]. Students are able to spend more time on conceptualisation and arrangement of the structure of their writing. They could also more effectively revise it based on the teacher's suggestions. With the online interactive system, students are able to make drastic revisions to sentences and are no longer bound by the space of the writing sheet. This process increases the number of revisions, and students' ability to organise their works is significantly enhanced.

Discussion of the Result of "Language Use." There is no significant difference between the two groups of students in language use, see [Table 4]. This phenomenon could be ascribed to the fact that it takes time to develop language ability, and reading is required to produce an effect. In just ten weeks, therefore, it is not possible to show a significant difference between the two groups of students. Both groups improve their ability to handle "language use" in the course of practice, but more time would be needs before significant results could be seen.

Base on the results of the protest and post-test, the average score of the post-test among the control group decreases and the standard deviation increases. During its limits duration, this study found that the traditional paper-and-pencil writing class is more helpful for those who already knew how to write well. For students of limits writing skills, it is not as useful. The difference could be perhaps ascribed to the process of interaction and modification, as well as writing through a CWB online interactive system.

Total scores of the two groups and their discussion. The dimensions of the scoring rubric include "Argumentation," "Organization" and "Language Use." Adding the scores of these three dimensions produces the total score. This study found the difference in total score between the two groups of students to determine their progress in Chinese essay writing, see [Table 5].

Table 5: Independent sample t-test of the total scores.

Rubric Score	Protest/ Post-test	Group	Number of Students	Mean	SD	*t*	Significance
Total Score	Protest	Experiment	32	60.28	11.312	1.476	.145
		Control	35	55.94	12.630		
	Post-test	Experiment	32	67.56	11.427	3.798	.000***
		Control	35	54.97	15.234		

*** p <0.001

As shown in Table A.5, the statistical analysis of the scores during the writing protest of the experimental group (in the CWB online interactive system) and the control group (in the traditional paper-and-pencil method) shows that the *t*-value is 1.476 and the *p*-value is .145>.05, indicating a lack of significant difference. Statistical analysis of the scores in the post-test of the experimental group and control group shows that the *t*-value is 3.798 and the *p*-value is .000<.05, indicating a significant difference. Therefore, it is evident that the experimental group experiences significantly more progress than the control group in essay writing performance.

The results of the experiments shows that students who wrote using the CWB interactive system made better overall progress than students who wrote using the traditional paper-and-pencil method. This indicates that the CWB online system with question sets for guidance could indeed influence students' performance in Chinese essay writing. The CWB online interactive writing system provides effective assistance for students during the "planning," "translating" and "reviewing" stages of the cognitive process theory of writing (Flower & Hayes, 1981).

With the conditioned writing question sets, students are encouraged to think comprehensively when "planning" the writing process and had timely access to assistance resources. When students proceeds to the "translating" part of the writing process, answers to the question sets helps them organise content. After completing the article, students who use the CWB online interactive system receive timely feedback from the teacher during the "reviewing" stage of the writing process. The teacher's suggestions enhance students' grasp of the key issue of the article and allows them to correctly revise the organization of their work. Because students want to present good work to their peers, they are more careful about the quality of their work. Through these factors, the overall performance of the experimental group is improved.

CONCLUSIONS

According to National Exam Center in Taiwan, data shows students' Chinese essay writing performance is getting down quickly in recent years. (Jiang, 2009) Even though, writing proficiency is an indispensable part of Chinese language learning. Students' writing performance suffers because they lack reading and writing training. The Internet also exposes them to the adverse influence of cyber-speak, making their writing increasingly difficult to comprehend. Understanding these causes, we begin to seek solutions. This study takes full advantage of the convenience of information technology by offering writing instruction through an online interactive system, but more appropriate guidance still needs to be adds to the teaching process. This study designs "conditioned writing" question sets to guide students and explore the influence of this interactive writing system on students' Chinese essay writing performance.

Lai & Calandra (2009) indicate that the use of computer-based support enhances participants' reflective writing experience. Their study had positive quantitative and qualitative results. In this study, students are divided in two groups: the experimental group, which wrote using the CWB online interactive writing system, and the control group, which wrote using a traditional paper-and-pencil format. The experiment for ten-wee involves five CWB writing exercises with question sets, each covering "argumentation," "organization" and "language use," the three essential elements of Chinese essay writing performance. Research findings indicate that students who use the combination of the CWB writing exercise with question sets and interaction during the writing process made more significant progress than students who receive the traditional paper-and-pencil writing instruction. The improvement of students in the experimental group in "argumentation" and "organization" is obvious, indicating that the CWB online interactive system is an excellent way for students to improve their writing performance.

An online interactive system frees writing instruction from the constraints of time and space. Students with access to the Internet can utilise the writing system for practise and can use the instructions and assistance links. Moreover, following completion of their work they benefit from convenient interaction with instructors and peers. Timely feedback allows them to revise according to the teacher's comments. Because their work is on display to their peers, students are also motivated to write better.

An online interactive writing system involves posting question sets on the Web site as well as guiding students through the process of writing to assist them in the "planning" stage of the cognitive process theory of writing (Flower & Hayes, 1981). Therefore, suitable question sets are required for effective guidance. To improve students' writing performance, they must be allows to practise progressively to give them a sense of achievement and the confidence and motivation to write.

Offering writing instruction through the CWB online interactive writing system is different from writing on the Internet. Even though writing on the Internet involves similar online display and discussion functions, these functions are insufficient to encourage students to complete writing tasks systematically, to think independently, to complete an essay in response to topical questions, and to revise their work. This is where the CWB online interactive writing system can be beneficial.

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Appendix

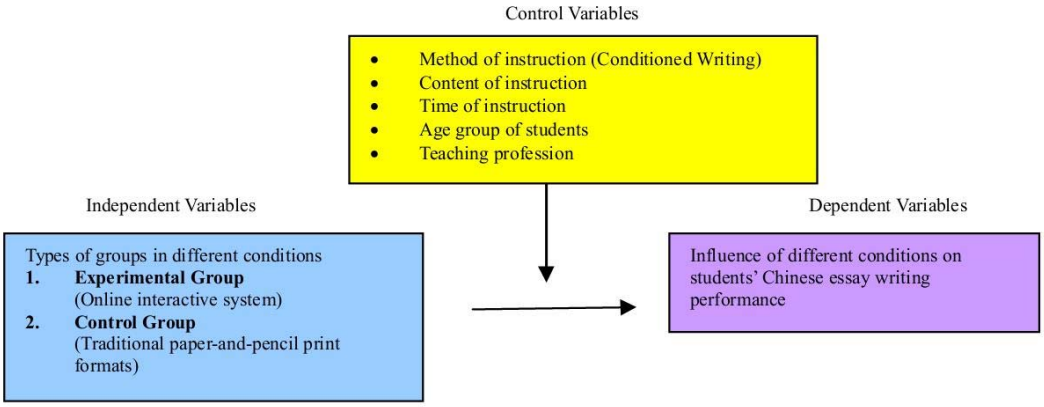

Figure 1.

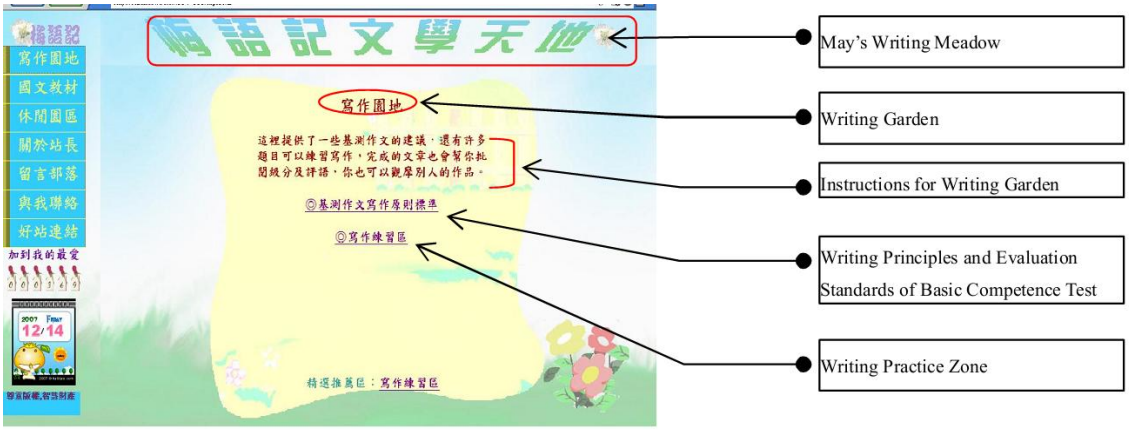

Figure 2.

Figure 3.

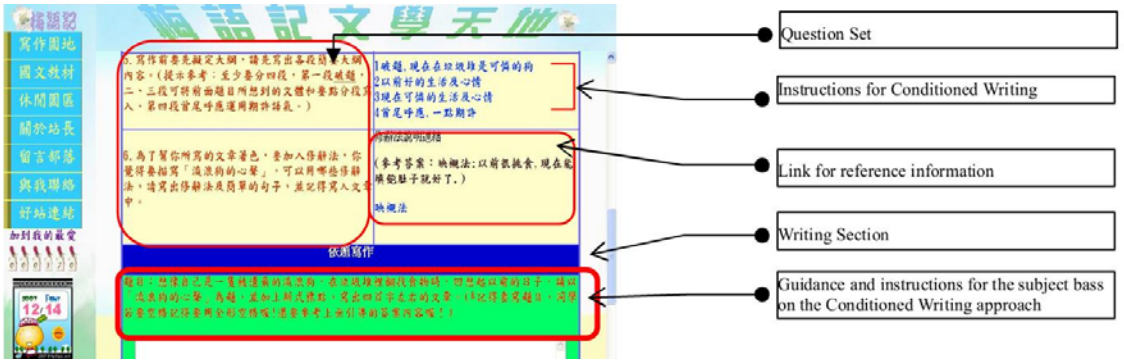

Figure 4.

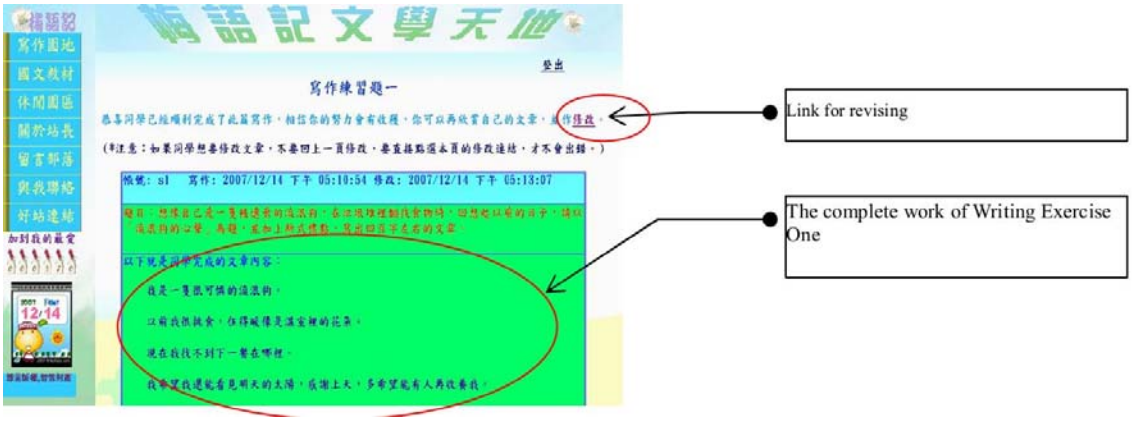

Figure 5.

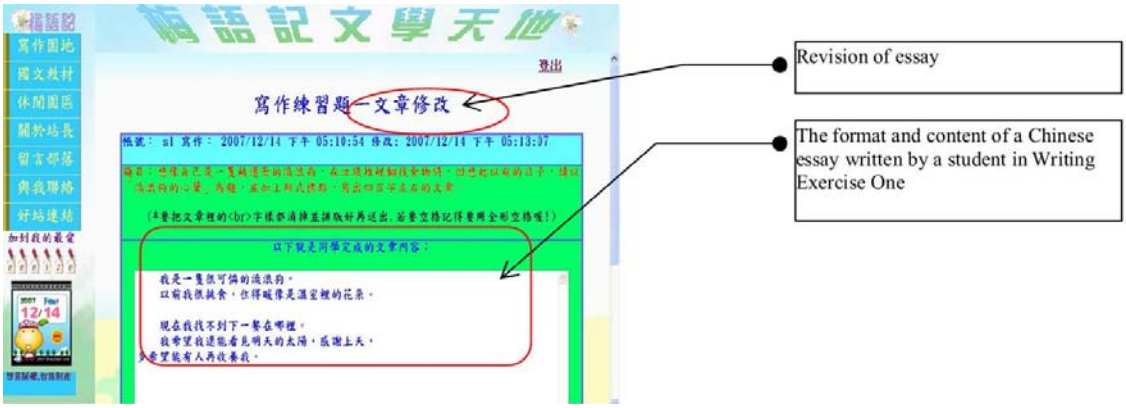

Figure 6.

INTERNET SHOPPING BEHAVIOR OF COLLEGE OF EDUCATION STUDENTS

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ABSTRACT
Internet is an important facilitator for human and human use this medium almost every phase. As a shopping medium, internet attract human so attract researcher. Younger people can adapt newer technologies so they can adapt internet as shopping tool. In this research it is tried to define college of education students' online shopping behavior and online shopping activities. Research results show that male students teacher are more familiar and have more positive attitude than female student teacher. Teacher students, who have more monthly income and have more internet self efficacy have positive attitude and intension to shop online. Participants who have credit card, have more familiarity and less anxiety concerning internet shopping.

INTRODUCTION

Internet has become an important tool, which usage has increased and beside usage its importance has also increased. Humans' everyday life has influenced by information and communication technologies (ICT) considerably (Farag, Krizek & Dijst, 2006). People use more ICT's in their daily lives. The use more cell phone, more computer and also use more Internet. Generally ICT, especially Internet simplifies information related work (Forsythe, Liu, Shannon & Gardner, 2006). In early days of information age, number of web sites and information on web sites are limited and static. Sometimes web site content had not been updated yearlong. Increasing web usage an new internet technologies lead to en user can update web content and lead to increase web usage. Recently internet has spread quickly and has become crucial tool all over the world (Farag, Schwanrn, Dijst & Faber, 2007). In western countries and also in other countries people started to use Internet via desktop computer. After invention of mobile devices accessing to Internet expanded. In the last decade, Internet has influenced communication, entertainment and shopping experience (Miyazaki & Fernandez, 2001). The number of applications is increased an easiness of these applications is also increased. By the way not only experiences users but also inexperienced users can use most of the applications. Internet and internet user have expanded internet limits and this widening has affected especially industrial sectors (Chung & Lee, 2003). Knowledge is the most important factor in today's life but especially in industry. Internet give opportunities to people share their idea and improvement about their works easily so one who search specific knowledge, can easily find over internet. User have developed many applications one of the important application is developed is online shopping (Teo, 2006).

As a shopping media, Internet attracts people and researchers (Teo, 2006). Growing number of Internet shopping and internet shoppers attract the researcher concerns day by day more researcher do more research concerning internet shopping process. People, who have Internet experiences, can search and find information quickly and most of the people do not have time to go shopping and they try to purchase their needs over internet and for these people variety and quickness of internet shopping are valuable characteristics of internet shopping (Järveläinen, 2007). Over recent years, U.S. shoppers has shifted from the traditional shopping to internet shopping and they do more internet shopping over internet (Seock & Norton, 2008). Internet shopping companies provide some options, which local companies never give. In this manner people prefer internet shopping. Internet shopping options have changed consumers information search and shopping habits and offer new occasion concerning shopping (Lokken, Cross, Halbert, Lindsey, Derby & Stanford, 2003). While people use internet shopping companies to buy something, significant part of the people use these sites to read other people comments and experience concerning products. And they decide which product is more suitable for them. Although new occasions, risks and drawbacks concerning internet shopping has taken their place in consumer minds (Toa, Liaob & Linc, 2007). Especially in electronic product people can pre-order what they want and get their product before the product goes to retail store. Internet shopping changed shopping trends and shopping without going a retail store from home or work has become popular (McKinney, 2004). People do not need to travel store by store, they can get product from home. So they do not tired to find the product and they do not need to deal with dealer. Internet shopping activities began to increase rapidly in the beginning of 90s (Guo-xin, 2009). Almost every store have interne shopping options. For example when one does not find the desired product in retail store, he/she can order online and products come his/her address or to retail store and he/she can pick product up. Besides internet shopping, shoppers search more often over internet (Soopramanien & Robertson, 2007). Because of knowledge variety and more comments written by other consumers, people choose to search internet shopping sites. On the other hand, people can ask question to other consumers and get retail

answer not the advertisement. Internet shopping characterizes new features and new opportunities such as information sharing and writing comments to products and services (Swinyard & Smith, 2003). Vendors and suppliers give more importance to constitute a web site and promote themselves over internet, through this way they can improve companies recognition and they try to reach more consumer (Grabner-Kraeuter, 2002). Some consumers searching information concerning the company for example they can give payment options how their technical services are, how they provide consumer/technical service, etc.. For companies, representing themselves over internet is easy because whenever company would like, they can add some new information to internet site. Internet shopping usually means that consumer purchase products over internet and wire more electronically, besides that consumer can search information concerning products and can read other consumer comments over internet shopping sites (Shih, 2004). The differences between traditional and internet shopping processes are: retailers and consumers use more technology in shopping and money transaction processes and both sides can easily gather desired data (Naiyi & Yinchen, 2007). These differences should take into account, if company want people trust them, they should serve accurate and valuable experiences to their consumers.

Internet shopping frequently observed as whole shopping process occur over web site as different procedures (Dixon & Marston, 2002). Usually whole processes are done over web sites customer pay price over web site and companies send the product to customer address. Whole process is easy for customer and is done without going to outside from home by customer. After arrival and improvement of internet shopping, retailers has tried to change the way they do business and they have been forced to change doing business (Teo, 2002). Internet and world wide web has changed and are changing the customers behavior (Sin & Tse, 2002). Before internet shopping age, customer had to travel store by store and spend their time to travel between stores. Sometimes they could not find the products they were searching or they could not get necessary information concerning product. By means of web sites consumers do not need to travel store by store and they can read plenty of information, which are provided by other customers. Communication feature of web sites has played critical role in shopping process (Kim, Williams & Lee, 2004). Internet has offered extraordinary chances to retailers, through these chances stores try to expand their limits and they reach the consumers, which they could not reach without internet (Kiang, Gilsdorf & Chi, 2004). Internet can remove almost all of the time and distance barriers. With the help of internet, companies can reach out of their boundaries. In this era retailers should understand what consumers would like and they should follow their competitors (Chen, Huang, Huang & Sung, 2009). Competitiveness of internet shopping forces the companies improve customer experiences and reduce financial, time and other risks.

Explanation and prediction of internet shoppers' behavior is a hard process but maximizing advantages and minimizing threats can motivate shoppers to shop online (Forsythe, Liu, Shannon & Gardner, 2006). In internet shopping process, customer computer and internet experiences, customer internet shopping experience and web site offerings are important factors. Privacy and security of online shopping and perceived risks are important barriers in front of internet shopping and retailers should develop some precautions handle these drawbacks (Miyazaki & Fernandez, 2001). Security and privacy of online shopping attracts researcher attentions (Järveläinen, 2007).Web sites most important role is to ensure customers concerning their financial data and private data. Most of the sites try different ways to protect customer data. They try to improve their security precautions and payment methods. If consumer trust the internet shopping web sites their intention to purchase would increase. The issue of payment security affects not only new Internet shoppers but also existing Internet shoppers (Kwon & Lee, 2003). Some existing Internet shoppers avoid to shop online because of payment security issue. And they can influence the people around them. While end users use internet regular basis, because of security and privacy issues they abstain from internet shopping (Lian & Lin, 2008). Honfeng, Chunjing & Jie (2008) state the factors, which are main barriers in front of internet shopping:

- Usefullnes and ease of use of online shopping
- Perceived risk of online shopping
- Functional service and after service of the web site
- Reputation related to online shopping

PURPOSE AND METHOD

This study seeks to define college of education students' online shopping behavior and online shopping activities. The research questions that guided the study are:

1. Is there any differences in online shopping behavior and online shopping activities
    a. by gender
    b. by internet connection place
    c. by monthly personal income

d. by credit card ownership

Study data were collected by questionnaire and questionnaire consists of two main sections. First section of questionnaire contains eight question related personal demographic data. Demographic questions are gender, age, internet connection place how long have participant connected to internet, how frequently does participant connect internet, connection time to internet, monthly personal income and credit card ownership.

Second section of questionnaire contains 15 sub scale and 64 questions. First four subscale named as online shopping familiarity, online shopping anxiety, trust toward online shopping and these sub scale were adopted form Yao & Li(xxxxx). Seven sub scale were named as shopping convenience, product selection, ease/comfort of shopping, hedonic / enjoyment, financial risk, product risk, time / convenience risk and these seven sub scale were adopted from Forsythe, Liu, Shannon & Gardner (2006). And last four sub scale were names as attitude, intensions, personal innovativeness, perceived consequences and adopted form Limayem, Khalifa & Frini (2000).

After questionnaire had formed, questionnaire administered in a College of Education in public Turkish University. Questionnaire administered face to face, and researcher visited all classes and explained aim of the study and questionnaire. Students were asked to participate research voluntarily. Finally 354 questionnaire were given to students and 338 questionnaire returned from the participants. After checking questionnaire 33 questionnaire were eliminated and finally research carried with 305 questionnaires.

FINDINGS

Table 1 Research participant's demographic data

		Frequency	Percent
Gender	Female	167	54,8
	Male	138	45,2
Age	18	3	1,0
	19	44	14,4
	20	103	33,8
	21	86	28,2
	22	36	11,8
	23 and above	33	10,8
Internet connection place	Home	199	65,2
	School	7	2,3
	Work	2	,7
	Internet Cafe	71	23,3
	Other	26	8,5
How long have you connected to internet	Less than 1 Year	13	4,3
	1 - 2 Years	39	12,8
	2 - 3 Years	57	18,7
	3 - 4 Years	58	19,0
	More than 4Years	138	45,2
How frequently connect internet	More than two times in a month	12	3,9
	One time in a week	13	4,3
	Two times in a week	63	20,7
	One time in a day	79	25,9
	More than a time in a day	138	45,2
Connection time to internet	30 min – 1 hour in a week	31	10,2
	1 hour – 3 hours in a week	54	17,8
	3 hours – 5 hours in a week	39	12,8
	5 hours – 10 hours in a week	56	18,3
	11 hours – 20 hours in a week	56	18,3
	More than 20 hours in a week	69	22,6
Personal income in a month	66 – 133 $	54	17,7
	134 – 200 $	88	28,9
	201 – 266 $	86	28,2
	266 $ and above	77	25,2
Credit card ownership	Yes	114	37,4
	No	191	62,6

Research participants' demographic data can be seen in table 1. While Male participants were 167 (%54,8), female participants 138 (%45,2). Research participants age vary between 18 and 22 and this range is similar to Turkey's university students age range. Research participants generally connect to internet where they reside. %23,3 or participants connect to internet form internet café. Internet café is the popular internet connection places and they provide computer and internet connection with small amount of money. When research participant economical status considered, using internet cafés provide many options to participants. When participants internet connection length examined, %45,2 of participants have connected to internet more than four years and just %4.3 participants have connected to internet less than one year. Based on this finding it can be said that participants are experienced internet user.

Another demographic data is internet connection frequency of participants. When participants internet connection frequency examined, %45,2 of the participants connect to internet more than one time in a day and %71,1 of participants connect to internet at least one time in a day. And just %3.9 of participants connect to internet more than two times in a month. Another finding concerning internet connection is internet connection time in a week. %59,2 of research participants connect internet more than five hours in a week. Another finding is research participants personal income, in Turkey university students' personal income constitute of fund sent by family, scholarship by governmental and private foundation and salary. However most of the Turkish students do not work and do not get salary so Turkish students' personal income generally consist of family funding and scholarship. %17,7 of the participants have personal income in a month 66 – 133$, %28,9 have 134 – 200$, %28,2 have 201 – 266$ and %25,2 have 266$ or more income in a month. Last finding concerning demographic data is credit card ownership, while %62,6 of the participants do not have credit card, just %37,4 of the participants have credit card.

Table 2 T-test results concerning sub scales score by participants gender

		N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Online shopping familiarity	Female	167	2,54	1,13	-3,53	303	,000
	Male	138	3,02	1,23			
Shopping Convenience	Female	167	3,12	0,86	-1,98	303	,049
	Male	138	3,32	0,93			
Financial Risk	Female	167	3,49	0,65	2,62	303	,009
	Male	138	3,30	0,63			
Time / convenience risk	Female	167	3,41	0,72	2,31	303	,022
	Male	138	3,20	0,82			
Attitude	Female	167	2,75	0,92	-3,72	303	,000
	Male	138	3,16	1,02			
Intensions	Female	167	2,82	1,03	-3,82	303	,000
	Male	138	3,29	1,08			
Perceieved Consequences	Female	167	3,34	0,70	-3,10	303	,002
	Male	138	3,59	0,68			

Research participants sub scale score compared by their gender and results were given in table 2. Scale has 15 sub scale but while reporting the findings just subscale which has shown significant difference were reported. According to the results there was a significant difference in online shopping familiarity subscale score, male participants have more sub scale score (M=3.02, SD=1.23) than female participants (M=2.54, SD= 1.13); $t_{(303)}$=-3.53,p=0.000. According to the results there was a significant difference in shopping convenience subscale score, male participants have more sub scale score (M=3.32, SD=0.93) than female participants (M=3.12, SD= 0.86); $t_{(303)}$=-1.98,p=0.049. According to the results there was a significant difference in financial risk subscale score, female participants have more sub scale score (M=3.49, SD=0.65) than male participants (M=3.30, SD= 0.63); $t_{(303)}$=2.62,p=0.009. According to the results there was a significant difference in time / convenience risk subscale score, female participants have more sub scale score (M=3.41, SD=0.72) than male participants (M=3.20, SD= 0.83); $t_{(303)}$=2.31,p=0.022. According to the results there was a significant difference in attitude subscale score, male participants have more sub scale score (M=3.16, SD=1.02) than female participants (M=2.75, SD= 0.92); $t_{(303)}$=-3.72,p=0.000. According to the results there was a significant difference in intentions subscale score, male participants have more sub scale score (M=3.29, SD=1.08) than female participants (M=2.82, SD= 1.03); $t_{(303)}$=-3.82,p=0.000. According to the results there was a significant difference

in perceived consequences subscale score, male participants have more sub scale score (M=3.59, SD=0.68) than female participants (M=3.34, SD= 0.70); $t_{(303)}$=-3.10,p=0.002.

Table 3 Comparing online shopping familiarity subscale scores by internet connection site

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	45,724	4	11,431		
Within Groups	391,621	300	1,305	8,757	,000
Total	437,345	304			

Research participants online shopping familiarity sub scale scores compared by internet connection site via one-way-anova analysis and results can be shown in table 3. Online shopping familiarity sub scale score differ statistically significant ($F_{(4,300)}$=8,757 , p<.001). To understand which group has more online shopping familiarity sub scale score post hoc test was done. Results show that participants, who connect internet home or workplace, have more online shopping familiarity sub scale score than who connect internet from internet café.

Table 4 Comparing online shopping anxiety subscale scores by internet connection site

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5,437	4	1,359		
Within Groups	128,689	300	,429	3,17	,014
Total	134,126	304			

Research participants online shopping anxiety sub scale scores compared by internet connection site via one-way-anova analysis and results can be shown in table 4. Online shopping anxiety sub scale score differ statistically significant ($F_{(4,300)}$=3,17 , p<.05). To understand which group has more online shopping anxiety sub scale score post hoc test was done. Results show that participants, who connect internet café, have more online shopping anxiety sub scale score than who connect internet from home.

Table 5 Comparing trust toward online shopping subscale scores by internet connection site

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11,765	4	2,941		
Within Groups	215,445	300	,718	4,10	,003
Total	227,210	304			

Research participants trust toward online shopping sub scale scores compared by internet connection site via one-way-anova analysis and results can be shown in table 5. Trust toward online shopping sub scale score differ statistically significant ($F_{(4,300)}$=4,10 , p<.01). To understand which group has more trust toward online shopping sub scale score post hoc test was done. Results show that participants, who connect from home, have more trust toward online shopping sub scale score than who connect internet from internet café.

Table 6 Comparing shopping convenience subscale scores by internet connection site

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13,124	4	3,281		
Within Groups	233,322	300	,778	4,22	,002
Total	246,446	304			

Research participants shopping convenience sub scale scores compared by internet connection site via one-way-anova analysis and results can be shown in table 6. Online shopping convenience sub scale score differ statistically significant ($F_{(4,300)}$=4,22 , p<.01). To understand which group has more online shopping convenience sub scale score post hoc test was done. Results show that participants, who connect from home and school, have more online shopping convenience sub scale score than who connect internet from workplace.

Table 7 Comparing shopping intension subscale scores by internet connection site

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14,793	4	3,698		
Within Groups	340,477	300	1,135	3,26	,012
Total	355,270	304			

Research participants shopping intension sub scale scores compared by internet connection site via one-way-anova analysis and results can be shown in table 7. Shopping intension sub scale score differ statistically significant ($F_{(4,300)}$=3,26 , p<.05). To understand which group has more shopping intension sub scale score post hoc test was done. Results show that participants, who connect from home and workplace, have more shopping intension sub scale score than who connect internet from internet café.

Table 8 Comparing perceived consequences subscale scores by internet connection site

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6,581	4	1,645		
Within Groups	143,510	300	,478	3,44	,009
Total	150,091	304			

Research participants perceived consequences sub scale scores compared by internet connection site via one-way-anova analysis and results can be shown in table 8. Perceived consequences sub scale score differ statistically significant ($F_{(4,300)}$=3,44 , p<.01). To understand which group has more perceived consequences sub scale score post hoc test was done. Results show that participants, who connect from home, have more perceived consequences sub scale score than who connect internet from internet café.

Table 9 Comparing online shopping familiarity subscale scores by personal income

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	21,332	3	7,111		
Within Groups	416,013	301	1,382	5,15	,002
Total	437,345	304			

Research participants online shopping familiarity sub scale scores compared by personal income via one-way-anova analysis and results can be shown in table 9. Online shopping familiarity sub scale score differ statistically significant ($F_{(3,301)}$=5,15 , p<.01). To understand which group has more online shopping familiarity sub scale score post hoc test was done. Results show that participants, who have 266$ or more personal income, have more online shopping familiarity sub scale score than who have 66 – 133$, 134 – 200$ and 201 – 266$ personal income.

Table 10 Comparing shopping convenience subscale scores by personal income

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16,289	3	5,430		
Within Groups	230,157	301	,765	7,10	,000
Total	246,446	304			

Research participants shopping convenience sub scale scores compared by personal income via one-way-anova analysis and results can be shown in table 10. Shopping convenience sub scale score differ statistically significant ($F_{(3,301)}$=7,10 , p<.001). To understand which group has more shopping convenience sub scale score post hoc test was done. Results show that participants, who have 266$ or more personal income, have more shopping convenience sub scale score than who have 66 – 133$, 134 – 200$ and 201 – 266$ personal income.

Table 11 Comparing product selection subscale scores by personal income

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	9,014	3	3,005		
Within Groups	166,848	301	,554	5,42	,001
Total	175,861	304			

Research participants product selection sub scale scores compared by personal income via one-way-anova analysis and results can be shown in table 11. Product selection sub scale score differ statistically significant ($F_{(3,301)}$=5,42 , p<.01). To understand which group has more product selection sub scale score post hoc test was done. Results show that participants, who have 266$ or more personal income, have more product selection sub scale score than who have 66 – 133$, 134 – 200$ and 201 – 266$ personal income.

Table 12 Comparing online shopping attitude subscale scores by personal income

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7,770	3	2,590		
Within Groups	287,452	301	,955	2,71	,045
Total	295,223	304			

Research participants online shopping attitude sub scale scores compared by personal income via one-way-anova analysis and results can be shown in table 12. Online shopping attitude sub scale score differ statistically significant ($F_{(3,301)}$=2,71 , p<.05). To understand which group has more online shopping attitude sub scale score post hoc test was done. Results show that participants, who have 266$ or more personal income, have more online shopping attitude sub scale score than who have 134 – 200$ and 201 – 266$ personal income.

Table 13 Comparing online shopping intension subscale scores by personal income

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	18,246	3	6,082		
Within Groups	337,024	301	1,120	5,43	,001
Total	355,270	304			

Research participants online shopping intension sub scale scores compared by personal income via one-way-anova analysis and results can be shown in table 13. Online shopping intension sub scale score differ statistically significant ($F_{(3,301)}$=5,43 , p<.01). To understand which group has more online shopping intension sub scale score post hoc test was done. Results show that participants, who have 266$ or more personal income, have more online shopping intension sub scale score than who have 134 – 200$ and 201 – 266$ personal income.

Table 14 Comparing perceived consequences subscale scores by personal income

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6,411	3	2,137		
Within Groups	143,680	301	,477	4,48	,004
Total	150,091	304			

Research participants perceived consequences sub scale scores compared by personal income via one-way-anova analysis and results can be shown in table 14. Perceived consequences sub scale score differ statistically significant ($F_{(3,301)}$=4,48 , p<.01). To understand which group has more perceived consequences sub scale score post hoc test was done. Results show that participants, who have 266$ or more personal income, have more perceived consequences sub scale score than who have 66 – 133$, 134 – 200$ and 201 – 266$ personal income.

Table 15 T-test results concerning sub scales score by credit card ownership

	Credit Card Ownership	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Online shopping familiarity	Yes	114	3,27	1,25	6,06	303	,000
	No	191	2,46	1,06			
Online shopping anxiety	Yes	114	2,73	0,69	-2,91	303	,004
	No	191	2,95	0,64			
Shopping Convenience	Yes	114	3,41	0,90	3,01	303	,003
	No	191	3,09	0,88			
Hedonic / enjoyment	Yes	114	3,55	0,71	2,55	303	,042
	No	191	3,38	0,74			
Attitude	Yes	114	3,31	0,99	5,36	303	,000
	No	191	2,71	0,91			
Intensions	Yes	114	3,44	1,10	5,40	303	,000
	No	191	2,78	0,99			
Perceieved Consequences	Yes	114	3,68	0,66	4,55	303	,000

	Credit Card Ownership	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Online shopping familiarity	Yes	114	3,27	1,25	6,06	303	,000
	No	191	2,46	1,06			
Online shopping anxiety	Yes	114	2,73	0,69	-2,91	303	,004
	No	191	2,95	0,64			
Shopping Convenience	Yes	114	3,41	0,90	3,01	303	,003
	No	191	3,09	0,88			
Hedonic / enjoyment	Yes	114	3,55	0,71	2,55	303	,042
	No	191	3,38	0,74			
Attitude	Yes	114	3,31	0,99	5,36	303	,000
	No	191	2,71	0,91			
Intensions	Yes	114	3,44	1,10	5,40	303	,000
	No	191	2,78	0,99			
Perceieved Consequences	Yes	114	3,68	0,66	4,55	303	,000
	No	191	3,32	0,69			

Research participants sub scale score compared by credit card ownership and results were given in table 15. According to the results there was a significant difference in online shopping familiarity subscale score and participant, who have credit card, have more sub scale score (M=3,27, SD=1.25) than who do not have credit card (M=2,46, SD= 1,06); $t_{(303)}$=6,06,p=0.000. According to the results there was a significant difference in online shopping anxiety subscale score and participant, who do not have credit card, have more sub scale score (M=2,95, SD=0,64) than who have credit card (M=2,73, SD= 0,64); $t_{(303)}$=-2,91,p=0.01. According to the results there was a significant difference in shopping convenience subscale score and participant, who have credit card, have more sub scale score (M=3,41, SD=0,90) than who do not have credit card (M=3,09, SD= 0,88); $t_{(303)}$=3,01,p=0.01 According to the results there was a significant difference in hedonic/enjoyment subscale score and participant, who have credit card, have more sub scale score (M=3,55, SD=0,71) than who do not have credit card (M=3,38, SD= 0,74); $t_{(303)}$=2,55,p=0.05. According to the results there was a significant difference in attitude subscale score and participant, who have credit card, have more sub scale score (M=3,31, SD=0,99) than who do not have credit card (M=2,71, SD= 0,91); $t_{(303)}$=5,36,p=0.000. According to the results there was a significant difference in intension subscale score and participant, who have credit card, have more sub scale score (M=3,44, SD=1,10) than who do not have credit card (M=2,78, SD= 0,99); $t_{(303)}$=5,40,p=0.000. According to the results there was a significant difference in perceived consequences subscale score and participant, who have credit card, have more sub scale score (M=3,68, SD=0,66) than who do not have credit card (M=3,32, SD= 0,69); $t_{(303)}$=4,55,p=0.000.

Table 16 Correlation results between sub scores

	Internet self efficacy	Online shopping familiarity	Online shopping anxiety	Trust toward online shopping	Shopping Convenience	Product selection	Ease/Comfort of shopping	Hedonic / enjoyment	Financial Risk	Product Risk	Time / convenience risk	Attitude	Intensions	Personal Innovativeness
Online shopping familiarity	,207**													
Online shopping anxiety		-,442**												
Trust toward online shopping	,304**	,454**	-,271**											
Shopping Convenience	,219**	,449**	-,236**	,373**										
Product selection	,232**	,261**	-,193**	,215**	,489**									
Ease/Comfort of shopping	,153**	,172**		,167**	,334**	,500**								
Hedonic / enjoyment	,257**	,337**	-,200**	,339**	,385**	,421**	,414**							
Financial Risk		-,360**	,255**	-,302**	-,220**									
Product Risk	,139*					,242**	,232**	,204**	,499**					
Time / convenience risk		-,180**	,114*	-,167**					,416**	,364**				
Attitude	,165**	,557**	-,332**	,380**	,445**	,310**	,237**	,443**	-,344**	-,119*	-,143*			
Intensions	,151**	,513**	-,329**	,347**	,439**	,332**	,190**	,394**	-,358**		-,132*	,639**		
Personal Innovativeness	,279**	,211**		,225**	,335**	,447**	,275**	,414**		,260**		,294**	,307**	
Perceived Consequences	,243**	,424**	-,245**	,310**	,405**	,397**	,359**	,522**	-,121*	,150**		,549**	,493**	,419**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

To understand correlation among sub scale scores correlation test was done and correlation results can be seen in table 16. According to correlation results;

Positive and weak correlation between internet self efficacy sub scale scores and Online shopping familiarity, Online shopping anxiety, Trust toward online shopping, Shopping Convenience, Product selection, Ease/Comfort of shopping, Hedonic / enjoyment, Financial Risk, Product Risk, Time / convenience risk, Attitude, Intensions, Personal Innovativeness, Perceived Consequences sub scale scores were found.

Positive and somewhat weak correlation between online shopping familiarity sub scale scores and Trust toward online shopping, Shopping Convenience, Hedonic / enjoyment, Attitude, Intensions were found. Positive and weak correlation between online shopping familiarity sub scale scores and product selection, Ease/Comfort of shopping, Financial Risk, Product Risk, Time / convenience risk, Personal Innovativeness, Perceieved Consequences were found. While negative and somewhat weak correlation correlation between online shopping familiarity sub scale scores and online shopping anxiety and financial risk were found, negative and low correlation between online shopping familiarity sub scale scores and time/convenience and risk perception were found.

While negative and somewhat weak correlation between online shopping anxiety and attitude and intensions were calculated, between online shopping anxiety and Trust toward online shopping, Shopping Convenience, Product selection, Ease/Comfort of shopping, Hedonic / enjoyment, Financial Risk, Product Risk, Time / convenience risk, Personal Innovativeness, Perceived Consequences negative and somewhat weak correlation were calculated.

Positive and somewhat weak correlation were calculated between participants trust toward online shopping sub scale scores and Shopping Convenience, Hedonic / enjoyment, Attitude, Intensions, Perceived Consequences sub scale scores, positive and low correlation were calculated between participants trust toward online shopping sub scale scores and Time / convenience risk, Personal Innovativeness sub scale scores and negative and weak correlation were calculated between participants trust toward online shopping sub scale scores and financial risk and product risk sub scale scores.

While positive and somewhat weak correlation were calculated between shopping convenience sub scale scores and Product selection, Ease/Comfort of shopping, Hedonic / enjoyment, Product Risk, Time / convenience risk, Attitude, Intensions, Personal Innovativeness, Perceived Consequences sub scale scores, negative and weak correlation were calculated between shopping convenience sub scale scores and financial risk sub scale scores.

While positive and somewhat weak correlation were calculated between product selection sub scale scores and Ease/Comfort of shopping, Hedonic / enjoyment, Financial Risk, Time / convenience risk, Attitude, Intensions, Personal Innovativeness, Perceived Consequences sub scale sores, positive and weak correlation were calculated between product selection sub scale scores and product risk sub scale scores.

Positive and somewhat weak correlation were calculated between ease/comfort sub scale scores and Hedonic / enjoyment, Perceived Consequences sub scale scores and positive and weak correlation were calculated between ease/comfort sub scale scores and Financial Risk, Product Risk, Time / convenience risk, Attitude, Intensions and Personal Innovativeness sub scale scores.

Positive and somewhat weak correlation were calculated between hedonic/enjoyment sub scale scores and Time / convenience risk, Attitude, Intensions, Personal Innovativeness, Perceived Consequences sub scale scores. Positive and weak correlation were calculated between hedonic/enjoyment sub scale scores and product risk sub scale scores.
While positive and somewhat weak correlation were calculated between financial risk sub scale scores and product risk and time/convenience risk, positive and weak correlation were calculated between financial risk sub scale scores and attitude, intension sub scale scores.

While positive and somewhat weak correlation were calculated between product risk sub scale scores and times/convenience risk and negative and weak correlation was calculated between product risk sub scale score and attitude sub scale score.

Negative and weak correlation were calculated between time/convenience risk sub scale score and attitude and intension sub scale scores.

Positive and somewhat weak correlation were calculated between attitude sub scale score and personal innovativeness and perceived consequences sub scale scores.

Positive and somewhat weak correlation were calculated between online shopping intension sub scale score and personal innovativeness and perceived consequences sub scale scores.
Positive and somewhat weak correlation was calculated between personal innovativeness and perceived consequences sub scale score.

RESULTS AND DISCUSSIONS

This research tried to define college of education students' online shopping behavior and online shopping activities. The results show that %54,8 of participants are female and %45,2 of participants are male. Participants age range is 18 – 22. Most of the participants connect internet where they reside and %45,2 of the participants have used internet more than four years and just %37,4 of the participants have credit card.

Research results show that male participants are more familiar to internet shopping, they find internet shopping more convenient and they have more intension to shop online. Female participants financial and time risk perceptions are higher than male participants perception. Farag, Schwanrn, Dijst & Faber (2007) state that male participant have positive attitude towards to internet shopping and their findings support this research findings. Different research found different internet shopping patterns, Sebastinelli, Tamimi & Rajan (2008) state that males and females use internet shopping for different types of products and Lokken, Cross, Halbert, Lindsey, Derby & Stanford (2003) state that shopping experience did not differ by gender.

This study results show that participants, who have more income, have more internet familiarity, find internet shopping more convenient, have more product selection perception, have more positive attitude, have more positive intension and their perceived consequences are high. In a research concerning students internet shopping Norum(2008) and Soopramanien & Robertson (2007) state that students, who have more income, have more intension to shop over internet.

Another results of this study is participants, who have credit card, have more familiarity, have less anxiety concerning internet shopping, have more positive internet shopping convenience, find more enjoyment in internet shopping, have more positive internet shopping attitude, have more intension and have more perceived consequences.

This study show that there is a positive correlation between internet self efficacy and other 14 subscale. Farag, Schwanrn, Dijst & Faber (2007) state that internet experience affect internet shopping and Teo (2006) state that internet self efficacy decreases internet shopping anxiety. Swinyard & Smith (2003) state that computer literacy positively correlate online shopping. These there research results support this study results.

Another result is that there is a negative correlation between participants online shopping familiarity and anxiety, financial risk perception and time risk perception and there is a positive correlation between online shopping familiarity and other sub scale. In a research concerning online shoppers Teo (2006) state that familiarity has positive and direct effect on internet shopping anxiety.

Results show that participants trust toward online shopping and internet shopping anxiety have negative effect on anciety, financial risk and time risk perception. Shih (2004) state that internet shopping attitudes have significant and strong positive effect on acceptanve of internet shopping.

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LEVERAGING OPEN SOURCE SOFTWARE IN THE EDUCATION MANAGEMENT AND LEADERSHIP TRAINING

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ABSTRACT
The development in information technology has now moved from the first wave that emphasises on computer technical skills to the second wave which focuses on the application and management aspects This paper aims to investigate the use of learning management system among future school heads in education management and leadership. The study was conducted in two phases. The first phase focused on developing a learning management system using open source software - *Moodle*. This phase emphasized on the processes involved in designing and developing the learning management system prototype called *E-Headship*. The second phase evaluated participants' suitability in becoming future school leaders and managers through the use of *E-Headship* for the National Professional Qualification for Headship (NPQH) programme. *E-Headship* was then evaluated in terms of the applications of the learning management system. Sixty (60) participants from Institut Aminudin Baki (IAB) - an institute for training school administrators took part in the study. The data were analyzed using descriptive statistic focusing on reporting of the results in percentile, means, standard deviation and frequency. As it compared the performance results of two groups, a simple T-test was also performed. The results revealed that *e-Headship* has succeeded in promoting teaching and learning strategies to a higher degree. It is hoped that the use of such prototype will help the education institution in designing and developing better programmes that could benefit the participants at large.
Keywords: open source software, education, leadership, management, learning management system, school administrators

INTRODUCTION

The first wave in information technology which emphasises on computer technical skills has now moved to the second wave which focuses on the application and management aspects (Adams & Morgan, 2007). The second wave in online learning technology emphasises more on the administration and management of information technology. In other words, online learning explains how man manages technology in their daily lives. Ready-made software and system are abundant in today's market but the problem remains: how are developing countries use the available software with a budget that fits their pockets? A study has found out that Free Libre Open Source System (FLOSS) is very potential in using open source system and also has contributed to the education system (Ghosh, 2004). A research in Bhutan discovered that poor developing countries have to fork out a substantial amount of their GDP to obtain legal licence and original software (Ghosh, 2004).

Based on the research mentioned, profit is not the main factor in developing open source software. Only 13% of open source users use it to gain profit. Most designers and software users agree that between 70% to 78% use open source based on social principle which is knowledge sharing and learning and developing new skills. Therefore, choosing to operate on open source is a wise decision for non-profit government and non-government agencies (Preston et al, 2010). The main challenge in online technology applications in education management and administration is adapting matters which are related to educational administration policy of a country, pedagogical approaches and learning theories. The understanding of using technology in management and

administration is mostly geared towards the uses of technology in industrial management and not in education. This inevitably call for an effort in developing the technology for online learning that adapt pedagogical approaches and embrace learning theories. In this scenario, there is a need to involve experts in the education field to select the content materials. Research shows that the use of open source in education can benefit the education field. Educators and webmasters could design and mould it in accordance to the needs of the institution (Gosmire et al. 2009)

This paper describes the use of learning management system among future school heads in education management and leadership. The study was conducted in two phases. The first phase focused on developing a learning management system using open source software - *Moodle*. This phase emphasized on the processes involved in designing and developing the learning management system prototype called *E-Headship* for the National Professional Qualification for Headship (NPQH) programme. The NPQH Programme is a one-year course on management and administration leadership designed for school leaders held at Aminuddin Baki Institute, Ministry of Education, Malaysia. The second phase was on the evaluation of participants' suitability in becoming future school leaders and managers through the use of *E-Headship.* It was evaluated in terms of the applications of *E-Headship.*

Open source software - MOODLE

The technology development and advancement accelerates globally. The existence of Microsoft which revolutionised computer software is a mark of that advancement. There is no doubt that computer system designers made a great fortune from their work and gained massive popularity. However, not all system designers design for profit. For instance, *Moodle*, an open source software, which was developed by Martin Dougiamas is one of the examples of software that emphasises on online learning which does not operate on profit. Martin Dougiamas is an educationist who has smartly combined the pedagogical knowledge of education and computer technology together which enriches the education of the 21st century. From *Moodle*, individuals or organizations are given the permission to download the software free of charge and the downloading comes with license (William, 2006). The system is equipped with all aspects of online learning such as the ability to store learning resources, communication and activities that are based on certain learning topics (Williams, 2005). The interesting features of *Moodle* includes downloading and sharing of documents, developing content in HTML, forum or discussions, quizzes, grading, formatted questionnaire, journal writing and other features which are seen as important to the development of online learning.

The programme, *Curriculum, Technology and Education Reform (CTER)* which was executed by College of Education, University of Illinois in 1998 uses *Moodle* (Gosmire, 2009). The programme has successfully produced post graduates who mastered three areas of education: curriculum, technology and reformation in education. The findings encompassed that most in-service teachers gave favourable feedback towards the online learning programme. The CTER programme combines various teaching methods that could promote learners' acquisition of knowledge. Another advantage that was brought in by online learning is the fact that it has changed the society's perception on lifelong learning. Online learning has allowed learners to learn in a virtual world. This, in turn has increased the number of diploma holders as well as those who try to get a degree while working. It has also increased the number of professionals who gained a second degree. This proves that online learning is widely accepted (Norazah, 2002). Although initially the online learning is viewed as any other method of learning, the perception is gradually changing. Many countries see this as an alternative mode in developing and training their human resource. Furthermore, ICT is seen as a 'push factor' that could solve many educational problems across the countries in the world (Levin et al. 2009).

METHODOLOGY

This section details the design and development of the learning management system, using *Moodle* for management and school leaderships, *E-Headship* the National Professional Qualification for Headship (NPQH) programme. The study was conducted in two phases. The first phase focused on the development process of *E-Headship.* The second phase stressed on evaluation of participants' suitability in becoming future school leaders and managers through the use of *E-Headship* for the NPQH Programme. The participants were the NPQH candidates at the Aminuddin Baki Institute (IAB), Ministry of Education, Malaysia. IAB is a training institute on management and educational leadership. It was evaluated in terms of the applications of *E-Headship*.

The process of designing, developing, implementation and evaluation of *E-Headship* was based on the model of Holistic Cycle (Norazah, 2002) and web development model for education (Perrin & Mayhew 2000). The conceptual framework is shown in Figure 1.

In the first phase, during the design process of *E-Headship*, it was ensured that all technical aspects such as the registration process, the main menu, updating content materials, links and arrangement, graphic and user guide were user friendly and learner centred. In setting up the *e-Headship* format, *Dreamweaver* software was used and the PhP configuration system was modified using *Moodle*. In the development of the teaching and learning content, softwares such as Microsoft PowerPoint, Microsoft Word, Flash and Raptivity were used.

In the second phase, the evaluation of *E-Headship* was done in terms of the applications the leaening Management system. The applications involved were the accessibility, registration process, e-content, interactivity and forum/quizzes. Sixty (60) participants who were the NPQH candidates took part in the study. The data were analyzed using descriptive statistic focusing on reporting of the results in percentile, means, standard deviation and frequency.

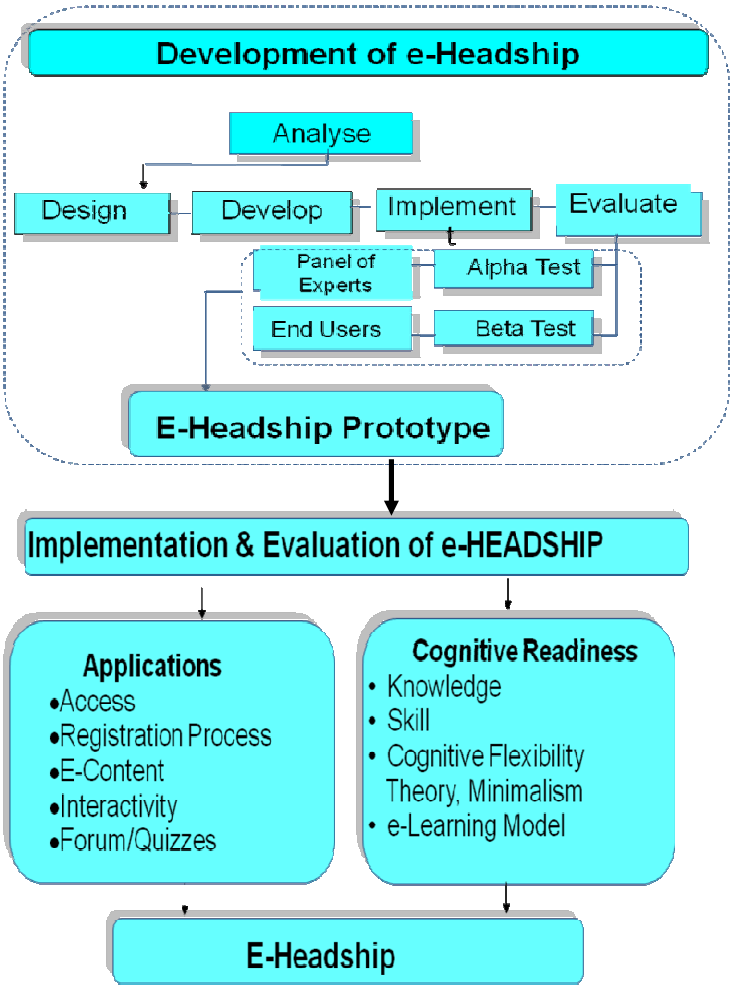

Figure 1 E-Headship Conceptual Framework

FINDINGS

The research findings are as follows:

Accessibility of *E-Headship*

In this research, the interface menu system used was based on *Moodle*. Amendments were made to suit the needs of the NPQH Programme as well as to adhere to the suggestions made by the experts of the system and NPQH content. Figure 2 shows one of the interfaces of *e-Headship*.

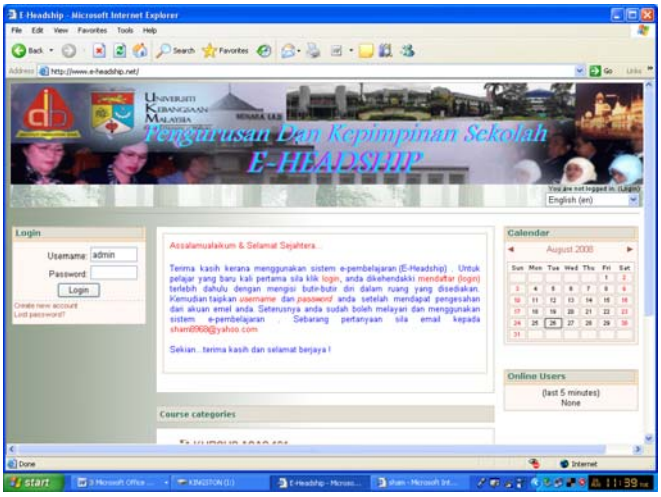

Figure 2. The Interface of *E-Headship*

Table 1: Data distribution the accessibility of *E-Headship*

ITEM	Mean	Std-Deviation
E-Headship is user-friendly.	4.03	.414
E-Headship module is easy to use.	4.17	.379
Access for *E-Headship* is smooth and fast.	4.03	.615
E-Headship has clear instructions.	4.07	.521
E-Headship has easy to understand user- guide	4.10	.548

Based on Table 1, the respondents agreed that *E-Headship* was user friendly (mean 4.03), the menu system was easy to use (mean 4.17), *E-Headship* is quick access system (mean 4.03) and it has clear instructions (mean 4.07).

***E-Headship* Registration System**

Moodle is equipped with registration system to ensure that the recorded information system and participants data were well kept. Figure 3 shows the registration system of E-Headship that was developed using Moodle format. It takes into account the safety features as well as users' information accessing this system.

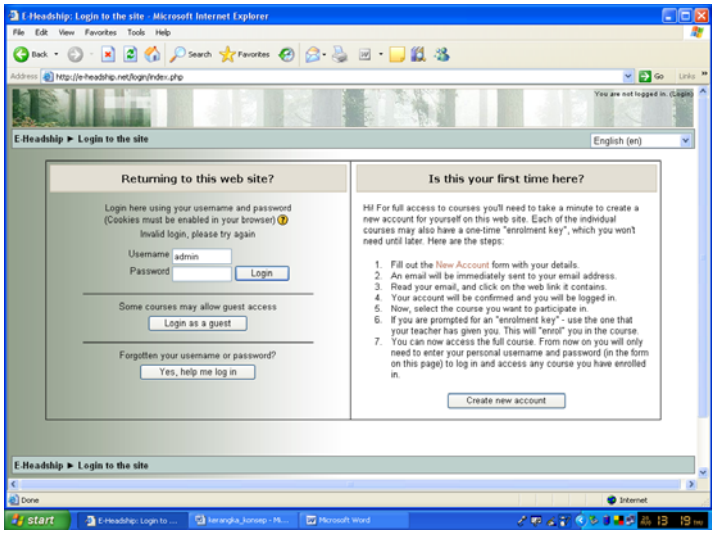

Figure 3 Registration system of *E-Headship*

Table 2: The data on *E-Headship* registration process

ITEM	Mean	Std-Deviation
E-Headship registration system has easy to understand instructions.	4.07	.583
E-Headship registration system does not require high skill technology.	3.97	.615
E-Headship registration system is user friendly.	4.03	.556
E-Headship registration system is simple and easy to acquire.	4.00	.587
E-Headship registration system is smooth running.	4.13	.507
E-Headship registration system is effective and quick to access.	4.03	.490

Table 2 showed that the respondents agreed that the registration system was easy to understand (mean 4.07), does not need high technology skills (mean 3.97), user-friendly (mean 4.03), simple and easy to use (mean 4.00), efficient (mean 4.13) and effective and quick to access (mean 4.03).

E-Headship Content

The teaching and learning content of *E-Headship* is one of the most important aspects in the development process. The content must adhere to the needs of the school leaders and managers and in line with the courses covered in the education management and leadership -NPQH. Figure 4 shows the list of courses in *E-Headship*.

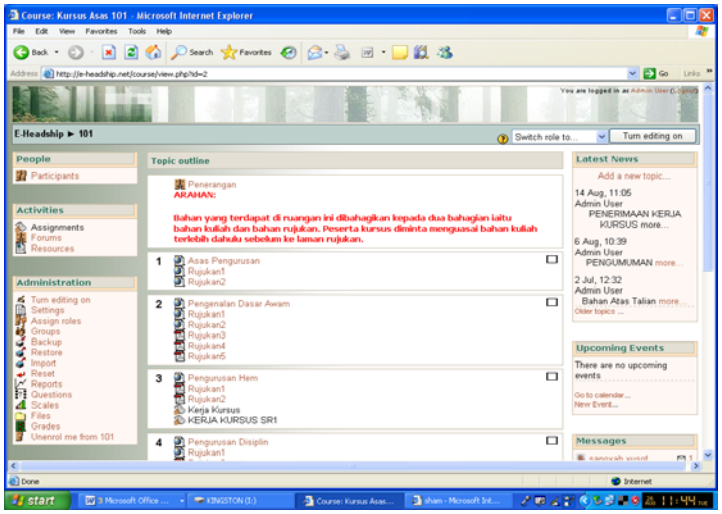

Figure 4 The list of courses in *E-Headship*

Table 3: *E-Headship* learning content.

ITEM	Mean	Std-Deviation
E-Headship content is developed to suit my level of knowledge.	4.00	.371
E-Headship content can increase self-motivation towards learning.	4.17	.531
E-Headship content requires minimum time to access.	4.03	.490
E-Headship content satisfies the objectives of the course.	4.07	.450
E-Headship content increases my understanding of the subject matter.	4.13	.434
E-Headship content uses technology that suits my ICT skill level.	4.17	.461
E-Headship content provides links to broader online information.	4.10	.403
E-Headship content is organized systematically.	4.13	.434
E-Headship content diversifies my learning methodology.	4.13	.507

Table 3 showed that the respondents agreed that the *E-Headship* content is suitable with the level of their ICT skille. (mean 4.00), provides self motivation (mean4.17), requires minimum time to access (mean 4.03), the content suits the objectives of the course (mean 4.07), increases understanding (mean 4.13), uses appropriate technology (mean 4.17), provides suitable links (mean 4.10), systematically arranged (mean 4.13), and enables diversity of learning methodology.

E-Headship Forum, Quiz and Discussions

Online communication and interactivity between learners and lecturers play very important roles in determining the effectiveness of a learning management system. This is due to the fact that students were not able to meet

face-to-face with the lecturer all the time. *E-Headship* is equipped with chatting and messages modes to ensure smooth communication between students, education administrators and lecturers. Figure 5 shows the chatting room in *E-Headship.*

Figure 5 Forum and Messages in *E-Headship*

Table 4 Respondents' feedback on the *E-Headship* Forum and Quizzes

ITEM	Mean	Std-Deviation
The forum in *E-Headship* helps in my learning process	4.00	.455
E-Headship quizzes increase my understanding of the subject matter.	4.00	.455
Discussions in *E-Headship* help my understanding of a topic.	4.13	.507
Discussions in *E-Headship* help to increase communication with course-mates.	4.03	.556
Discussions in *E-Headship* help students exchange information.	4.00	.525
Discussions in the forum help me in understanding a topic quicker.	4.10	.548
Forum in *E-Headship* helps to quicken the information delivery system.	4.17	.461
Forum, quiz and discussion in *E-Headship* learning supports my classroom learning	4.07	.583

Table 4 shows that the respondents agreed that the forum helps in their learning process (mean 4.00), the quizzes incorporated in the forum increase their understanding of the subject matter (mean 4.00), Discussions in *E-Headship* help their understanding of a topic (mean 4.13), help to increase communication with course-mates (4.03), help students exchange information (4.00), help them in understanding a topic quicker (4.10) and helps to quicken the information delivery system (4.17). The results also showed that the Forum, quiz and discussion in *E-Headship* supports their classroom learning.

CONCLUSION

Many learning institutions have implemented efficient learning management system from the open source software. Research findings on the perception of the future school heads in education management and leadership towards *E-Headship* are encouraging and remain very positive. They perceived the learner-to-content interaction, learner-to-learner interaction, learner-to-instructor interaction in the *E-Headship* positively. The studies by Gosmire et al (2010) also reveals similar positive interaction. The design and development of *E-Headship* has succeeded in promoting teaching and learning strategies to a higher degree. These findings are parallel with many studies on the effectiveness of the integration of technology in the teaching and learning process (Gregory & Beyrer (2010), Effandi et.al (2007) and Uys (2010) & Dell et al (2010). Their studies revealed that web-based learning could increase learning motivation. Therefore, opting for open source is in line with the mission of higher learning institutions (Kovalik & Hosler (2010 & Wilburt (1997). By incorporating the theories of learning and teaching strategies, *E-Headship* dship has succeeded in enticing and encouraging school administrators to further explore the function of ICT in education.

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MOBILE LEARNING PERCEPTIONS OF THE PROSPECTIVE TEACHERS (TURKISH REPUBLIC OF NORTHERN CYPRUS SAMPLING)

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ABSTRACT
The aim of this research is to analyze mobile learning perceptions and mobile learning levels of the prospective teachers at a university in Turkish Republic of Northern Cyprus according to their departments and gender. The research consists of 355 prospective teachers studying at a private university. The "Mobile Learning Perception Scale" was used for data collection. In the analysis of the data, descriptive statistics, t-test and variance analysis were used. As a result of the research, it was found out that mobile learning perceptions and mobile learning levels of the prospective teachers showed no significant difference according to the department and gender variables. As a result it was found out that prospective teachers' mobile learning perception levels were low.
Keywords: Prospective teacher, mobile learning perception, appropriateness of branch, aim-mobile technologies fit, forms of m-learning application and tools' sufficient adequacy of communication

INTRODUCTION

With the rapid development of the technology and advances in electronic learning technologies, mobile learning began to occupy a great part of our lives. The pace of the life getting together with the need of learning started mobile learning (m-learning) concept. The rapid development in computers, mobile devices, and internet technologies resulted in the emergence of the mobile learning (m-learning) concept. M-learning can be realized independently of place and time (Bal & Arıcı, 2011). Mobile technologies, which were previously preferred mostly by young people, started to be used by all age groups in recent years. While the laptops and mobile phones that have the highest usage in percentage among the mobile technologies have become widespread, there is a decrease in the use of technologies such as cable phones and TV sets, which are considered to be examples of old technology. Meanwhile, there have been significant advances in the services provided by cell phones and tablet PCs. M-learning is an education model that emerged with the development of mobile technologies (Odabaşı, 2009). Today, some technological devices make a significant contribution to the process of learning. Among these devices; cell phones, tablet PCs, portable games, computers, digital sound recorders are the most frequently used devices. Day by day, the use of mobile technological devices is preferred to those that are immobile (Tarımer, Şenli, & Doğan, 2010).

Mobile learning is identified as e-learning that can be realized by means of mobile computing devices (Quin, 2000); that assists in the development of learners' literacy and numeral skills, their skills in using information and communication technologies, and in having an access to the fields of their concern (Attewell, 2011); that facilitates students' access to educational materials and contributes to their learning with the help of mobile devices in wireless environments (Litchfield, Dyson, Lawrence, & Zmijewska, 2007); that is an education model in which education process is carried out fully or partially with mobile technologies (Oran & Karadeniz, 2007); that increases life long learning and informal learning (Vavoula & Sharples, 2009). The most important difference between mobile learning and other learning activities is that "learners are continually on the move" (Sharples, Taylor, & Vavoula, 2005).

In m-learning activities, tablet PCs are preferred for their appropriate screen sizes and multi-functional features. They are not much common among people in Turkey; on the other hand, it is a fact that mobile phones are the technological devices used by the people of all age groups (Oran & Karadeniz, 2007). Although it provides more flexible facilities of usage than tele-learning, and web based learning models, it is not used as much as it is expected as it is a new model without enough services and materials (Odabaşı, 2009).

Mobile Learning Theories

Current mobile learning theories make use of the following:
Behaviourism, Cognitivism, Constructivism, Situated Learning, Problem-Based Learning, Context Awareness Learning, Socio-Cultural Theory, Collaborative Learning, Conversational Learning, Lifelong Learning, Informal Learning as well as Activity Theory, Connectivism, Navigationism, Location-based learning. All of the aforementioned theories are discussed in Table 1 (Keskin & Metcalf, 2011).

Table 1. Mobile Learning Theories

Theories	**Definitions**	**Focus**	**Examples with mobile technologies**
Behaviorist Learning	Learning has occured when learners evidence the appropriate reinforcement of an association between a particular response and stimulus (Smith and Ragan, 2005)	**Information and content delivery in mobile learning** Language learning: Test, practices, quiz, listening-practice speaking Drill and feed back: Mobile Response System Content delivery by text messages.	English learning Applications *SMS, MMS, Voice recorder softwares* Mobile Response System: *Qwizdom, Turning Point Response System Tell me tech. (searching)*
Cognitivist learning	Learning is the acquisition or reorganization of the cognitive structures through which humans process and store information (Good and Brophy, 1990)	**Information and content delivery in mobile learning** Using Multimedia learning (Dual code, Cognitive Load Theory): Images, audio, video, text, animations	Multimedia (text, video, audio, animation, images) *SMS, MMS, e-Mail Podcasting Mobile TV*
Constructive learning	Learning is an activity process in which learners construct new idea or concepts based on their current and past knowledge (Bruner, 1966)	**Context and content-dependent mobile learning** Questions for Exploration Cases and examples Problem solved and Decision making applications Multiple representations Authentic contexts based information database **Collaboration and interaction in mobile learning** Collaboration and interaction between students Comunication via mobile phones	Handheld games Simulation Virtual reality Interactive Podcasting and SMS Interactive mobile TV and SMS
Situated learning	Learning is not merely the acquisition of knowledge by individuals, but instead a process of social participation (Brown et all, 1989).	**Social Context and Social participant dependent mobile learning** Authentic domain activity Collaborative social interaction Cooperative activities Expert modeling Situated mentoring Workplace learning	Natural science learning Medical education Multimedia museum Virtual experts by artificial intelligence tech. Mobile performance support system
Problem-based learning	Learning aims to develop students' critical thinking skills by giving them an illdefined problem that is reflective of what they would encounter as a practicing professional (Koschmann et all, 1996)	**Problem based context and solved based contentdependent mobile learning** Problems–Solutions Case centred activities Collaborative social interaction	Medical education Business administration Nursing *Simulations SMS MMS Voice responde systems*
Context awareness learning	Context awareness means gathering information from the environment to provide a measure of what is currently going on around user an the device (Naismith et all, 2004)	**Context aware in mobile learning** Context-dependent content management Contextual event notification Context-aware communication Navigation and retrieval of learning materials User interface adapted according	Multimedia museum and gallery Pre-class podcasts *Films e-books Podcasting*

		to time and location contexts	
Socio-cultural theory	Learning occurs first through interpersonal (interaction with social environment) than intrapersonal (internalization) (Vygotski, 1978).	**Social Context and Social participant dependent mobile learning** Mobile experts Community of practice Workplace learning Mobile communication	Mobile performance support system Virtual experts Mobile forum, E-mail Social network (Web 2.0 tools)
Collaborative learning	Learning is promoted, facilitated and enhanced by interaction and collaborations between students.	**Collaboration and interaction dependent mobile learning** Actively participation Social context Communication between peers via mobile phones.	Mobile Assisted Language Learning Mobile Response System Mobile computer supported collaborative learning *Forum, Web 2.0 tools, email, mobile portal, games*
Conversational learning	Learning is in terms of conversations between different systems of knowledge (Sharples, 2002).	**Interaction and communication dependent mobile learning** Solving a problem Exploring an environment Communication between peers via mobile phones.	Laboratory classes Field trip Mobile computer supported collaborative learning *Calling, Interactive Voice Respond (IVR)*
Lifelong learning	Learning happens all the time and is influenced both by our environment and the particular situations we are faced with (Sharples, 2000).	**Lifelong information and interaction with education content in mobile learning** Podcasting Information resources Mobile web site	Social networks (Blogs, Wikipedia, Twitter, Youtube) Podcast E-mail Mobile Forums
Informal learning	Learning is a process of learning that occurs autonomously and casually without being tied to highly directive curricula or Instruction (Vavoula, 2004)	**Information and interaction with education content in informal mobile learning setting** Mobile information resources Mobiles in a museum setting Field Trips Science Field Work	Social networks (Blogs, Wikipedia, Twitter, Youtube) Podcast E-mail Mobile Forums
Activity theory	Learning occurs with three features-involving a subject (the learners), an object (the task or activity) and tool or mediating artefacts and human behaviour is situated within a social context that influences their actions (Vygotsky, 1987).	**User actions in social context dependent mobile learning** Actively participation Social context Activities	Museum Art Gallery exhibit via SMS, polls, calling Mobile Games Multimedia
Connectivism	Learning is process of connecting specialized nodes or information sources (Siemens, 2004).	**Diversity of information sources in mobile learning** Connecting specialized nodes Information sources Facilitate continual learning environment Knowledge management Activities Decision-making	Social networks (Blogs, Wikipedia, Twitter, Youtube) Podcast E-mail Mobile Forums Diccussion Platforms Podcasting
Navigationism	Learning is a process of	**Complex of information**	Social networks

	connecting specialized nodes or information sources (Brown, 2005).	**sources in mobile learning** Connecting specialized nodes Information sources Facilitate continual learning environment Knowledge management activities Decision-making Manage information (identify, analyse, organize, classify, assess, evaluate, etc.) Sense making and chaos management.	(Blogs, Wikipedia, Twitter, Youtube) Podcast E-mail Mobile Forums Diccussion Platforms Podcasting
Location based Learning	Location-based learning holds promise for just- in-time learning tied to a student's physical location (Johnson et all, 2009)	**Location context in mobile learning** Conceptual knowledge Conceptual application Constructive environment Partnership with location Immersive activities	Field trips Archaeology studies Location based game Virtual world *Google Map, GPS, RFID, network triangulation*

Keskin & Metcalf (2011, p. 203-205).

In the research carried out with university students by Çakır (2011), most of the participants who had the opportunity of using mobile education tools stated that they were interested in mobile learning environments and wanted to make use of mobile learning technologies if they had an opportunity. Moreover, this study supports the fact that the learning process continues on the move. In the study on mobile learning, Liaw, Hatala, & Huang (2010), found out that students' interest in the subject matter, motivation and academic success increase when online learning and published learning sources are used together. In another study, Acartürk (2012) states that the use of mobile devices has become more common in many areas in daily life than previous years and the technologies like e-book have begun to replace printed materials. The study carried out by Uzunboylu & Ozdamlı (2011) investigated the attitudes of the students towards the technology based cooperative learning after receiving training in the technology-based cooperative learning environment. It was found out that the students significantly developed positive attitudes towards technology at the end of the experiment.

In recent years there are many studies related to mobile learning in education (Seppala & Alamaki, 2003; Rismark, Sølvberg, Strømme, & Hokstad, 2007; Mcconatha, Praul, & Lynch, 2008; Hussain, & Adeeb, 2009; Çuhadar, Odabaşı, & Kuzu, 2009; Sharples, 2000; Başoğlu & Akdemir, 2010; Franklin, 2011; Alzaidiyeen, N. J., Abdullah, A. G. K., & Al-Shabatat, A. M., 2011; Korucu & Alkan, 2011; Zhang, Song, & Burston 2011; Keskin & Metcalf, 2011; Wu, Wu, Chen, Kao, Lin, & Huang, 2012; Hung, Hwang, Su, & Lin, 2012). As is seen in the literature review on mobile learning, although most of the studies are related to the development of mobile learning materials the studies on the attitudes of the prospective teachers towards mobile learning are few in number (Al Fahad, 2009). It is thought that the outcomes of this research on the attitudes of the prospective teachers towards mobile learning will contribute to the field of study in determining whether prospective teachers have positive m-learning perceptions and whether there are deficiencies in the use of mobile technologies.

The Aim of the Study

The aim of this research is to determine mobile learning perception levels of the prospective teachers and to find out whether their mobile learning perceptions differ or not according to their department and gender. The aim of the study is to provide answers to the following questions.

1. What are the mobile learning perception levels of the prospective teachers?
2. Do the mobile learning perception levels of the prospective teachers differ significantly according to their department?
3. Do the mobile learning perception levels of the prospective teachers differ significantly according to gender?
4. What are the opinions of prospective teachers about mobile learning?

RESEARCH METHODOLOGY

Research Model

In this study, in which attitude towards mobile learning was studied, mixed method where qualitative and quantitative methods are used together was used (Denzin & Lincoln, 2005; Vitale, Armenakis, & Field, 2008).

The Universe and Sample of the Study

The sample of the study consists of total 1171 prospective teachers who are studying in Turkish Language Teaching (n=172), English Language Teaching (n=47), Pre-school Teacher Education (n=338), Computer and Instructional Technology Teaching (n=20), Mentally Handicapped Teaching (n=236), Primary School Teaching (n=54) and Guidance and Psychological Counselling (n=298) at a private university in Turkish Republic of Northern Cyprus.

In this study, 30% quota sampling method was used for quantitative method sampling selection; maximum variety method among purposeful sampling methods was used for qualitative method working group selection.

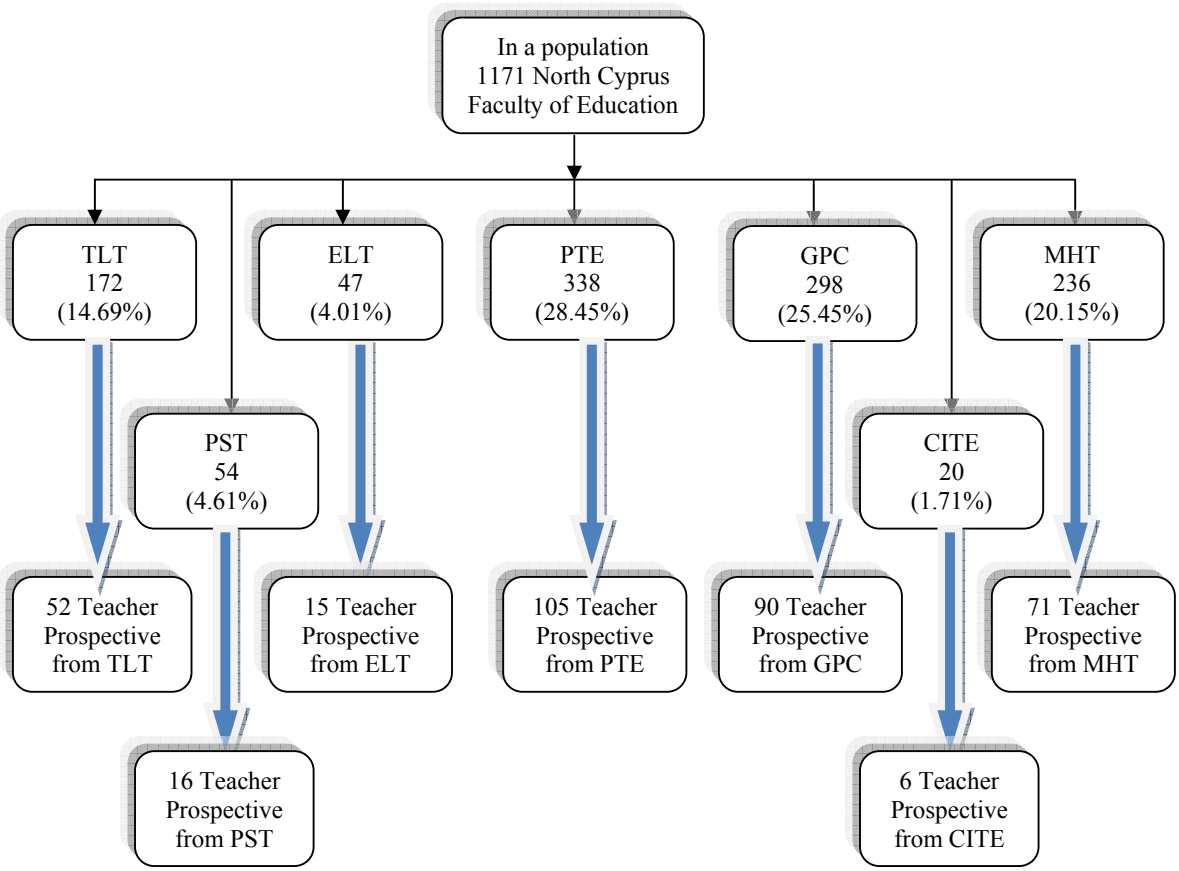

Figure 1. Selecting a quota sample

TLT: Turkish Languange Teaching, ELT: English Languange Teaching, PTE: Pre-school Teaching Education, GPC: Guidance and Psychological Counceling, MHT: Mentally Handicapped Teaching, PST: Primary School Teaching, CITE: Computer and Instructional Technology Teaching Education.

Average age of individuals is between 2.96±.963 (21-22) age range. During the collection of the data through interview which is one of qualitative methods, 35 prospective teachers who represent working group the best was chosen according to age, department, gender and socio-demographic independent variables.

Tablo 2. Teacher Prospectives' Demographic Characteristics

Independent variables		n	%
Department	TLT	52	14.6
	PTE	105	29.6
	GPC	90	25.4
	MHT	71	20.0
	PST	16	4.5
	ELT	15	4.2
	CITE	6	1.7
Gender	Female	135	38.0
	Male	220	62.0
Age	18-20	142	40.0
	21-22	113	31.8
	23-25	71	20.0
	26+	29	8.2

TLT: Turkish Language Teaching, ELT: English Language Teaching, PTE: Pre-school Teaching Education, GPC: Guidance and Psychological Counselling, MHT: Mentally Handicapped Teaching, PST: Primary School Teaching, CITE: Computer and Instructional Technology Teaching Education.

Data Collecting Instruments

Demographic Information Form: Independent variables of the study were collected by a personal information form prepared by the researcher.

Mobile Learning Perception Scale: "Mobile Learning Perception Scale" developed by Uzunboylu and Özdamlı (2011) is 5-point Likert scale type and consists of 26 items. Mobile learning scale has three sub dimensions: "Aim-Mobile Technologies Fit (8 items)," "Appropriateness of Branch (9 items)" and "Forms of M-learning Application and Tools' Sufficient Adequacy of Communication (9 items)". Replies to the items are graded as "Completely agree", "Agree", "Indecisive", "Disagree" and "Completely disagree". In positive items "Completely agree" is 5 points, "Completely disagree" is 1 point. The points given to the scale range from 26 to 130. Point means of mobile learning perception scale was explained in 3 point range as low ($\bar{x}$=26-60), average ($\bar{x}$=61-95) and high ($\bar{x}$=96-130). High points show positive mobile learning perception and low points show negative mobile learning perception. Cronbach Alpha coefficient of the scale originally used by Uzunboylu and Özdamlı (2012) was determined as .97. In this study, Cronbach Alpha coefficient of the scale was determined as .91.

In order to get suitable data, in this study, scanning model among qualitative research models and semi-constructed interview technique were used. Qualitative research was identified as a research type in which qualitative data collecting methods like observation, interview, and document analysis were used; and in which a qualitative process was followed in order to show perception, events in a natural, real, and holistic manner (Yıldırım & Şimşek, 2004). Scanning model is a concept that aims to describe a situation as it is. In scanning model an individual or an object that take part in a study is tried to be identified in their own conditions as they are. They are not changed or affected in anyway (Karasar, 2009).

Data Collection

Before application of the scale, participants were asked whether they were volunteering or not after the aim of the research was explained; and scale was applied to volunteer prospective teachers. Prospective teachers answered the scale in 15-20 minutes.

In this study held in order to determine prospective teachers' mobile learning perception, data were collected with semi-constructed interviews from qualitative data collecting methods. The most important ease that semi-constructed interview gives to the researcher is that it gives more systematic and comparable information to the researcher since interview is carried on the protocol prepared in advance (Yıldırım & Şimşek, 2004). According to Berg (1998) some questions are prepared to use in all interview for semi-constructed interviews. Interviewees are asked questions in the same order; however interviewees are allowed to answer the questions as long as they want.

Convenient day and time was decided by asking prospective teachers who are volunteer. Interviews were carried out in the office of the researcher in a silent environment on the day and time decided in advance. Real names of

attendants were used during interviews. And then each participant was given a code name. Before asking interview questions, they were informed by giving an interview form.

Analysis of Data and Application

In the statistical evaluation of the research, all analyses are performed by using SPSS 16.0 for windows. When the number of individuals included within the scope of the research exceeds 50, it is recommended that Kolmogorov-Smirnov test be utilized for testing whether or not the data obtained from the attitude scales display a normal distribution (Coakes & Steed, 1997; Tabachnick & Fidell, 2000). In the Kolmogorov-Smirnov test, since the statistical null hypothesis states that "the distribution of the grades does not display a meaningful difference from the normal distribution", the fact that the calculated "p" value exceeds .05 has led to the evaluation that the grades do not display a significant difference from the normal distribution (Büyüköztürk, 2010). A frequency analysis was done relating to the distribution of the answers. Furthermore, the relationship between independent and dependent variables was analyzed. To determine whether there was a difference between the groups, the "t" test was conducted for double variables and the "F" test for three or more variables. In the study, the level of significance was accepted as .05.

FINDINGS

Points of dependent variables "Aim-Mobile Technologies Fit", "Appropriateness of Branch" and "Mobile Learning Application and Tools" were tested in order to find whether they show normal distribution or not. Normal distribution test result is given in the Table 3.

Table 3. Descriptive Statistics and Kolmogorov-Simirnov Z and Normality Test Results for MLPS Dimensions.

		A-MTF	AB	FMA and TSAC
N		355	355	355
Normal Parameters (a,b)	Mean	18.940	21.157	20.436
	Std.Deviation	4.3911	6.0228	5.6870
Most Extreme Differences	Absolute	.066	.058	.071
	Positive	.066	.058	.071
	Negative	-.058	-.041	-.058
Kolmogorov-Smirnov Z		1.244	1.087	1.346
Asymp. Sig. (2-tailed)		.090	.188	.053

a Test distribution is Normal; b Calculated from data; AB, Appropriateness of Branch; A-MTF, Aim-Mobile Technologies Fit; FMA and TSAC, Forms of M-learning Application and Tools' Sufficient Adequacy of Communication; MLPS, Mobile Learning Perception Scale; SD, standard deviation.

When the Table 3 was analyzed it was found out that points of dependent variables "Aim-Mobile Technologies Fit", "Appropriateness of Branch" and "Forms of M-learning Application and Tools' Sufficient Adequacy of Communication" show normal distribution. Therefore, parametric tests were used for the analysis of dependent variables of the research.

Findings about the first sub-question

The first sub-question was identified as "What are the mobile learning perception levels of the prospective teachers?". Identifying statistics about prospective teachers' mobile learning perception are given in the Table 4.

Tablo 4. Descriptive Statistics on Prospective Teachers' Mobile Learning Perception Scale Dimensions.

	Mobile Learning Perception Scale dimensions			
	n	Mean	SD	Range
A-MTF	355	18,9408	4,39110	9-30
AB		21,1577	6,02283	9-39
FMA and TSAC		20,4366	5,68707	9-35
Mobile Learning Perception		60,5352	12,16208	34-101

AB, Appropriateness of Branch; A-MTF, Aim-Mobile Technologies Fit; FMA and TSAC, Forms of M-learning Application and Tools' Sufficient Adequacy of Communication; MLPS, Mobile Learning Perception Scale; SD, standard deviation.

When Table 4 is analyzed, it is found out that prospective teachers' mobile learning perception is in "low" level in general.

Findings about the second sub-question

The second sub-question was identified as "Do the mobile learning perception levels of the prospective teachers differ significantly according to their department?" ANOVA result that was applied for finding whether mobile learning perception of prospective teachers differ according to their departments or not are given in Table 7.

Table 5. Descriptive Statistics about Prospective Teachers' Mobile Learning Perception According to Department Variable

	Branches of Prospective Teachers						
	Mean (SD)						
	PTE *n* = 105	GPC n=90	MHT n=71	TLT n=52	PST n=16	CITE n=6	ELT n=15
A-MTF	18.400 (4.166)	19.8333 (4.834)	18.647 (4.545)	**17.980** (4.065)	19.625 (3.383)	**21.333** (2.875)	20.400 (3.850)
AB	20.781 (5.853)	21.300 (6.323)	21.521 (6.559)	**20.596** (5.681)	19.937 (6.082)	**26.000** (4.195)	22.533 (3.602)
FMA and TSAC	21.114 (6.114)	20.588 (5.045)	19.647 (5.867)	**19.615** (6.142)	19.562 (4.830)	**24.000** (3.346)	20.866 (4.882)

AB, Appropriateness of Branch; A-MTF, Aim-Mobile Technologies Fit; FMA and TSAC, Forms of M-learning Application and Tools' Sufficient Adequacy of Communication; MLPS, Mobile Learning Perception Scale; SD, standard deviation.

Table 6. Test of Homogeneity of Variances for the Variables by Department

Variables	F	df1	df2	Sig.
A-MTF	1.329	6	348	.243
AB	1.845	6	348	.090
FMA and TSAC	1.650	6	348	.133

As it is seen in Table 5, the best mean ($Mean_{A\text{-}MTF}$=21.333±2.875; $Mean_{AB}$=26,000±4.195; $Mean_{FMA\ and\ TSAC}$=24.000±3.346) belongs to prospective teachers of Computer and Instructional Technology Teaching Education Department in Mobile Learning Perceptions. The lowest mean ($Mean_{A\text{-}MTF}$=17.980±4.065; $Mean_{AB}$=20.596±5.681; $Mean_{FMA\ and\ TSAC}$= 19.615±6.142) belongs to prospective teachers of Turkish Language Teaching Department in Mobile Learning Perceptions.

Table 7. Results of the Multivariate one-way ANOVA

		Sum of Squares	**df**	**Mean Square**	**F**	***p***	**Partial eta square**
A-MTF	Between Groups	230.196	6	38.366	2.024	.062	.033
	Within Groups	6595.561	348	18.953			
	Total	6825.758	354				
AB	Between Groups	235.396	6	39.233	1.083	.372	.018
	Within Groups	12605.770	348	36.223			
	Total	12841.166	354				
FMA and TSAC	Between Groups	220.731	6	36.788	1.140	.338	.019
	Within Groups	11228.593	348	32.266			
	Total	11449.324	354				

p<.05

As a result of ANOVA test that was applied to find whether there was a significant difference between mobile learning perception sub-dimensions of according to prospective teachers' departments or not, it was determined that there was not any significant difference. In this case, it can be said that mobile learning perception is independent from the department variable. In other words, it is not affected.

Findings about the third sub-question

The third sub-question was identified as "Do the mobile learning perception levels of the prospective teachers differ significantly according to gender?". T-test was used in order to determine whether mobile learning perception of prospective teachers differ according to gender. And the results are given in Table 8.

Table 8. Descriptive Statistics and T-test of Gender on Mobile Learning Perception Scale Dimensions.

	Gender								
	Male n=220		Female n=135		**Levene's Test for Equality of Variances**	**F value**	**t value**	**p value**	**Partial eta squared**
	Mean	SD	Mean	SD					
A-MTF	18.840	4.240	19.103	4.638	1.476	.225	.547	.585	.001
AB	21.186	5.982	21.111	6.110	.004	.947	.114	.909	.000
FMA and TSAC	20.518	5.624	20.303	5.806	.168	.683	.345	.731	.001

AB, Appropriateness of Branch; A-MTF, Aim-Mobile Technologies Fit; FMA and TSAC, Forms of M-learning Application and Tools' Sufficient Adequacy of Communication; MLPS, Mobile Learning Perception Scale; SD, standard deviation.

As it is seen in Table 8, "Aim-Mobile Technologies Fit", "Appropriateness of Branch" and "Forms of M-learning Application and Tools' Sufficient Adequacy of Communication" perception of male and female prospective teachers is similar. In this case, it can be said that mobile learning perception is independent from gender variable. In other words, it is not affected.

Findings about the fourth sub-question

The fourth sub-question was identified as "What are the opinions of prospective teachers about mobile learning?". Thoughts of prospective teachers about mobile learning are summarized as follows:

- ✓ "It is a learning type that lets us reach any information by using mobile phones, tablet PCs, and PDAs (Personal Digital Assistant)."
- ✓ "It is reaching information without depending on any place (home, school, office etc.). For example, it is a thing that allows a student not to reach information or training just being in a stationary place, but in the street, cafe or a bus, briefly everywhere, with mobile devices such as mobile phones."
- ✓ "I do not know what it is. / I do not have any idea about what it is. / I do not know what it is because I am against technology."
- ✓ "Reaching information has become easier since the integration of the internet to mobile phones. I can say that people got into mobile learning process with mobile phones".
- ✓ "It is the learning technology in which people can reach information with their mobile phones after the integration of the internet to mobile phones."
- ✓ "It is a process of learning through the internet. It is an education without interaction through distance education."
- ✓ "It is a kind of thing in which teachers record their instructions, share on the net and students follow them."
- ✓ "Mobile learning includes mobile phones, smart phones, laptops, notebooks, tablet PCs. Education with these materials is called mobile learning. I believe that it will become more common, it will ease education and training, and it will be useful in the future."
- ✓ "It is the case in which people can reach information anytime and anywhere they want with their mobile phones, tablet PCs and all technology devices through developing technology."
- ✓ "Mobile learning is a kind of learning through the Internet. / Using the Internet with mobile phones."
- ✓ "It is a distance education of school courses with technology."

- ✓ "Mobile learning never replaces a teacher because one's teaching is very different as a result of experiences. Computer assisted teaching keeps students away from the courses. It cannot supply permanent learning."
- ✓ "Mobile learning is computerized learning system. It is a learning process in which student listens to computer instead of the teacher."
- ✓ "As I have heard, it is cyber learning technology."
- ✓ "Mobile learning is instruction on the Internet. Mobile learning is not accurate. It is not as healthy as teacher-student interaction."
- ✓ "It is learning by using technology devices. It is online and offline learning apart from traditional learning. Since it provides instant information, I completely agree to use it."
- ✓ "I think it can be technology education. That is to say, it is a kind of distance learning."
- ✓ "It is distance education that is not one to one. I think information is not permanent as there is not teacher-student interaction."
- ✓ "It is learning everywhere without going to a school via computer, phone or any other technologies. In this way, an individual spend, much more time for himself with his friends, family. Briefly it saves time."
- ✓ "I know it is applied in Oxford and Kazakhstan. You should be online to attend the course. I have seen in a documentary that many people get a profession while working."
- ✓ "Mobile learning is sharing lecture, homework, e-book and course activities on the intenet. It is a kind of studying without going to a school. For example, courses of open-university are sent to the student on the internet. It is advantageous in terms of time but it cannot be useful in terms of interaction with people."
- ✓ "Mobile learning reminds me of correspondence school."
- ✓ "I do not believe this type of can accomplish its aim with mobile learning. However, I believe that it will raise the quality of education if it is used as an aid because education should take place face to face and in a social environment."

CONCLUSION AND RECOMMENDATION

It was determined that prospective teachers' mobile learning perception is, in general, low and many of them have no information about mobile learning. It is also found out that prospective teachers who stated they have knowledge about mobile learning have inaccurate knowledge about it, and they believe that mobile learning will diminish effective communication environment. It was determined that prospective teachers' mobile learning perception does not differ significantly according to their department. This research finding is parallel to the result of the study of Uzunboylu & Ozdamlı (2011). It was determined that prospective teachers' mobile learning perception does not differ significantly according to gender. This result is parallel to the study of Economides & Grousopoulou (2008), Uzunboylu & Ozdamlı (2011). According to the study of Economides & Grousopoulou (2008) held on Greek male and female's phone using, there is not a significant difference in terms of gender. According to a study by Uzunboylu & Ozdamlı (2011) carried out with teachers who work in TRNC, mobile learning perception does not differ significantly in terms of gender. This result conflicts with the studies held by McKinney, Dyck & Luber (2009), Wang, Wu & Wang (2009), Al Fahad (2009), Çavuş & Biçen (2009), and Broos (2005). In the research by McKinney, Dyck & Luber (2009), male teachers have more positive mobile learning perception than female teachers. In a similar way, Wang, Wu & Wang (2009) found that mobile learning perception differs in favour of males according to age and gender variable. In the studies of Çavuş & Biçen (2009), and Broos (2005), there is a significant difference in favour of males towards communication technologies. The case in which there is not any significant difference according to gender and department can result from prospective teachers' lack of knowledge about mobile learning. These recommendations can be given as a result of this research for further studies and applications.

1. When prospective teachers' mobile learning perception is thought to be in "low" level, informative meetings can be held at school about what the mobile learning is.

2. Studies can be carried out with instructors.
3. Similar studies can be held in different faculties and universities.

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MODULE FOR LEARNING INTEGRAL CALCULUS WITH MAPLE: LECTURERS' VIEWS

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ABSTRACT
Engineering technology students can attain a meaningful mathematics learning if they are allowed to actively participate in hands-on activities. However, the current dissemination of knowledge in the classroom still focuses on teacher-centered paradigm of teaching. A study to explore lecturers' views regarding a newly developed integral calculus with Maple software module was conducted. Nine lecturers with at least eight years of teaching experience were involved in the evaluation of the module. They were brought to a computer laboratory at the university to evaluate the activities developed in the module using a newly developed manual. Within six hours, they attempted and evaluated the assigned activity in groups. Each of the lecturers wrote his or her comments on the activities, manual and lesson plans booklets. Their comments were qualitatively analyzed to provide a guideline in producing a meaningful module in teaching and learning of integral calculus. From their written comments, there were two main findings obtained. Firstly, they highlighted the importance of giving reflective questions at the end of each subtopic to train the engineering technology students to critically aware about their thinking skills. Secondly, some of the lecturers believed that by giving counter-examples, these students will develop a better conceptual understanding in each newly learnt topic. Apart from these two main findings, other comments were also considered in modifying the manual, lesson plans and set of six integral calculus activities. As a result, a module which emphasized on student-centered learning based on conceptual and procedural understanding and metacognitive awareness teaching approach will be produced. This module will be used to enhance students' procedural and conceptual understanding in learning integral calculus at the university.
Keywords: Integral calculus, Maple software, module, evaluation, engineering technology

INTRODUCTION

Mathematics is a live subject and it is used to solve problems (Thomas & Holton, 2003). Thus, the way to teach the subject by asking students to memorize rules per se is inadequate. For the first six years of schooling, school programs typically regard mathematics as mainly a matter of writing symbols on paper, according to certain set of rules (Davis, 1986). On the other hand, it needs an approach of teaching that can enhance a deep understanding of the concepts underlie in each topic. Deep cognitive understanding can be obtained through a carefully designed teaching that allows students to flexibly cater their pre-knowledge deficiencies and also allows them to do reflection on the concept in different ways (Haripersad, 2011). One reason for these deficiencies is the insufficient means used to disseminate basic concepts to students through classical lecture mode of teaching (Deliktas, 2011). This "one for all" teaching approach most of the time, cannot cater the needs of various types of learning style preferences of students in a big lecture group. On top of that, lecturers have difference preferences in teaching. These circumstances add further complications to students in comprehending newly learnt concept.

In order to gain an insight into students' learning styles at the university involved, a study was conducted prior to the development of a new teaching strategy to teach integral calculus. Students at the university involved in this study are engineering technology students. Therefore the instrument developed by Solomon and Felder for engineering students was chosen as a mean to gather the required information. The instrument adapted is Index of Learning Styles Questionnaire (ILS) 1997 (Felder, 1988, 1993; Felder & Spurlin, 2005; Soloman & Felder, n.d.). The analysis of data obtained gives the following outcomes (Table 1):

Table 1: Engineering Technology Students' Learning Style Analysis

Dimension		Students in every dimension (%)
A - R	Active	67.47
	Reflective	32.53
S - I	Sensing	50.60
	Intuitive	49.40

VS - VB	Visual	93.98
	Verbal	6.02
SEQ - G	Sequential	55.42
	Global	44.58

The outcomes reveal that engineering technology students at the university involved can be helped to experience a meaningful learning if they are exposed to a certain characteristics of teaching. Specifically, their learning process can be fostered if they are allowed to be actively involved in the process of learning, given an opportunity to explore the hands-on activities of learning, and presented with visual inputs in the linear and sequential manners. In other words, a quality learning experience in a higher education must take into account not only the content but also its dissemination process. From the investigation done, the development of a new strategy was carried out without totally sacrificing the lecture mode of teaching. Instead, the existing lecture mode of teaching practice was enhanced with the advancement of technology in designing a new teaching strategy for integral calculus. In view of that, technology integration approach is adapted in this study.

Technology integration approach uses various activities in the traditional context with computer technology mode of teaching. It combines multiple delivery media which are designed to complement each other to encourage learning. Furthermore, the fast learning process from technology integration benefit students in catching up with the syllabus (Yesilyurt, 2010). In teaching integral calculus, the technology integration approach is designed to include graphical, numerical and analytical presentations of materials during lectures complemented by software applications in tutorial sessions. In this study, Maple software is applied in the teaching and learning integral calculus to foster students' understanding in this topic. Activities are designed to encourage deep learning mindset amongst engineering technology students at the university. Deep learning is defined as examining new facts and ideas critically, tying them into existing cognitive structures and making numerous links between ideas (Houghton, 2004). This definition is similar to what Hiebert and Lefevre (1986) describe as conceptual knowledge. Conceptual knowledge involves a rich network of relationships between pieces of information which allows flexibility in accessing and using the information (Hiebert & Lefevre, 1986). Thus, using technology integration approach, the engineering technology students are able to easily move between listening to lecture, cooperatively work to do the activities using Maple software, involve in class discussion and work individually outside classroom using Maple software as a platform to assess their understanding. With that in mind, the main objective of this research is to evaluate the integral calculus module developed.

METHODOLOGY

A set of a new module to teach integral calculus for engineering technology students at the university was developed. The development of this module was based on APOS theory, where it is the acronym for Action, Process, Object and Schema. This theory is a constructivism theory (Bergsten, 2008; Dubinsky, 2001) and it was developed by Dubinsky based on Piaget's reflective abstraction (Asiala, et al., 1996, 2004; Dubinsky & McDonald, 2001). Piaget's idea was extended to suit the context of college level mathematics. In this theory, the understanding of mathematics concept "…*begins with manipulating previously constructed mental or physical objects to form actions; actions are then interiorized to form processes which are then encapsulated to form objects. Objects can be de-encapsulated back to the processes from which they were formed. Finally, actions, processes and objects can be organized in schemas*" (Asiala, et al., 1996). This theory suggests that students have to have appropriate mental structures for them to comprehend a given mathematical concept (Maharaj, 2010). In this theory, the mental constructions analysis is known as genetic decomposition of the concept where it describes how the concept is developed in the mind of a student (Asiala, et al., 1996, 2004).

In this study, the module was developed to consist of six parts, which are integral calculus with maple manual, integral calculus notes, lesson plans, integral calculus activities, tutorial questions and exercises. These six parts were developed based on the content of Technical Mathematics 2 at the university involved in this study. In this study, three parts, which are the manual, the lesson plans and the activities, were evaluated by nine lecturers teaching at the university. They were brought to the computer laboratory at the university to try the activities developed using Maple software. The activities were attempted after they went through and evaluated the manual developed. They were asked to work in groups to complete the activities since the activities were developed based on ACE teaching cycle (activities, class discussion and exercises) (Dubinsky & Leron, 1994). Six groups were formed to work on six different activities. Each of them was given six hours to complete the assigned activity. Lecturers who are familiar with Maple software worked individually. However, they were allowed to discuss the activities with members from other groups. Each of them was asked to write comments in order to improve the manual, the lesson plans and the activities developed in teaching and learning integral

calculus. Their comments were qualitatively analyzed to provide a guideline in producing a utility and meaningful manual, lesson plans and set of activities in teaching and learning this topic.

FINDINGS AND DISCUSSION

Lecturer's Profile

Nine lecturers involved are from different fields of expertise (Table 1). Three mathematics lecturers who involved in this study have more than 10 years experience. Two of them have been teaching mathematics for more than 15 years. The most experienced lecturer has been teaching mathematics for 20 years and her field of expertise is mathematics and statistics. The second mathematics lecturer's field of expertise is mathematics and computer science. She has been teaching for 16 years. The third mathematics lecturer has been teaching mathematics for 14 years and her field of expertise is mathematics and mathematics education. Six other lecturers are from Robotics, Artificial Intelligence, Control Engineering, Mechatronics and Automation Engineering, Mechanical Engineering and French Language fields of expertise. All of them have at least eight years of teaching experience and the most experienced lecturer is teaching French language for 16 years. All of them apply integral calculus extensively in teaching their subjects except for the French Language lecturer. This French Language lecturer was selected in order to attain views from a non-mathematics background respondent.

Table 1: Lecturers' Profile

No.	Lecturer's code	Field of Expertise	Teaching Experience (Years)
1	MATH01	Mathematics and Statistics	20
2	MATH02	Mathematics and Computer Science	16
3	MATH03	Mathematics and Mathematics Education	14
4	IA01	Robotics	12
5	IA02	Artificial Intelligence	12
6	IA03	Control Engineering	8
7	1A04	Mechatronics and Automation Engineering	8
8	MM01	Mechanical Engineering	8
9	FR01	French Language	16

Activities

Activity 1

Activity 1 was attempted by a group of two lecturers (MATH01 and FR01). MATH01 is an expert Maple user, whereas FR01 is not familiar with the software. However, MATH01 does not apply Maple in her class. These two lecturers wrote their comments on the activity booklet (Table 2). Comments ICA1.1, ICA1.4, ICA1.5 and ICA1.6 emphasized on the importance of posing a reflective question at the end of each part. Students need to be given some times to do a reflection on their Maple outputs. Thus, reflective questions need to be designed carefully because the quality of reflection has the effect on the achievement test (Chang & Chou, 2011). Moreover, the questions allow students to review their learning process consistently. These questions also serves as an active monitoring, consequent regulation and orchestration agents as what is defined in metacognitive learning objectives and goals (Vos & Graaff, 2004). Metacognitive ability is crucial in learning engineering technology mathematics as students in this field are using this subject to make sense of the real life application in their related field. Thus their comments were considered to improve the activities developed.

Comments ICA1.2 and ICA1.3 give an indication that students need to be given a clue on writing a complete solution for an indefinite integral questions. To respond to these comments, three questions were designed to create a chain of knowledge towards giving students ideas about the format of a complete solution for any indefinite integrals. The questions involved a topic learnt prior integral calculus, i.e. derivative of functions. In the first question, five linear functions were designed as a set of derivatives questions. The functions are the same except for their constant terms, where five different constant values were used (0, 3, -5, 0.4 and – 3/5). The functions are:

$$x,\ x+3,\ x-5, x+0.4 \text{ and } x-\tfrac{3}{5}.$$

In this question, students are asked to differentiate the functions with respect to x. The derivatives will then be used as integrands in the second question. Finally, in the third question, students are asked to compare the integrals with the original linear functions in the first question for them to realize that a complete answer of any indefinite integrals need to be added with a constant.

Comment ICA1.7 is about giving more examples on non-basic trigonometric functions. This comment is considered but the examples are not included in the activity, instead they are included in the tutorial questions. Whereas, the comment on introducing integration of functions with respect to different variables is not used in developing activities in Activity 1 because similar questions were already being asked in Activity 2 questions.
Finally comment ICA1.8 emphasized on giving counter-examples to build a deep understanding mindset amongst engineering technology students at the university. This approach is able to create a cognitive conflict or disequilibrium in the students' mind (Gruenwald & Klymchuk, 2003). A cognitive conflict is invoked when students are facing contradiction or inconsistency in his or her ideas (Zazkis & Chernoff, 2008). Cognitive conflict can help students understand areas of mathematics critically through discussing and correcting their mistakes (Irwin, 1997). Furthermore, the disequilibrium enhances the driving force of the development in understanding (Koichu, 2008; Piaget, 1977). Without this, knowledge remains static (Piaget, 1977). Other studies have proven the positive impact of provoking students' critical thinking (Toka & Askar, 2002; Watson, 2007). Thus, in this study, the comment is used to add counter-examples in order to trigger students' critical thinking as it will create a path-dependent logic, in which students are capable of giving different answers to the same questions (Tall, 1977).

Table 2: Lecturers' Comments on Activity 1

Code	Lecturer's code	Activity Number	Comments
ICA1.1	MATH01	1.2: Question 2 Rules for definite integral	Need to be rephrased so that the students can comment on the: (1) Answers (2) Equation format Is the answer for $\int_1^3 x\,dx + \int_4^6 x\,dx$ equivalent to $\int_1^3 x\,dx + \int_3^6 x\,dx$? Give your comments.
ICA1.2	MATH01	1.3: Question 1 Indefinite Integral as an anti-derivative	The students will write down what they see. So, for example $\int e^{2x}\,dx = \frac{1}{2}e^{x}$. The good students will remember to add "C" to every answer. The weak students may not.
ICA1.3	FR01		C (constant) is not indicated in the expression palette → the student needs to add it himself in his answer. Remind students to put C.
ICA1.4	MATH01	1.4: Question 1 Indefinite Integral as an anti-derivative	Separate the positive and negative powers for questions. The students will observe that powers will be different. For questions with negative powers, the students need to remember/recall the process of changing negative powers to positive powers.
ICA1.5	MATH01	1.4: Question 3(h) Indefinite Integral as an anti-derivative	Rephrase this. Make the students realize that they have to adjust their answers according to the variable of interest. I think this activity should come first in the series of anti-derivative.
ICA1.6	MATH01	1.4: Question 5(f) Indefinite Integral as an anti-derivative	Can also get the comment from students on what happened to this function if *x* becomes a negative power.
ICA1.7	MATH01	1.4: Questions 8,9,10 Indefinite Integral as an anti-derivative	OK but need more examples so that students can conclude on the general property – also try questions with different variables.
ICA1.8	MATH01	1.5: Conclusion	In order for students to come up with actually/general property, they need to also understand constraints to the properties

Activity 2

Activity 2 was attempted by a group of two lecturers (MATH03 and IA03). MATH03 is an expert Maple user who applies this software in her teaching. IA03 is also familiar with the software but he does not use this software in teaching his subject, which is Control Systems. These two lecturers wrote their comments on the activity booklet (Table 3). Comment ICA2.1 is similar to comment ICA1.7 in Activity 1 in which different independent variables were suggested to be included in the activities. The comments were considered in developing questions in Activity 2, and since the questions given by MATH03 are relevant and suitable, they are used in improvising the questions in Activity 2.

Comment ICA2.2 emphasized on the importance of theoretical knowledge prior to practical approach using Maple. IA03 also claims that students may not understand the process even though they managed to reach the final solution using the software. Both comments are actually part of the planning strategy used in developing questions in the set of activities. They were already used to plan the strategy developed, where the theoretical knowledge is taught in the lecture prior to respective tutorial sessions. Regarding the assurance of students' procedural understanding, activities were already carefully designed to not only encourage procedural but also conceptual students' understanding. They were designed based on the characteristics of procedural and conceptual questions highlighted by Arslan (2010) and also Dubinsky (1994).

Comments ICA2.3, ICA2.4, ICA2.5, ICA2.7, ICA2.9 and ICA2.10 are similar to comments ICA1.1, ICA1.4, ICA1.5 and ICA1.6 in Activity 1 where the importance on giving reflective questions was highlighted by MATH03. This mathematics lecturer has given a comprehensive and details comments on improving the questions in Activity 2. She has also suggested questions to be added in each part in this activity. All her suggestions are considered and used to modify the questions.

IA03 proposed in ICA2.6 that the application of Maple software is more appropriate for students in semester 4 and higher. In this study, the module developed is for year one, semester two diploma students because the mathematics subject taught is not only a pre-requisite subject for a higher mathematics subject, but also all mathematics related technical subjects. It is important to ensure the full understanding of this topic during their year one. In addition, calculus is presented as the peak of secondary school mathematics, and it has been applicable to the most capable students only (Kissane, 2007). Since computers have potential for both amplifying and reorganizing mathematical thinking (Drijvers, et al., 2010), it is suitable to help students to master the basic calculus concepts. Furthermore computers can promote mathematical thinking skills through purpose functions and process functions. The purpose functions engage students to think mathematically and the process functions aid them through five categories, namely tools for developing conceptual fluency, tools for mathematical exploration, tools for integrating mathematical representations, tools for learning how to learn and tools for learning problem-solving methods (Drijvers, et al., 2010; Pea, 1987). The final comment for Activity 2, i.e. ICA2.11 can also be related to comment ICA2.6 where the module is designed for measuring students' conceptual and procedural understanding on integral calculus. In other words, the message in comment ICA2.11 is actually part of the consideration taken in the initial stage of developing the module, which is during the planning stage.

Table 3: Lecturers' Comments on Activity 2

Code	Lecturer's code	Activity Number	Comments
ICA2.1	MATH03	2.1: Indefinite Integrals	Add a new question: Use Maple to determine the following integral: (a) $\int 7\,dx$ (b) $\int x^7\,dx$ (c) $\int k^7\,dx$ (d) Compare the results obtained in (b) and (c), what can you conclude about the variable of interest (independent variable), x?
ICA2.2	IA03	2.1: General Comments	The theoretical explanations on mathematics problem solving were needed before giving the hands-on practical activities. Practical approach will provide a simpler problem solving method, but sometimes… students failed to understand how were the solutions obtained.
ICA2.3	MATH03	2.1: Question 2(f)	Rephrase to: Observe the exponential function given

			and the result obtained from Maple.
ICA2.4	MATH03	2.1: Question 3	Remove all questions, replace with this: Use Maple to integrate the following *trigonometric* functions: (a) $\int \cos(2x+5)dx$ (b) $\int \cos(3x+5)dx$ (c) $\int \cos\left(\frac{1}{2}x+5\right)dx$ (d) Based on the coefficient of the result obtained, what can you conclude?
ICA2.5	MATH03	2.1: Question 4	Rephrase the question: use Maple to evaluate *the following indefinite integrals*: Remove Question 4(e) and 4(f).
ICA2.6	IA03	2.1: General comments	MaLT – IC method is not suitable for Semester 1 and 2 students. (But it is suitable for students in Semester 4 and onwards).
ICA2.7	MATH03	2.2: Question 1 Definite Integrals	Remove Question 1(d), 1(e) and 1(f) Replace with $(d)\int_0^{-2}(4x+7)^4dx$. (h) Compare the answer of definite integrals in (a) and (d), determine the property applied to obtain the result in (a) and (d).
ICA2.8	MATH03	2.2: Question 2	Question 2(c), 2(d) and 2(e): outside tutorial class → self learning
ICA2.9	MATH03	2.3: Question 1 Properties of Integrals	Put a break for different type of question. 1(a) and 1(b), 1(c) and 1(d), 1(e) and 1(f)
ICA2.10	MATH03	2.3: Question 2	Put a break for different type of question. 2(a), 2(b) and 2(c), 2(d) and 2(e).
ICA2.11	IA03	2.5: Conclusion	Need to study the effectiveness of MaLT – IC in terms of students' understanding in solving mathematics in details. MaLT – IC can assist students to solve any mathematics problems easily… The value of understanding??

Activity 3

Activity 3 was attempted by IA01 who applies Maple software in his robotics research. However he did not give any comments on questions in Activity 3. Therefore questions in Activity 3 were modified based on the comments given by other lecturers in different set of activities.

Activity 4

Activity 4 was attempted by a group of two lecturers (MATH02 and IA02). Both are not familiar with Maple software and thus, they worked together to complete the activity given. Their comments were written on a set of activity booklet and manual booklet (Table 4). Comments ICA4.1 and ICA4.2 emphasized on a clearer instructions given to students. The statement given in the first draft: Use *Maple command* ... is changed to *Use Maple changevar* command.... The *changevar* command is for substitution technique. Similarly, *intparts* command is used for integration by parts technique and *parfrac* command for partial fraction conversion. They are used to modify the instructions in the second draft. MATH02 and IA02 suggest students to critically synthesis two types of Maple outputs in Comment ICA4.3. This suggestion is not used in modifying questions in Activity 4 because at this university involved in this study, all diploma students are assessed until analysis level only. The different Maple outputs are shown in Figure 1.

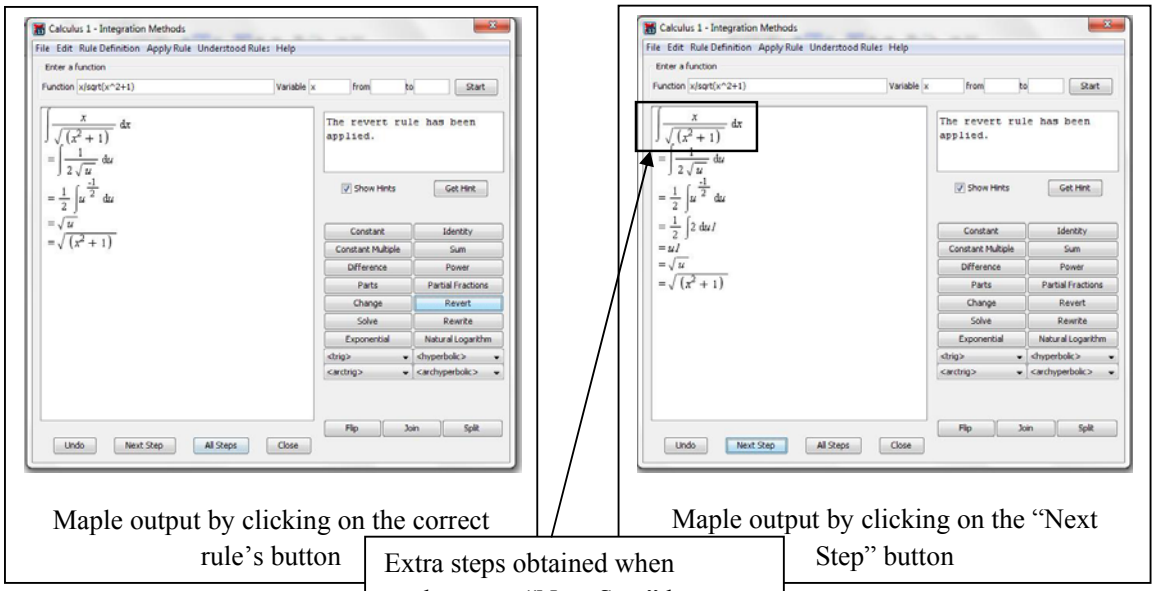

Figure 1: Different Maple Outputs

Table 4: Lecturers' Comments on Activity 4

Code	Lecturer's code	Activity Number	Comments
ICA4.1	MATH02 IA02	4.3: Question 1 Integrating by Using Partial Fractions Technique	Maple Commands: to specify
ICA4.2	MATH02 IA02	4.3: Question 2	Maple Tutors: to specify
ICA4.3	MATH02 IA02	4.5: Conclusion	Need to elaborate/explain on the difference "respond" from Maple's Tutor in terms of different working method to solve a particular question ("Next step" case)

Activity 5

Activity 5 was attempted by MM01. However he did not give any comments on the Activity 5. Similar to what have been done to questions in Activity 3, all questions in Activity 5 were improvised based on comments from similar type of questions from different sets of activities.

Activity 6

Activity 6 was attempted by IA04 who is not familiar with Maple software but he is familiar with programming using other software such as MATLAB and Lab VIEW. He wrote his comments on the activity booklet (Table 5). Comments ICA6.1, ICA6.2 and ICA6.3 were considered in order to give clearer instructions to students in not only questions in Activity 6, but also in all set of activities. In this case, students are clearly guided to refer to the correct part in the manual. Comment ICA6.4 is also used to make the presentation of information more organized and systematic.

Table 5: Lecturers' Comments on Activity 6

Code	Lecturer's code	Activity Number	Comments
ICA6.1	IA04	6.1: Question 1 Exploring Various Types of Graphs	Write: Note: Refer to MaLT – IC Part 4 Manual. Highlight the student to refer the most main part in MaLT – IC manual. In every unit (exercise). Let them refresh/explore by themselves.
ICA6.2	IA04	6.2:	Write: Note: Refer to MaLT – IC Part 4 Manual.

		Area between Curves	Highlight the student to refer the most main part in MaLT – IC manual. In every unit (exercise0. Let them refresh/explore by themselves.
ICA6.3	IA04	6.3: Volume of Solid of Revolution	Note: Part 5.
ICA6.4	IA04	Learning Objectives	At the end of the tutorial session, the student is able to : (1) – (3) Rewrite the paragraph to point form: -Activity 6.1 -Activity 6.2 -Activity 6.3

Manual

The comments given by the lecturers are listed in Table 6. Two lecturers (MATH02 and IA02) suggested that a page to list down table of contents should be included. This suggestion is considered to modify the manual developed. Three lecturers (MATH02, IA01 and IA02) highlighted the importance of a clear explanation in order to distinguish between "Document mode" with "Worksheet mode" in Maple interface (comments ICM1, ICM2, ICM3, ICM7, ICM8 and ICM9). The improvement done is by adding more diagram in the explanations, adding a clearer explanation as suggested by MATH02 and IA02: "*Need to click on "File" first"* and adding a sequential flow of instruction: "*File → New → Document Mode"* and " *File → New → Document Mode"*. Nevertheless, the comment from IA01 to include hyperlink to these two modes cannot considered because students will only be given the hard copy of this manual but not the soft copy. MATH02 and IA02 suggested an additional of step; i.e. STEP 5 to ask students to press ENTER button as the last step. Thus in order to avoid confusion, they also suggested that the word "Enter" initially used in steps 1 and 3 be replaced with the word "Type".

Three lecturers commented on the logo in terms of its size and location. According to IA01, logo will "pin" readers to the icon thus he suggested putting the page number next to the logo. In ICM12, MATH01 suggested the researcher to include clear instructions on entering non-standard trigonometric functions in Maple document. This suggestion is used in the "Input and Output" section in Part 1 of the manual. Similarly, comments ICM15, ICM18, ICM19, ICM20 and ICM22 suggested additional instructions for saving file, clearing data, opening palettes instruction, entering symbols and defining symbols. All of the comments are used to improve the manual instructions. The comment from IA01 in ICM14 is similar to comment ICA1.8 in which it emphasized on giving counter-examples to build a deep understanding mindset amongst engineering technology students at the university. The comment will be put in the remark to warn students the importance of the instruction. Finally, suggestion from IA01 in comment ICM21 to promote students self-learning is also considered.

Table 6: Lecturers' Comments on Manual

Code	Lecturer's code	Manual Number	Comments
ICM1	MATH02 IA02	Part 1 Preface	Add TOC: →precise numbering, sub-topics i.e.: PART 1 1.1 1.2 1.3 PART 2 2.1 2.2 …
ICM2	MATH02 IA02	Part 1 Getting Started	Brief explanation on Document mode and Worksheet mode. Suggest to be part at page 5 (beginning)
ICM3	IA01	Part 1 Getting Started	Hyperlink to help on the difference between the two modes.
ICM4	MATH02 IA02	Part 1 Getting Started	Reduce size: the logo
ICM5	IA01	Part 1 Getting Started	This will pin the readers view to the icon. Pg x 0f x LOGO
ICM6	MM01	Part 1 Getting Started	Reposition the logo either to the left, right or bottom.

ICM7	MATH02 IA02	Part 1 Maple Environment: Document Mode	Let us start with blank Document Mode. *Need to click on "File" first.*
ICM8	MATH02 IA02	Part 1 Maple Environment: Document Mode	Suggest put the sequence: File → New → Document Mode
ICM9	MATH02 IA02	Part 1 Maple Environment: Worksheet Mode	Suggest put the sequence: File → New → Worksheet Mode
ICM10	MATH02 IA02	Part 1 Input and Output: Rational Expression	Replace the word Enter with Type
ICM11	MATH02 IA02	Part 1 Input and Output: Rational Expression	Add step 5: Press ENTER
ICM12	MATH01	Part 1 Input and Output: Powers	To include 'steps to enter derived trigonometric functions'
ICM13	IA01	Part 1 Input and Output: Powers	Do not type dot.
ICM14	IA01	Part 1 Input and Output: Products Case 2	Try to show without the cntrl key. There'll be an error. Importance of the cntrl=key.
ICM15	MATH02 IA02	Part 1	Give option to students: → instruction to save → instruction to clear screen
ICM16	MATH02 IA02	Part 1 Editing Expressions and Updating Output: To Edit One Computation	Examples? →put more detail instructions
ICM17	MATH02 IA02	Part 1 Editing Expressions and Updating Output: To Edit a Group of Computations	Suggest putting later at the intermediate or advancing level.
ICM18	MATH02 IA02	Part 1 Input Modes	Symbol: Such as √‾, ∫ , □
ICM19	MATH02 IA02	Part 1 Input Modes: Palette Input	4. Now, select default palettes 5. add info on palette "collapse" and "expand"
ICM20	MATH02 IA02	Part 1 Input Modes: Palette Input	→drag symbol √‾. →add example √‾
ICM21	IA01	Part 1 Input Modes: Palette Input	Try using the help system for student to learn independently.
ICM22	MATH02 IA02	Part 1 Input Modes: Symbol Names Input	√‾ sqrt ∫ …
ICM23	MM01	Part 1 Input Modes: Symbol Names Input	Short cut key in subtopic like…
ICM24	MATH02 IA02	Part 2 Entering Integration	Remove *int(f(x),x)* and *int(f(x), x=a...b)* in the output column.

Lesson Plan

There is only one lecturer giving comments on lesson plan. MATH01 suggested to add "*and to agree to a unanimous conclusion*" to the statement written in the first draft: "*Students are asked to discuss their findings*". Thus, the new statement reads as "*Students are asked to discuss their findings and to agree to a unanimous conclusion*". It is important for students to reach a conclusion in ensuring their understanding in the newly learnt topic. This is crucial as understanding confers flexibility in thought and action that help students to respond appropriately to novel events (Newton, 2001). During the discussions, not only explanations supported by mathematical reasons given by students but also their mistakes created opportunities to engage further with mathematical ideas. This promotes conceptual thinking which reflect mathematics as not merely doing activities, but also explanations (Kazemi, 1998). MATH01 also suggested that lecturer must do some reflections on students' answers to ensure the completion of all activities in the limited duration allocated for tutorial slots.

Table 7: Lecturers' Comments on Lesson Plan

Code	Lecturer's code	Lesson Plan Number	Comments
ICLP1	MATH01	1.7 Method of Instruction/Learning (3)	…and to agree to a unanimous conclusion.
ICLP2	MATH01	1.7 Method of Instruction/Learning	Self assess?? If a 'good' student is chosen → then the allocated time is sufficient. If a 'weak' student is chosen → then the 10 minutes may not be sufficient for him. This is because (a) He may not have fully grasped the concept of integration yet. (b) 'stage-fright' / inferiority complex. Suggestion: Lecturer reflects an answer sheet, writes down the answer and gets feedback from students.

CONCLUSION

Nine lecturers involved in evaluating the newly developed module. Their comments provide information upon which the researcher can make improvements to the module developed. Based on qualitative analysis, there are two major common inputs highlighted by the lecturers. Firstly, the importance of giving reflective questions after completion of each sub-category in the activities was highlighted by the lecturers. They emphasized that students need to be given some times to do a reflection on their Maple outputs. These reflective activities are able to trigger metacognitive awareness amongst the engineering technology mathematics. It is crucial for engineering technology students to be aware about their thinking skills as they use mathematics to make sense of the real life application in their related field. Secondly, some of the lecturers involved in this study agree that by giving counter-examples, mathematics lecturers are able to help students in mastering the newly learnt concept. Counter-examples may create cognitive conflict which can help students to understand areas of mathematics critically through discussing and correcting their mistakes. This is important to ensure the dynamic nature of the mathematics knowledge. Furthermore, it promotes conceptual thinking which reflect mathematics as not merely doing activities, but also explanations. These comments were used to produce a utility and meaningful manual, lesson plans and set of activities in teaching and learning this topic. Finally, the edited module will be used to enhance students' procedural and conceptual understanding in learning integral calculus at the university.

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NEOLIBERAL MECHANISATION OF EDUCATION

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BACKGROUND OF THE STUDY

When education is historically analyzed, it is mainly observed that educational change is generally driven by ideological or political forces. The main aim is imposition of state ideologies on millions, who are considered to be the future of a nation, for mental and social control. Another impact forcing educational change is the effect of technological change requiring capable and skilled labor force for the changing occupational structures (Hogan, 1979). It is a fact that the nature and functions of education cannot truly be understood apart from the matrix of economic life (Bowles & Gintis, 1976).

With the development of new technologies, mechanization and the need for skilled technical labor force began to gain significance in the early eighteenth and late nineteenth century. According to Bowles and Gintis, the major function of schooling is to socialize students into habits and personality traits appropriate for their later work life. Education was, then, seen as "a system to produce amenable and fragmented labor force (p.125). For Callahan (1962), "…the history of twentieth century education is … the history of imposition upon the schools of 'business values' and social relationships reflecting the pyramid of authority and privilege in the burgeoning capitalist system" (in Bowles & Gintis, 1976, p. 44). Education was based on the notion "different but equal" for all which was also adopted by John Dewey (1859-1952) and formulated as 'a common and equal opportunity for all' but later altered into 'a different but equal education for all' by the liberals (Bowles & Gintis, 1976). This was justified by democratic concerns based on the fact that every child will be going into different directions when their future occupational needs are concerned so why not "equip students with appropriate habits and skills necessary for their integration into different occupational structures" based on their skills and abilities (p.227). The schools, thus, were considered as institutions serving the market system which in turn served liberal capital economy.

Education, in this perspective, served as a system linking the supply and demand for talent and skill by selecting and sorting people on the basis of ability and achievement. This was mainly carried out with a pragmatist/experientialist perspective, stressing the fact that in order to be learned, things must be observed or experienced as real. However, the idea of real was contradictory to the Realist and Rationalist perspectives believing that reality is constantly changing and people learn best by applying experiences and thoughts to problem solving. Peirce (1839-1914) believed that thought must produce action, rather than linger in the mind and lead to indecisiveness. For Pragmatists education meant hands-on problem solving, experimenting, and projects often with students working in groups (cooperative learning). As opposed to pragmatist cooperative learning, existentialists stress the importance of individualism. For them, individual choice and individual standards, rather than external standards are central. People do not define themselves within a group but in relationship to existence by the choice they make. Thus, they should not accept anyone's predetermined philosophical system; rather, they must have a philosophy of existence of their own, focus on their freedom and make meaning for their own lives. Existentialists believe that the classroom should have the freedom of choice. Learners must take responsibility for their own learning and the classroom environment should provide a context in which the learner confronts others' views to clarify his own. Real answers and real solutions to problems come from within not from an outside authority.

Existentialist views on education led to individualized instruction/tailored teaching referring to instructional maneuvers attempting to tailor teaching and learning to a learner's unique strengths and needs (Cruickshank, et. al., 2008). Programmed and computer assisted instruction, and distance education are both outgrowths of individualized instruction. Both programmed and computer assisted instruction are self-instructional formats. Material to be learned is broken down into segments and when the student successfully completes one segment goes on to the next. If the program is sophisticated enough it can diagnose student's mistakes and gives individualized feedback. Thus the learner rather than communicating with the teacher interacts with the computer. Distance education, on the other hand, is a variation of individualized instruction serving learners who

cannot possibly access education in school environments. Such programs may include radio, television, computer programs supported by printed materials. But how effective is computerized education? Can it replace classroom teaching?

Nick Grant in the foreword of 'Neoliberalism and Education and its Consequences' (Hill & Kumar, 2009, pp. vii, viii) says that "The social delight in what a person is trying to say to another, and the dialogue it starts , should be the educationalist's starting point" . He goes on to say that this should be kept in mind when education is being considered for pupils from all over the world and from all kinds of different economical backgrounds. However, he says, much learning today is "far from being delightful, mostly mechanical, pointless, and disenchanting". There is great irresponsibility, and even exploitation in educational funds, administration and purpose. Educational materials are prepackaged and curricula are imposed. He calls this "edubusiness" and the people dealing with such programming and packaging "edupreneurs". This new learning process imposed on pupils is passive, away from creativity, "lacks dialogue and intimidates speculative learning and discovery". He argues that the connotations of the notions of creativity and internationalism are distorted and they exist in educational terminology as "necessary elements for global capitalist market competition, not universal hallmarks of humanity". Teachers are mainly concerned with "delivery" and learning becomes totally "instrumental". The delight is not in the dialogue between the learner and the teacher or for the sake of learning or for its social usefulness but in the "accumulation of credits". The delight of the 'learning package' producers comes from the profit made from the wide spread usage of the package. This inevitably creates a *Global Education Industry* producing pre-prepared and programmed digitally usable materials, depriving teaching and learning from the 'delight' of the warm and caring human voice and touch.

Hill (2003) argues that in education, especially in universities and higher vocational education "the language of education has been very widely replaced by the language of the market. The lecturers function as the 'deliverers of the product', they 'operationalize delivery', and 'facilitate clients' learning' within a system in which the motto is 'quality management and enhancement'; students are 'customers' who select 'modules' on a pick' n' mix basis', and critical thought is degraded and replaced by 'skill development'" (p.39).

Taking this new educational phenomenon around the world today as an outgrowth of neoliberal capitalism, this paper aims at examining how neoliberalism actually functions in universities and whether human instruction can actually be replaced by computerized instruction.

THEORETICAL BASIS FOR THE STUDY

In *A Brief History of Neo-liberalism* David Harvey (2011) describes neo-liberalism as "… a theory of political economic practices that proposes that human well being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets and free trade" (p.2). Harvey continues to say that the state functions as a body establishing an 'institutional framework' which safeguards these practices and moreover, sets up, where they lack, markets such as 'land, water, education, health care…' but refrains from intervention beyond this point. Following on the traditional idea that a state exists for the good of its citizens, and taking the above into consideration an understanding that neoliberalism becomes an ethic, a "social good … maximizing the reach and frequency of market transactions … seeking to bring all human action into the domain of the market" (p. 3), is deduced. This harbors the neoliberal conviction that human nature is competitive, rationalizing personal gain for benefit, hence, regarding the private as beneficial as opposed to the public which is considered bad. Clinging to this ethic, therefore, the economic rationality hinges on competition and the understanding of a non-interventionist but guardian state. For Harvey, "this requires technologies of information creation and capacities to accumulate, store, transfer, analyze and use massive data bases to guide decisions in the global market place (information society)" (p.3) creating a hegemony based on "manufactured consent" (Gramsci, 1891-1937; in Norton Anthology of Literary Criticism, 2001, p.1135).

One of the most appropriate sites for the creation of a neo-liberal hegemony are a plurality of institutions a part of what Louis Althusser (1971) refers to as Ideological State Apparatuses (ISA), which function extensively through ideology in clandestine ways, among which are political parties, churches, news papers, cultural ventures, and schools which are the most important for the purpose of the study. Such institutions, among which are primarily schools, are vessels that indoctrinate people with the dominant ideology, nowadays the neo-liberal ideology presented as values and principles paraded as equality, opportunity, welfare, and freedom. Clearly to be seen is the fact that neo-liberal profit oriented economic policies are driven hand-in-hand with educational policies as Bowles and Gintis (1976) also point out by arguing that schooling in capitalist America (and in general in countries pursuing neo-liberal policies) has two functions; "the reproduction of the labor power essential to the process of capital accumulation" and "the reproduction of the social relations of power"

(p.129). Bowles and Gintis identify the former function as the supply of students to meet the demand of future skilled workers possessing "technical and cognitive skills required for adequate job performance". They identify the latter function as "institutions and social relationships which facilitate the translation of labor into profits" (Hogan, 1979, p. 388). They claim that the education system justifies inequality by feigning to support an objective meritocratic system to delegate people to economic positions that are disparate. Through these function they conjoin educational and capitalist (neo-liberal) policies suggesting that schools as ISAs do better to indoctrinate than to impart objective knowledge and analytical skills (p.389).

This may seem contradictory particularly in the light of developments regarding the restructuring of the schooling system, especially in Western capitalist (neo-liberal) nations, spearheaded by the United States and the United Kingdom. In these countries, governments are clamping down on funds for public schools in favor of them being funded by private business organizations or corporations (Lipman, 2007). Glen Rikowski (2007) draws attention to this phenomenon that came to exist after being unleashed by the World Trade Organization (WTO) in 1994 as the General Agreement on Trade in Services (GATS), which he regards as having "a strange kind of social existence" (p.145). Rikowski considers the GATS as "the monster casting a shadow over state schools" (p.146). He also points out that GATS is to open up as many as 160 service sectors, including education, to international capital; a move, he says, regarded as 'irreversible' by Kelk and Worth (2002, in Rikowski, 2007, p. 151). Hence, under the diktat of international capitalist centers, governments become the guardians of neo-liberal ideologies and policies. In line with this argument, Hill (2003) invites one to look at the big picture:

> Markets in education, so-called 'parental choice' of a diverse range of schools (or, in parts of the globe, the 'choice' as to whether to send to children to school or not) privatization of schools and other education providers, cutting state subsidies to education and other public services are only a part of the educational and anti-public welfare strategy … (p.2).

Hill goes on to argue that both national and global neo-liberalism desire cuts in public funds, which he believes they have largely succeeded. However, he points out that besides saving tax on capital to increase profit, the capitalist/neo-liberal agenda consists of a series of plans 'for education', 'in education', and 'for educational businesses'. Plans for education concentrate on forming, as Bowles and Gintis (1976) also noted, labor power for business corporations, 'plans in education' concentrate on liberating business activities for profit in the field of education, and finally the plan 'for educational businesses' is to make profit from international privatizing activities (p.2). For all such neo-liberal strategies to unfold Hill recalls Kagarlitsky's (2001) words: "Globalization does not mean the impotence of the state, but the rejection by the state of its social functions" (p.5). Moreover, Hill extends the popular idea that a "strong Interventionist State" is needed by the Capital particularly in the field of education and training – in the field of producing an ideologically compliant but technically skilled work force (p. 8).

Therefore, in the light of the above ideas, schools, coupled with the media (Lipman, 2007) have transformed into institutions (ISAs) incorporating a hegemonic structure of neoliberal cultural/ideological domination. Regarding this hegemonic structure of domination, Shapiro (1984) notes that "active consent is ensured by including not only dominant social interests but also those of subordinate interests". Shapiro expounds this idea by saying that culture must be considered a totality "containing compromises and concessions by dominant groups", to a point where the nature of the (neoliberal) social structure still remains the key player. Drawing upon the emergent model in the United States, Shapiro, like Hill (2003), Bowles and Gintis (1976) and others, claims that "in the U.S., it is possible to distinguish, for example, the extent to which corporate interests have ensured an educational system that is strongly vocational, utilitarian, and professionally oriented" (p.29).

The picture is more or less the same within the European Union (EU). Hirtt (2011), talking about the situation that educational policies have come to be by bodies such as the OECD, WTO, the World Bank, and the European Commission, points out that "their priority in education is no longer the 'formatting' of citizens … but rather the preparation of producers and consumers for their role in the economy" (p. 213). Hirtt clearly states the fact that education or 'edubusinesses' in the hands of 'edupreneurs' has become a lucrative field in the service of international capital to be exploited for profit. However, this is not just a one-way street housing a '$ 2000 billion' world education market, but at the same time an operation to produce a skilled labor force for the economic market (p.217). To this effect, Hirtt states, alluding to the European Council (EC) meeting in Amsterdam in 1997 that the EC recommended "giving priority to the development of professional and social skills for a better adaptation of workers to the evolution of the labor market" (p. 219). Hirtt draws attention to the downgrading of general knowledge in favor of the new knowledge and adaptability skills in the face of constantly changing technologies and the consequent need to adapt. As can clearly be understood, the purpose

of education is rapidly becoming one to prepare students to conform to the neoliberal view of society in which they can be trained to compete in the international work force. Hirtt, also points to the fact that it has now become a common place with employers to ask for diplomas in information and communication technologies (ICT) based on a EC concept paper regarding the objectives of education: "It is the opinion of all Member States that the basic skills acquired by young people at the end of their education or professional training should be reviewed and broadened to include information and communication technologies" (EC, 2001, in Hirtt, 2011, p. 220). As a result, Hirtt states that schools are finding themselves under pressure to introduce more courses and course hours in computer studies.

Faced with decreasing funds, universities are, nevertheless, expected to raise their productivity and find sources of income either through the commodification of learning and/or knowledge, or through partnerships with businesses. One way of doing this is through the use of ICT by standardizing and packaging knowledge and making it available online. Levidow (2007) illustrates such an approach by exemplifying a practice undertaken by the University of California, Los Angeles in 1997 when the university "established an Instructional Enhancement Initiative that required computer Web sites for all its arts and sciences courses. Its aims were linked with a 'for profit business' for online courses, in partnership with high-tech companies" (p.245). Levidow continues to say that particularly in the U.S. (the EU followed suit shortly after) universities were adapted to suit profit making activities, among which was the commodification of all research undertaken by universities. As a means of income, research was foregrounded and teaching was given a secondary position. Levidow points out that these developments, in order to increase teaching efficiency, resulted in standardization of course materials and their posting on web pages which could be "merchandized to other universities" (p.246).

The route that educational strategies seem to be following are towards economics of education in which all institutions, particularly universities, become businesses and knowledge, as instructional material, becomes a commodity. For this to happen on a global scale, marketing strategies which rely on speed, availability and standardization are necessary elements which can only be provided through the use of technology, namely ICT. The use of ICT in higher educational institutions (to deliver the commodity) takes the form of varieties of online education programs at different degree levels, online instruction, material and interaction supply and opportunities for distance education. In the dichotomy between teacher-student and computer-student or the real world education and virtual education, it seems that it is the student who loses, evident in what Levidow says, "this approach changes the role of the students, who become consumers of instructional commodities. Student-teacher relationships are reified as relationships between consumers and providers of things. This marginalizes any learning partnership between them as people" (p.246). The implication of what Levidow asserts is superficial learning in which knowledge is transmitted without critical perspective in a wholly mechanistic manner.

METHODOLOGY

The study is a qualitative study since it takes reality as a subjective human experience happening in a social context, and in historical time (Thorne, 2000). It mainly employs methods of qualitative research to uncover what academicians think and feel about neoliberal approaches to education and computerized teaching and distance education. The validity of the data collected is mainly connected with theoretical knowledge and judgments are made on the grounds of the findings from relevant studies.

Because to the inductive reasoning process involved in the study, it employs a semi-structured interview format with open ended questions to academicians concerning effects of neoliberalism on education and effectiveness of computer programmed or various forms of computerized distance education on student- teacher interaction. It also makes use of the grounded theory method of qualitative research since a variety of resources such as review of records and interviews are used. As this method operates in a reverse fashion; rather than beginning with a hypothesis, data will be collected, key points will be marked and from the concepts and categories collected a hypothesis related to the study will be created.

Sample

The sample used in this study is rather small. The academicians involved in the study are mainly faculty members from Faculties of Arts and Sciences in North Cyprus. For the purpose of the study, a semi structured group interview was held, during the interview notes were taken, the interview was recorded, recordings were transcribed, related parts for the study were selected and data was analyzed into main topics.

Data Analysis

The study applied a truly analytical process because it approached the phenomenon of neoliberalist education and computerization of instruction from a subjective point of view of the researchers as to what might count as

relevant or important during data analysis for the purpose of the study. Data analysis did not make use of any computer programs to analyze data since such programs are not capable of intellectually conceptualizing and transforming data into meaningful findings. The study rather employed human intellect through explicit steps in analyzing and conceptually interpreting the data set as a whole, to transform the raw data into a new and coherent depiction of the phenomenon.

Data collected from the review of texts and documents previously written on the phenomenon was carefully read to be fully understood and correctly interpreted and the data collected from the interviews in the form of recordings and transcripts was carefully sorted, organized, conceptualized, refined and interpreted so that findings could be evolved and constructed clearly.

The study has a phenomenological approach because it is oriented towards the depth and detail gained through exhaustive, systematic and reflective study of what theoreticians write and what academicians say based on their experiences. The study mainly makes a comparative analysis of teaching-learning experiences through human interaction and computerized instruction. Cognitive processes involved for the analysis of data can mainly be listed as comprehension of the phenomenon under study; synthesis of the relations and linkages within the aspects of the phenomenon; theorization of how and why these relations appear as they do; and recontextualization of the new knowledge. Thus, the data will be considered, examined, and reformulated as the research product.

The study will set an argument to be accepted or rejected based entirely on the experiences and beliefs of the reader. It will only try to put findings in a logical and explicit manner so that the critical reader will be able to see the relation between the actual data and the conclusions drawn.

FINDINGS AND DISCUSSION

During the semi-structured interview, two questions were posed as quoted below and the discussion evolved around these two basic questions asked to participating academicians:

"Our conviction is that market oriented neoliberal policies have not left the education sector untouched, as a result of which the commodified education in our day has begun to rely more on ICTs. Within this context what is your opinion of:

1. the impact of neoliberal policies on education; in particular on higher education?
2. the growing urge to use ICTs to facilitate computerized online instruction to be a substitute for human instruction?

The responses concerning the first question were categorized into three main topics based on the discussion that took place during the semi-structured interview: shift towards commercialization of education; related to this, an abandonment of traditional ways in favor of utilizing the web or the virtual environment; and the pressure put on universities for competition and survival in turn affecting faculty.

Commenting on the direction taken by universities under neoliberal policies, it was noted that the university felt the need to open new departments based on training rather than education to meet market demands by preparing students for newly emerging job positions at the expense of the closure of programs within the social sciences and humanities. Instrumental in such a move was the decision taken by the Higher Education Board of Turkey (YÖK) to delegate the training of teachers to the Faculties of Education rather than prospective teachers being educated at related disciplines in Arts and Sciences Faculties and being certified with a pedagogical certificate. This meant a loss of blood for the faculties of Arts and Sciences and even closing down of some departments. Also noted by the participants was the fact that derivatives of management courses such as tourism management, hotel management, hospital management, etc. to cater for industry and the service sector needs were devised and opened. This conforms to the complaints and the general critique voiced by academicians, educators and the critics in the West of neoliberal policies pursued in the field of education. One of the foremost critics of such neoliberal policies of education, writer and teacher educator Dave Hill (2011) states. "across the globe and more so in the newly liberalized economies … there is a trend towards looking down upon social sciences on the grounds that they do not produce an employable population. The mantra is of job-oriented courses, which is reflected when many universities and colleges transform their history courses into travel and tourism courses" (p. 18).

Another issue voiced by the participating academicians was the constant urge to go online within the context of advertising the university. Among the new promotion criteria for faculty introduced by the universities require

individual lecturers and academicians to make their course material available online, conduct correspondence with their students, assign papers and projects and check work produced by students online. The Web-o-metrics has become an important tool for defining the place of the university within the league of world universities, thus opening new programs within the framework of distance education has been interpreted as steps towards commercialization as addressed within the body of the paper.

Almost by all participants it was noted that universities in Turkey and in North Cyprus have more than ever before in their history been subjected to pressure to step up competition with the aim of attracting and recruiting students both at the undergraduate and the graduate levels. These observations, of course, pertain to private universities and universities run by foundations which receive little or no state funding. The nationwide competitiveness among universities initiated by the Higher Education Board of Turkey (YÖK) has particularly affected universities in North Cyprus in terms of student enrollment. This resulted from the establishment of numerous private higher education institutes in Turkey due to the neoliberal perspectives to education viewing it as lucrative business. Therefore, with this new conjecture private universities in North Cyprus try their best to recruit students and establish partnerships with business because they generate income solely from student tuitions and marketable research. These moves seem to be ushering in the neoliberalization of education within this geography. A move initiated almost two decades ago in Western capitalist nations, the U.K. model seems to have set a precedent. Levidow (2007) referring to the U.K. speaks of a strikingly similar picture: "The government has pressed for a substantial increase in student numbers, while providing little increase in funds. Under pressure from the Research Assessment Exercise, many university departments have shifted resources from teaching to research, while seeking more research funds from industry" (p.248)..

The discussion evolving around the second question mainly centered on the reproductive nature of transmission and reception of information/knowledge and exposition of knowledge through an encouraging and motivating medium both for the learner and the instructor (which could only be achieved through human interaction). It also clarified that computerized teaching disregards student diversity in background and learning styles and that it eliminates different teaching styles and adaptability and flexibility of teachers in a real classroom setting since it is a prepackaged program.

Participant 1: "I do not believe that computerized instruction can fully develop reproductive knowledge. Full understanding of knowledge, learning something completely new can be achieved through explanations, exemplifications, elaborations and discussions which need the assistance of a teacher who could be considered as the facilitator".

Participant 2: "The students might not have difficulty understanding the material, but they seem to have difficulty in solving everyday problems or applying ideas and knowledge to other related concepts which is killing interdisciplinarity".

Participant 3: "When students do not understand, the program allows them to revise the content, which they might not have the opportunity to do in a real classroom, however, it requires a lot of time to initially explore and understand the system and how it works. This requires a sound computer literacy".

Karal, Çebi & Turgut also make a reference to the same issue by saying: "Communication complexity exists because the device, the infrastructure, the support and faculty development have all to coinside…" (p. 272).

Participant 4: "We are only looking at the issue from the students' perspectives. How about the nature of the course and the teaching style of the instructor? The organization and presentation of material depends on the nature of the course within a discipline and the teaching philosophy and methodology preferences of the instructor. However, online packages are generally prepared by ICT companies working in collaboration with universities. Such companies which are mainly oriented towards business and profit are provided with the content but the organization, design and animation required by the course is constructed by technicians who lack pedagogical knowledge and the job satisfaction and inspiration a teacher gets from teaching, so the material becomes mechanical and dull".

Participant 2: "This brings to my mind that human beings are social creatures. They need to interact with each other which is a true learning experience because people learn from each other. When we talk about university students, we should not forget that online education deprives young adults from the social interaction which they most certainly need because social interaction provides them with the opportunity of intellectual intimacy for their social and academic self-concept development".

Participant 3: "I believe it (online instruction) also kills the motivation of the instructors on the other end of the line since they are deprived of the lively intellectual discussion accompanied with emotions, gestures and jokes".

Participant 1: "It (online instruction) simply teaches preprogrammed interaction patterns with a machine. It does not take into consideration how attitudes, emotions and interpersonal skills are acquired and how these might help to develop the social and emotional intelligence of a person. This simply means that a person acquiring new skills does not need to acquire these because s/he is not expected to have interpersonal relations at his/her future work place. Probably the less interaction means the more work".

Even though the data is small due to the small number of participants taking part in the study, it nevertheless, gives suggestions sufficient to generate an understanding of how academicians working in the field of social sciences view online education/instruction. More significantly, a very large proportion of the responses are aligned with what has been said and discussed by both academicians and critics within the body of the paper. It is a fact that online education poses a communication barrier between the instructor and the learner (İşman, Dabaj, Altınay & Altınay, 2003, 2004: Bozkaya & Aydın, 2007). There has been extensive work to conceptualize and understand social interactions and constructs within a classroom, where there has been little work concerning the social, attitudinal and cognitive results of subject-specific online instruction. This means that time is an important element to be able to see how the packaged instructional programs and online education in general will affect the society as a whole.

CONCLUSIONS AND RECOMMENDATIONS

Neoliberalism, if considered along the lines Harvey (2011) describes it be as discussed earlier, seeks "to bring all human action into the domain of the market … within an institutional framework" (p. 3, 2). It was already indicated earlier that this move towards the marketization of society brought along a new ethic expressing competitiveness personal benefit and private ownership. For this ethic to become established, Harvey draws attention to the requirement of technologies of information creation and the building up of related technologies of collecting, storing, analyzing and transferring information through massive data bases, in other words a move towards what is commonly regarded as information society, which becomes central to the neoliberal project (Levidow, 2007). Levidow also draws attention to the centrality and vitality of an information society, arguing that "the management, quality and speed of information become essential for economic competitiveness" (p. 239). He also adds that the whole 'social project' depends on highly skilled labor, achievable only through the use of ICTs for an increased productivity and the provision of new services.

The above ideas, commonly voiced by writers and critics of neoliberal policies on education, shed light as to the route taken by educational institutions, in particular by universities which are considered to be the sources of more sophisticated and skill based knowledge, to employ and rely more heavily on ICTs. It is not, therefore, surprising that universities are compelled to make curriculum changes and standardize course materials rendering them to knowledge which can easily be digested without much debate and argumentation which in turn fosters critical reflection. Consequently, academicians are compelled to go on line, produce and present e-materials, e-communicate with their students, and offer online courses. Distance education programs are also offered within this framework. While treating the student as a satisfied customer, the main aim is to produce a competent individual furnished with the necessary skills to be a part of the qualified labor force required by the business world.

Arguments put forward by academicians participating in this study has shown that instruction in virtual environments hinders the reproductive nature of passing on and taking in information/knowledge, the emotive and intellectual exchange between the instructor and the student, does away with the instrumental elements of education such as humanly contact, expression of feelings through eye contact, gestures and mimics, and joking while learning in a delightful environment based on sharing. Learning in a virtual environment is being in contact with someone that one does not see and come to know as a person leading to indifference, which in turn will create individuality. Indifference may kill motivation of participating and sharing with others in a society. There is a motivation difference between motivation to learn through sharing and a motivation to benefit through profit.

Producers of digitally available/online materials seem also to be aware of the drawbacks of such systems as Chao, Hwu & Chang (2011) draw attention to work undertaken to develop a system that may minimize these drawback by building an "online learning framework" (p. 318) to allow knowledge sharing through organized interaction. They argue that some of the interaction patterns are not identified and included in their study because the relationships during interaction is complicated and are not truly possible to account for in a virtual

environment. Aware of the lack of a social environment Jou, Chuang, & Wu tried to create interactive web-based environments to scaffold creative reasoning and meaningful learning. They stress the importance of project based learning for interdisciplinary learning and discuss that the web-environment should provide a basis for creativity and project design. There seems to be many problems to be overcome when interaction, creativity, and critical thinking is concerned. On the other hand, all work undertaken to overcome these problems which have arisen when the human element (teacher-student interaction involving affective and cognitive factors) is taken out indicates the downsides of the mechanical path education seems to have taken.

Universities today, based on neoliberal ideology are turned into institutions producing a labor force with specific professional skills and equipped with the necessary flexibility skills to be able to adapt to the changing needs of the business world. The concerns of this new work force are economical rather than social. The connection between universities and society is being replaced by the connection between universities and businesses. University graduates are trained to view the world as a competitive market place and focus on profit rather than the good of the society. Individuality is replacing collectivity, and competition is taking the place of creativity and critical thinking. The ideas of critical thinking and interdisciplinarity that were the arguments peaking in the late 20th century is replaced by one area focused, skill based training. ICTs which are said to be connecting the world are actually separating and disconnecting people from each other and from their environment.

As it was stated earlier there is enormous research and study to conceptualize and understand social interactions and constructs within a classroom and their consequences on students' self-concept, self-esteem, and social relationships. However, there has been little work concerning the individual, social, attitudinal and cognitive results of online instruction serving neoliberal aims and objectives. This means that (a long) time is an important element to be able to see how the packaged instructional programs and online education in general will affect the society as a whole in the future.

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OPTIMIZING T-LEARNING COURSE SCHEDULING BASED ON GENETIC ALGORITHM IN BENEFIT-ORIENTED DATA BROADCAST ENVIRONMENTS

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ABSTRACT
Ubiquitous learning receives much attention in these few years due to its wide spectrum of applications, such as the T-learning application. The learner can use mobile devices to watch the digital TV based course content, and thus, the T-learning provides the ubiquitous learning environment. However, in real-world data broadcast environments, the mobile learners are unable to continuously watch a digital course for a long time, because the power of devices and the user patient constrain available learning time. In this paper, we design an optimal watching mode for data broadcast T-learning environment, such that the learner can retrieve as many distinct courses as possible within given time. We then optimize the watching mode by using the genetic algorithm in order to reduce the computation cost of the optimization. Our experimental results show that genetic optimization process indeed reduces the computation cost, and still lead to a near optimal watching mode.

1. INTRODUCTION

Recent advance in digital communication technologies and wireless communication devices have led to a vast and expeditious development in e-learning applications, such as M-learning (mobile learning) (Massey, 1999), T-learning (TV-based interactive learning) (Aarreniemi-Jokipelto, 2004; Aarreniemi-Jokipelto, 2005). The learner can use mobile devices (e.g., 3G mobile phones) to watch the digital TV based course content, and thus, the T-learning is extended to be an efficient ways to solve the learning system scalability and the bandwidth limitations problem in ubiquitous learning environment. Digital TV channels are now based on the wireless data broadcast technique (Zheng, 2005), whose advantage is that the server can broadcast information to numerous clients (Atzori, 1997). This way of exploiting broadcast to disseminate information is particularly applicable to the T-learning system, since in many teaching experiences, many learners need same course content. Thus, the T-learning with data broadcast techniques would greatly reduce the bandwidth cost of the e-learning applications. In the rest of this paper, we study T-learning under data broadcast environments.

In the T-learning system, the system broadcasts the course content according to the broadcast program. In the broadcast program generation, *Broadcast Disks* algorithm is a well-known and widely discussed approach (Acharya, 1995) in the last decade. The main idea is to broadcast the data of the high access probability more frequently than those of the low access probability so that users would spend less expected time on average to access their required data.

Study on the design of the broadcast program, and its variants are numerous and successful (Hwang, 2001; Triantafillou, 2001; Vaidya, 1995). However, they simply assume that users would continuously listen to the broadcast for a long enough period to receive the needed information. But, the learner is only allowed to listen to the broadcast for limited period due to following two reasons. First, the mobile user is unable to for obtaining a period of learning in a real environment. For example, a learner watches the teaching curriculum to learn English for a short period before work. Second, a mobile device could be unable to continuously retrieving the digital TV for a long time due to the limited battery life of mobile devices (Chen, 2002). Hence, a learner cannot continuously watch the digital TV in a T-learning environment.

In the T-learning environment, an efficient watching mode should “wait” for some time slots (i.e., go into doze mode) after receiving different hot and distinct courses. Hence, the watching mode of the learner includes two

phases: (i) watching time phase, and (ii) rest time phase. The watching time phase uses the active mode for a period to watch digital courses, the rest time phase uses the doze mode for a period to stop watched digital courses. The watching mode allows learners switch between the doze mode and the active mode to intelligently retrieve courses in order to save learning time or avoid increasing the battery consumption in watching digital TV. However, determining how long a learner should wait if without the knowledge of the broadcast program structure is difficult and complex. On one hand, a learner does not wish to miss a hot course while he/she is in the doze mode. On the other hand, the learner is not happy to receive the same hot course in the active periods. Therefore, scheduling the precious watching time to receive the hot courses is a critical issue to be resolved.

In this paper, our first contribution is to provide a data retrieval method for broadcast-based T-learning environment by employing our recently designed technique, *benefit-oriented data broadcasting technique* (Lin, 2008). In such environments, learners can obtain the watching mode with greatest benefit from a broadcast index, even when the learner is unaware of the broadcast program structure. In our design, the T-learning system would inform the learner the best combination of watching mode (W_t, R_t) according to learner's the start time (S_t) and the total learning time (T), where W_t is watching time and R_t is rest time. In the case that a learner follow the best watching rule to retrieve the broadcast program, the learner can watch the T-learning courses with the most beneficial manner. To properly resolve this problem, we will first define the concept of benefit from the learner's viewpoint so as to measure how good a combination (W_t, R_t) is to the learner. The combination (W_t, R_t) with greatest benefit is the one that the broadcast server would send to learners.

An intuitive approach to find the optimal (W_t, R_t) pair is to test all possible (W_t, R_t) combinations, where $1 \le W_t$, $R_t \le T$. However, the computation cost for achieving the optimal benefit could be enormously high. Our second contribution in this paper is to optimize (W_t, R_t) by using a genetic algorithm (GA) process (Holland, 1975). The genetic algorithm has been proven as one of the most applicable solution to the problem of permutations and combinations (Davis, 1985; Ozdamar, 1997; Hou, 1994). In this paper, we design a highly efficient genetic algorithm that dramatically reduce the computation cost and still lead to a near optimal (W_t, R_t) combination. We then conduct a set of experiments to show the performance of the genetic algorithm. Our experimental results show that the GA-based optimization indeed obtains a near optimal benefit with low computation cost.

The remaining sections of this paper are organized as follows. Section 2 introduces the system model on the T-learning technologies. In Section 3, we describe the parameter and formulate our problem. Section 4 presents our proposed genetic algorithm. Then, Section 5 shows the experiment results. Finally, we conclude the paper in Section 6.

2. BROADCAST-BASED LEARNING ARCHITECTURE

Figure 1 depicts the Digital-TV broadcast-based learning architecture for T-learning applications. The Digital-TV broadcast system includes five components: (1) broadcast content generator, (2) broadcast program generator, (3) watching mode indicator generator, (4) course broadcast, (5) course retrieval, which are presented in details as follows.

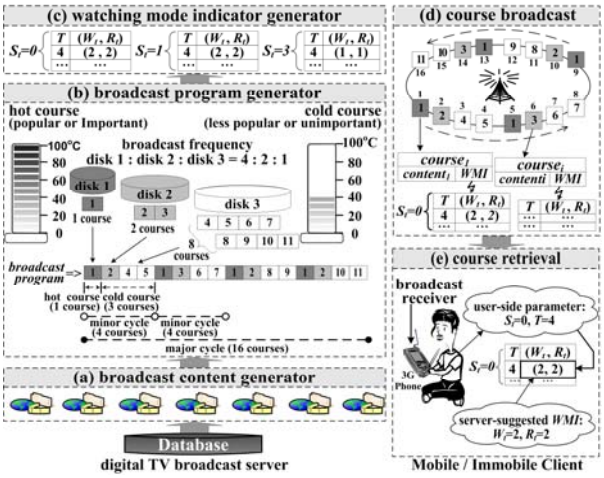


Figure 1. Broadcast-based learning architecture.

The *broadcast content generator* is used to generate broadcast contents to satisfy user demands, as shown in Figure 1(a). In real-world, a server is impossible to broadcasts all contents to users, due to too many different

demands from users. Thus, the broadcast contents that satisfy each user only include the most applicable data (e.g., hot courses) to the broadcast applications (Imielinski, 1994). The *broadcast program generator*, shown in Figure 1(b), is used to generate broadcast program for the broadcast data (Acharya, 1995). The broadcast program determines the broadcast sequence and the frequency of the broadcast content. The *watching mode indicator generator* is designed to generate the best combination of watching mode (W_t, R_t) based on the start time (S_t) of the learner and the total learning time (T) of the learner. Figure 1(c) illustrates an example of the watching mode indicate. If the S_t=1 and the T=4, the learner uses the watching mode (W_t=2, R_t=2) to watch the broadcasting courses.

When the above-mentioned procedures have been completed, the digital-TV broadcast system broadcasts the course information, as shown in Figure 1(d), via wireless networks or wired networks, such as satellite, cable, or terrestrial transmitters, etc (Atzori, 1997). While course information is broadcast, the user can retrieve the course information through mobile devices (e.g., 3G phone, PDA), as shown in Figure 1(e). In order to increase receive information efficiency, many proposed methods achieve the high-performance data retrieval based on cache or prefetch techniques (Zheng, 2002).

3. PROBLEM STATEMENT

3.1. Terminologies

The parameters of the digital-TV broadcast system include *NumDisks*, $DiskSize_i$, and $DiskFreq_i$. We define the *NumDisks* as the number of disks in the broadcast model. The $DiskSize_i$ is defined as the number of courses in a disk. The $DiskFreq_i$ is defined as broadcast frequency ratio of each broadcast disk in a broadcast disk program. For example, in Figure 1(b), *NumDisks*=3, $DiskSize_2$=2, and $DiskFreq_2$=2.

The parameters of the T-learning learner include S_t, W_t, R_t, and T. S_t is defined as the learner starts to watch the digital course at time stamp S_t. W_t is defined as the time interval that the learner watched the digital-TV, and R_t is defined as the time interval that the learner stopped watching digital-TV. The overall watch and rest time of all iterations from start time S_t to the total learning time, is denoted as T (i.e., $T = \sum W_t + \sum R_t$). $(W_t, R_t)^{opt}$, named an *optimal watching mode*, has the valuable information that suggests the learner an optimal watching mode to watch courses. Using the optimal watching mode, a learner is able to retrieve the hot courses with the least time consumption.

In our design, each broadcast course has two kinds of information: one is the content of the course, the other is a small table, *watching mode indicator (WMI)*, as shown in Figure 1(d). The *WMI* is composed of two attributes: one is the total learning time T; the other is the corresponding optimal access mode expressed in the form of a pair $(W_t, R_t)^{opt}$ according to different S_t. In this example, a learner has 4 units of time (i.e., T = 4) to receive the broadcast data and now receive the first course is the $course_1$ (i.e., the S_t =0) in the program. From the downloaded course, the *WMI* suggests that (2, 2) is the best watching mode for T=4. So, for the rest of the 4 time slots the learner will achieve the greatest benefit if it receives data for the next 2 time slots and then sleep for the next 2 time slots.

3.2. Terminologies

From the learner's view point, the greatest benefit is to acquire the most valuable course from a T-learning system with the least amount of time, no matter at what time instant the learner starts to listen and the total learning time. Hence, we formally define our problem as follows.

Problem formulation:

Given a frequency-based broadcast program B, learner's total learning time T and start time S_t.
Find the $(W_t, R_t)^{opt}$ pair such that the *benefit* is maximal

In the formulated the problem, we observed two phenomenons. First, we observed the watch time affecting the *benefit*. Basically, the less watch time has the larger the *benefit*, because spending less time on watching course content means more energy is saved for future use. Second, we also observed broadcast frequency affects the *benefit*. This is because that the higher broadcast frequency represents the more popular course, and the more popular course contains the most applicable data (e.g., hot courses) to satisfy learners. As mentioned above, two observations are adopted to express the *benefit*.

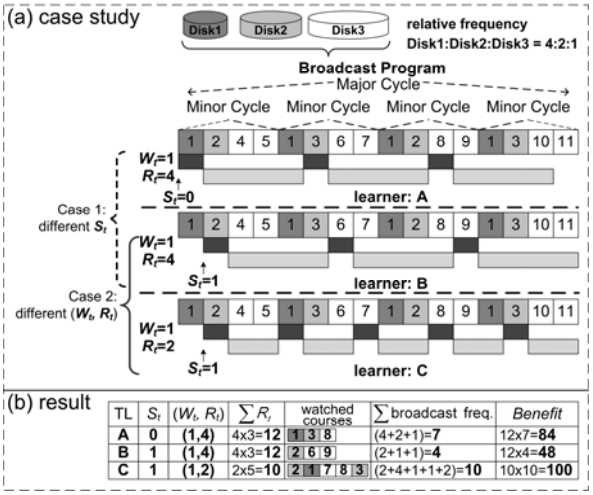
Observation 1: The greater the total rest time, the greater the benefit, i.e., *benefit* is proportional to total rest time. This is because the learner spends less watch time on watching the needed course.

Observation 2: The greater the importance of the retrieved distinct courses, the greater the *benefit*, i.e., *benefit* is proportional to the sum of the broadcast frequency of retrieved distinct courses.

Notice, we only consider the distinct courses in Observation 2 because a received duplicate course does not offer any new information. Hence, the importance of a retrieved course can be properly represented by its access frequency. Therefore, we formally define the assessment formula of the *benefit* as

benefit = (total rest time) × (sum of the frequency of watched distinct courses)

Figure 2 shows an example to illustrate the assessment formula of the *benefit*. In this example, we studied two cases. In Case 1, the learners (i.e., learner A and learner B in Figure 2(a)) watch Digital-TV at difference S_t, and they use the same watching mode to watch courses. In Case 2, the learners (i.e., learner B and learner C in Figure 2(a)) watch Digital-TV at the same S_t, and they use the different watch mode to watch courses.



TL	S_t	(W_t, R_t)	$\sum R_i$	watched courses	∑broadcast freq.	*Benefit*
A	0	(1,4)	4x3=**12**	1 3 8	(4+2+1)=**7**	12x7=**84**
B	1	(1,4)	4x3=**12**	2 6 9	(2+1+1)=**4**	12x4=**48**
C	1	(1,2)	2x5=**10**	2 1 7 8 3	(2+4+1+1+2)=**10**	10x10=**100**

Figure 2. An example for the assessment formula of the benefit.

By Case 1, two learners A and B have received the same *WMI* (W_t, R_t)=(1,4). Assume that S_t of A is 0 and S_t of B is 1, as shown in Figure 2(a). From the Figure 2(b), their benefits obtained under these two S_t's are 84 and 48, respectively, which quite a dramatic difference is caused by only one unit of difference in their S_t. By Case 2, two learners B and C start learning at the same S_t=1. Assume that *WMI* of B is (1,4) and *WMI* of C is (1,2), as shown in Figure 2(a). From the Figure 2(b), their benefits obtained under these two *WMI*'s are 48 and 100, respectively, which quite a dramatic difference is caused by only one unit of difference in their *WMI*. From the case study of the above, the *WMI* (1,4) of the learner B is changed to the *WMI* (1,2) of learner C in Case 2, then the benefit (48) of learner B would become the benefit (100) of learner C, a very significant increase. Hence, the *WMI* should be estimated by taking S_t into consideration.

An intuitive approach to find the *WMI* is to test all possible (W_t, R_t) combinations, where $1 \leq W_t, R_t \leq T$. However, the complexity of executing such algorithm is $O(T^2 \times NumDisks)$, too high a complexity to meet our need. In this paper, we will design a highly efficient genetic optimization process to resolve this problem, and the details are presented in Section 4.

4. GENETIC OPTIMIZATION PROCESS

Genetic Algorithms (GAs) (Srinivas, 1994) are heuristic search algorithms based on the natural selection and evolution. GAs is used to simulate processes in natural system necessary for evolution. They represent an intelligent exploitation of a random search within a defined search space to an optimization problem that evolves toward better solutions. The Figure 3 illustrates the GA flow chart for optimizing *WMI* in this paper. The flow chart includes eight steps, and is presented as follows.

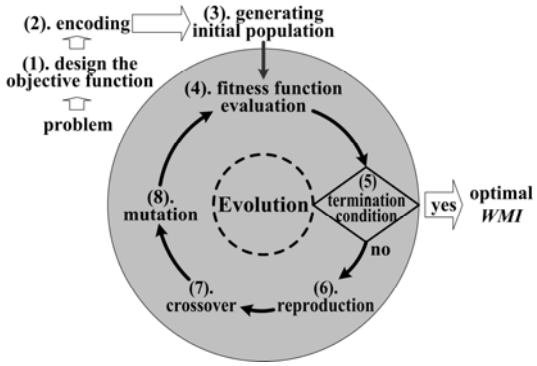


Figure 3. The GA flow chart for optimizing *WMI*.

Step1. Design the objective function
The purpose of the objective function is to determine the maximum/minimum optimization of problems under the specific conditions. Hence, we must analyze the problem and design the objective function based on the problem before implementation of GAs. In this paper, our objective function is to find out the maximum of *benefit* in Section 3.2.

Step2. Encoding
This step is to encode variables of the solution as a chromosome. The encoding methods can be classified as integer encoding, real number encoding, etc. In this paper, we use integer encoding to encode *WMI*. Due to the characteristics of the broadcasting environment, the watch time and rest time muse be the integer type. The Figure 4 illustrates an example of integer encoding in this paper. It has two variables W_t and R_t, respectively, and $1 \leq W_t$, $R_t \leq T$.

W_t	R_t
1	2

Figure 4. An example of integer encoding.

Step3. Generating initial population
Once a suitable representation has been decided upon for the individuals (i.e., chromosomes), it is necessary to create an initial population to serve as the starting point for GAs. In this paper, the initial population adopts uniform to create a random initial population with a uniform distribution.

Step4. Fitness function evaluation
In GAs, the fitness function evaluation is defined measures the suitability of individuals for the environment under consideration. In this paper, we design the fitness function based on the formula of the *benefit* (Section 3.2), and the fitness function is represented as follows.

Fitness function = (total rest time) × (sum of the frequency of distinct courses)

Step5. Termination condition
The GA process is repeated until a termination condition has been reached. In this paper, the termination condition is fixed number of generations, and thus Step 5 is to determine whether a conditions for termination. If the condition is satisfied termination condition, then GA outputs the optimal solution. Otherwise, the individual with higher fitness value will enter the next procedure.

Step6. Reproduction
The reproduction determines how the GA process creates children at each new generation. In this step, we use the frequently-used roulette wheel selection. The idea of roulette wheel selection simulates a roulette wheel with the area of each segment proportional to its expectation. The step uses a random number to select one of the sections with a probability equal to its area, and the selected probability of the individual k is shown in Eq. (1), where f_k is the fitness of the individual k.

$$p_k = f_k / \sum_{i=1}^{n} f_i \quad (1)$$

Step7. Crossover
The crossover is to create a new individual, which inherits features from both parents in certain way. The common crossover includes one-point crossover, two-point crossover, and uniform crossover, and in many

studies (Syswerda, 1989; Falkenauer, 1999), the uniform is the better way to crossover. Thus, we use the uniform to crossover in this paper. The implementation of uniform crossover can be divided into two substeps. First, the system uses the random binary to create a crossover vector. Second, the system selects the genes where the vector is a 1 from the first parent, and the genes where the vector is a 0 from the second parent, and combines the genes to form the child. Figure 5 shows an example for the uniform crossover. The first parent is (1,2), the second parent is (2,1), and the crossover vector is (1,0). After the uniform crossover, the child is (1,1), as show in the figure.

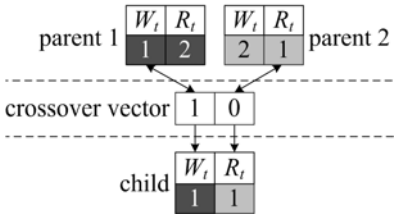


Figure 5. Illustration of uniform crossover.

Step8. Mutation

In the GA process, the mutation is to allow the algorithm to avoid local maximum/minimum by preventing the individuals become too similar to each other, thus evolution would not generate better descendants. The basic idea of mutation is to make small random changes in the individuals, which provide genetic diversity and enable GA to enlarge search space. Figure 6 illustrates an example of mutation. Assume that the second gene is the mutation point in this example. The mutation operator would set the gene to a random number with a predefined probability. After mutation, the second gene from 2 to became 5, as show in Figure 6.

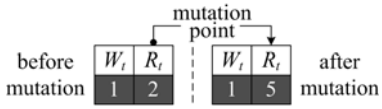


Figure 6. Illustration of mutation.

When the mutation has accomplished its process, which represents has accomplished an evolution process of a generation. Then, GA continues repeating Step 4~Step 8 for evolution of each generation until the termination condition is met. Finally, the system outputs the most fitness of the individual, and the result is the optimal *WMI*.

5. EXPERIMENT STUDY

After presenting the GA design, this section provides a detailed quantitative analysis to verify our proposed method. The system prototype designed for the experiment study is implemented by the genetic algorithm tool (GATOOL) of MATLAB (Genetic Algorithm and Direct Search Toolbox, 2008).

5.1. Experiment setup

Section 5.1 introduces parameter settings of the digital-TV broadcast system for our experiment study. The experimental digital-TV broadcast system has three broadcast disks, Disk 1, Disk 2, and Disk 3. The sizes of them are 1, 2, and 8 respectively, and the relative frequency is 4: 2: 1, as show in Table 1.

Table 1. Parameters and setting of the digital-TV broadcast system.

Parameter	Setting
NumDisks	3 (Disk 1,Disk 2, Disk 3)
$DiskSize_i$	Disk 1 = 1, Disk 2 = 2, Disk 3 = 8
$DiskFreq_i$	Disk 1 : Disk 2 : Disk 3 = 4 : 2 : 1

Table 2 depicts the parameters and setting of the learner for our experiment study. The parameters of the total learning time (T) are set to 4, 8, 16, and 32. The start time (S_t) are set based on the various popular degree of courses, it includes hot, medium, cold. These parameter settings are to simulate 12 scenarios for the behavior of learners, as show in Figure 7. Finally, the parameters and setting of the GA is shown in Table 3.

Table 2. Parameters and setting of the learner

Parameter	Setting
T	T=4,8,16,32
S_t	popular degree=Hot, medium, cold

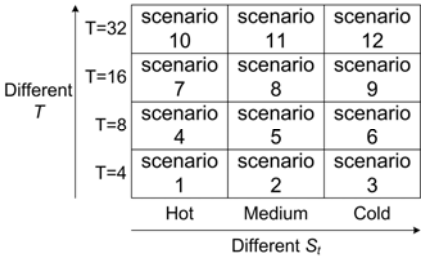


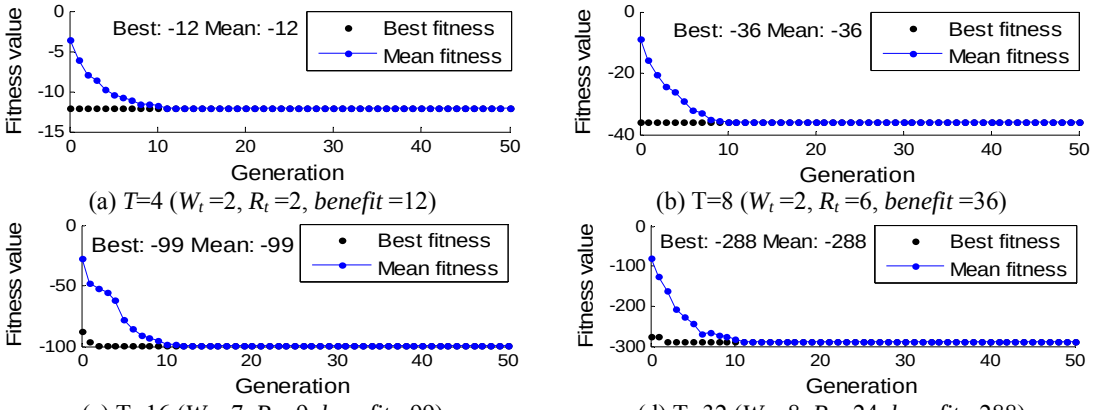
Figure 7. Categories of experiment scenarios.

Table 3. Parameters and setting of the GA (GATOOL).

Parameter	Setting
Population size	50
Generation	50
Selection function	Roulette
Crossover function	Scattered
Mutation function	Gaussian, Scale: 0, Shrink: 1.0

5.2. Scenario-based testing

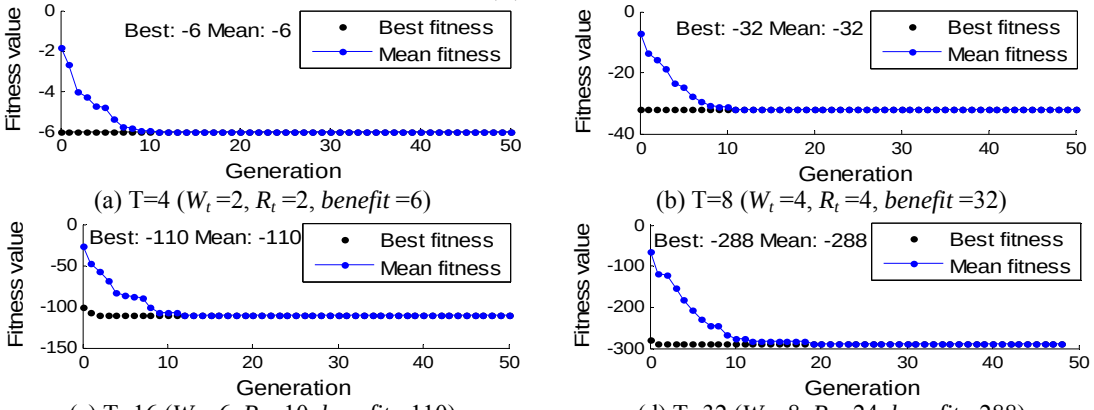
In order to evaluate the validity of GA for optimizing WMI, we design a set of scenario-based tests to observation the performance of the GA solution. Figure 8 illustrates the transformation of the individual's fitness on the evolution of each generation, and includes the WMI and benefit of each scenario. Form the result, GA obtains the WMI and benefit for each scenario after 10 iterations. Hence, GA can compute the WMI with high performance in the broadcast-based learning environment.



(a) T=4 (W_t =2, R_t =2, *benefit* =12) (b) T=8 (W_t =2, R_t =6, *benefit* =36)

(c) T=16 (W_t =7, R_t =9, *benefit* =99) (d) T=32 (W_t =8, R_t =24, *benefit* =288)

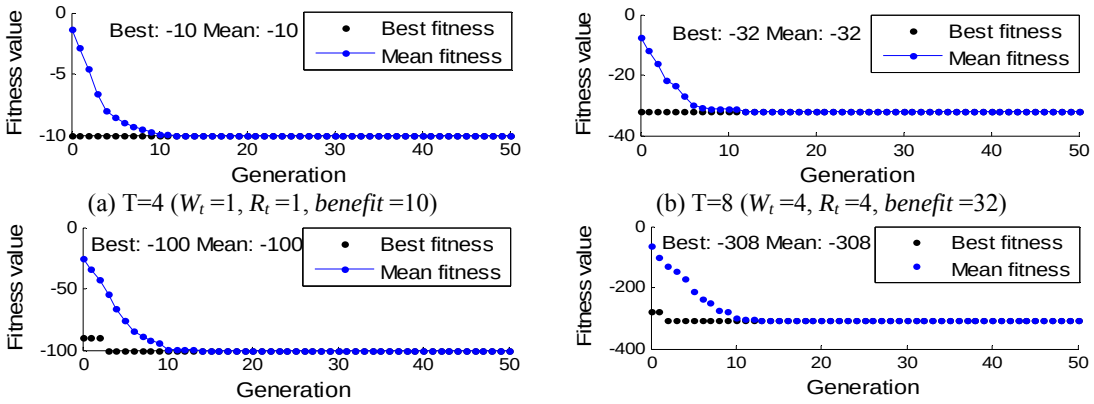
(A) S_t = hot



(a) T=4 (W_t =2, R_t =2, *benefit* =6) (b) T=8 (W_t =4, R_t =4, *benefit* =32)

(c) T=16 (W_t =6, R_t =10, *benefit* =110) (d) T=32 (W_t =8, R_t =24, *benefit* =288)

(B) S_t = medium



(a) T=4 (W_t =1, R_t =1, *benefit* =10)

(b) T=8 (W_t =4, R_t =4, *benefit* =32)

(c) T=16 (W_t =6, R_t =10, *benefit* =100)

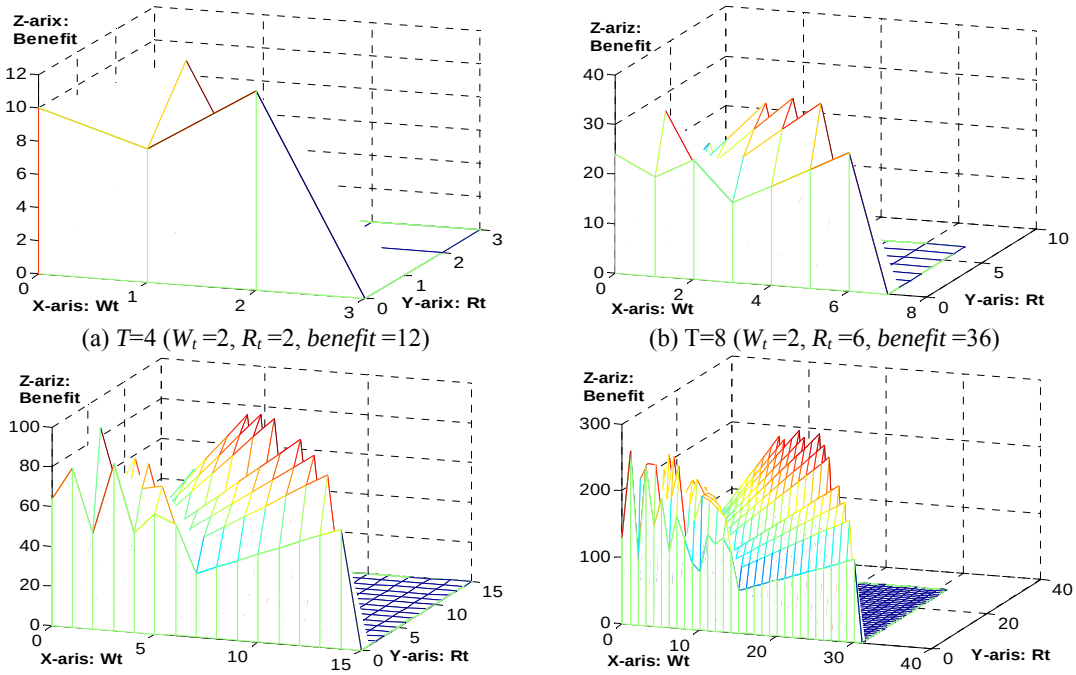
(d) T=32 (W_t =10, R_t =22, *benefit* =308)

(C) S_t = cold

Figure 8. *WMI* and *benefit* by using GA.

5.3. Scenario-based testing

In order to evaluate the accuracy of GAs on optimize *WMI*, our second experiment verifies the *WMI* generated from GA. The steps of this experiment can be divided into two substeps. First, we implement the enumeration approach which tests all possible (W_t, R_t) combinations to find the optimal (W_t, R_t) pair. Second, we compare the *benefit* of GA and the enumeration approach to verify the performance of GA. The Figure 9 shows the *WMI* and the *benefit* by using the enumeration approach. The results show that the computation cost of the enumeration approach increases as the increasing total learning time (T), but the enumeration approach ensure to find the optimal *WMI*.



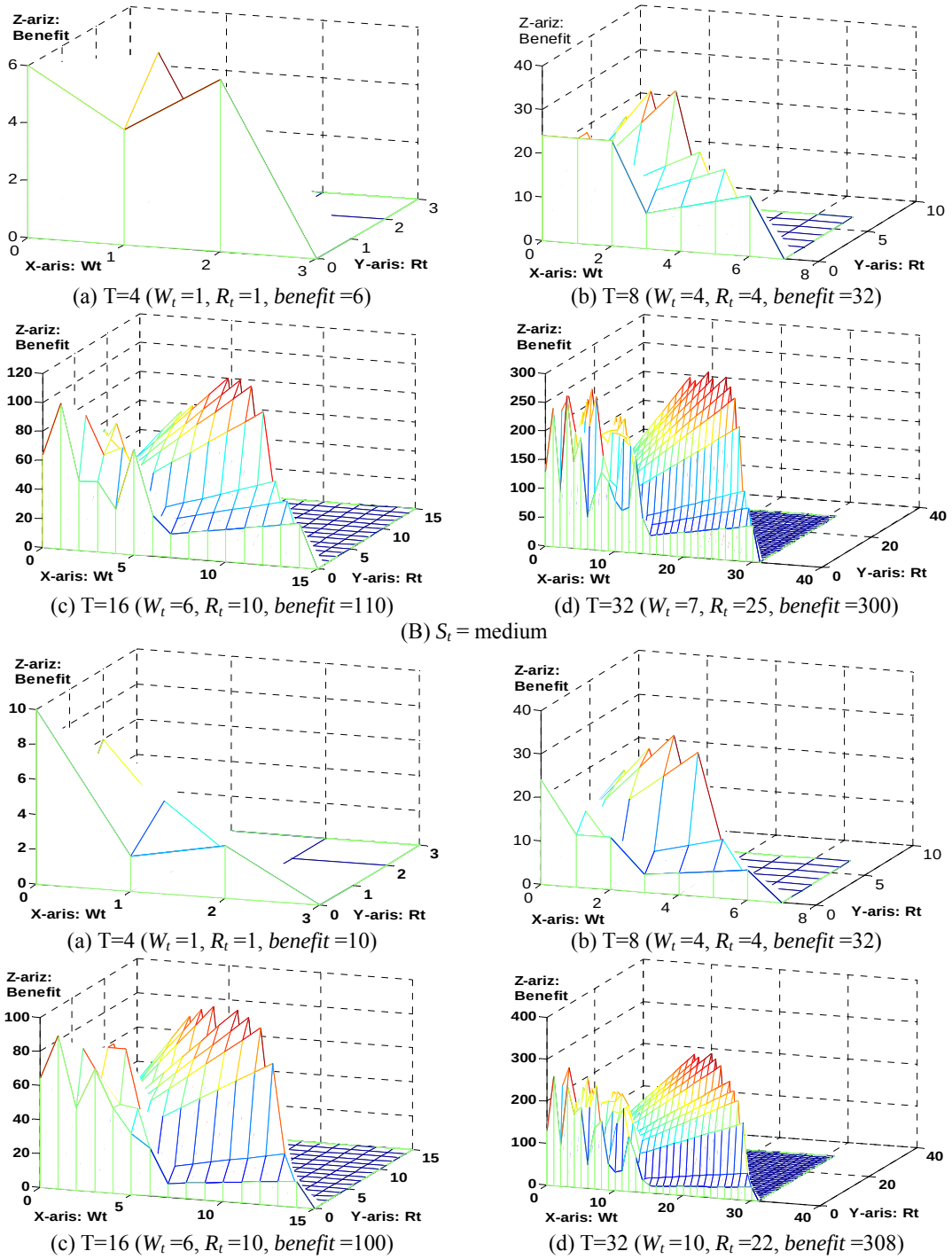
(a) T=4 (W_t =2, R_t =2, *benefit* =12)

(b) T=8 (W_t =2, R_t =6, *benefit* =36)

(c) T=16 (W_t =6, R_t =10, *benefit* =100)

(d) T=32 (W_t =8, R_t =24, *benefit* =288)

(A) S_t = hot



(a) T=4 (W_t =1, R_t =1, *benefit* =6)

(b) T=8 (W_t =4, R_t =4, *benefit* =32)

(c) T=16 (W_t =6, R_t =10, *benefit* =110)

(d) T=32 (W_t =7, R_t =25, *benefit* =300)

(B) S_t = medium

(a) T=4 (W_t =1, R_t =1, *benefit* =10)

(b) T=8 (W_t =4, R_t =4, *benefit* =32)

(c) T=16 (W_t =6, R_t =10, *benefit* =100)

(d) T=32 (W_t =10, R_t =22, *benefit* =308)

(C) S_t = cold

Figure 9. *WMI* and *benefit* by using the enumeration approach.

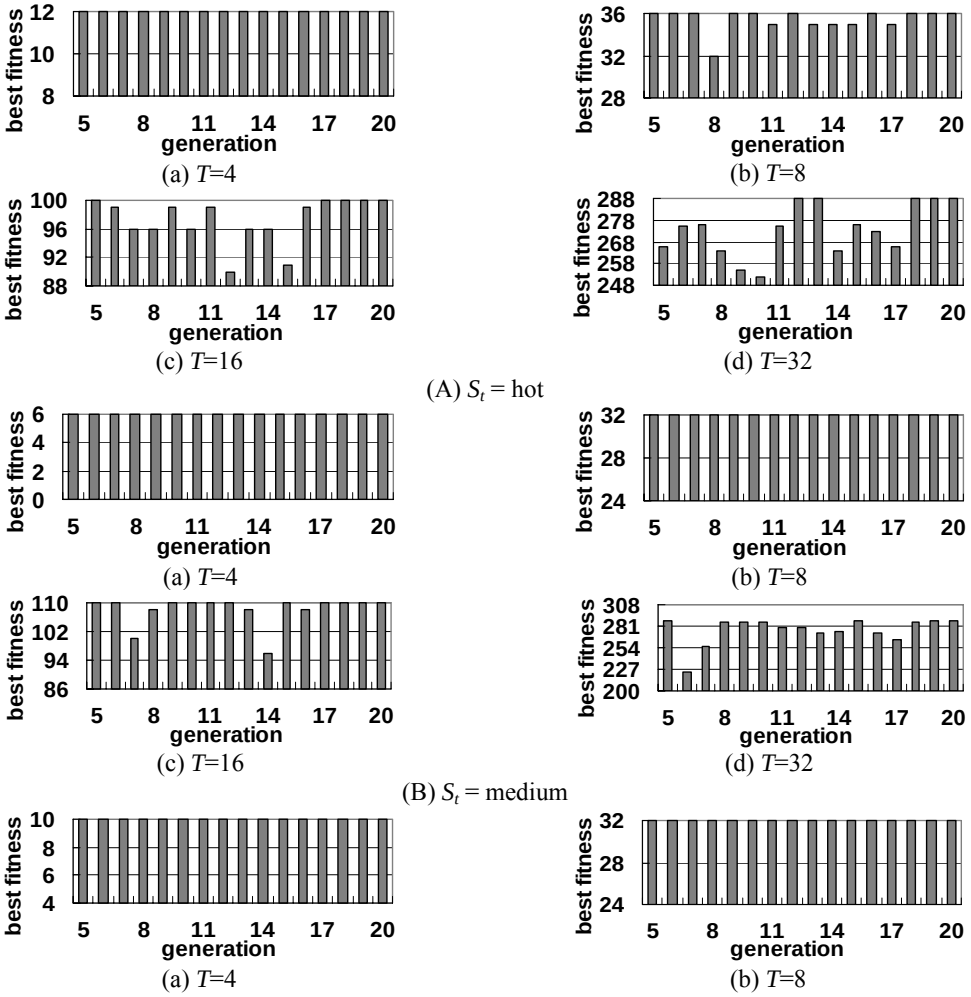
Table 4 shows the comparisons of the benefit on different methods. From the result, GA obtains almost the same results with the enumeration approach, the only two cases of GA ((S_t = hot, T=16), (S_t = medium, T=32)) did not achieve the optimal WMI. In other word, the correct rate of GA is 83%. In addition, we also observe that the difference of benefit between the GA approach and the enumeration approach for two cases ((S_t = hot, T=16), (S_t = medium, T=32)) is only less than 5%. Thus, the GA approach is quite efficient for computing WMI.

Table 4. Comparisons of the benefit on different methods

		GA	Enumeration
S_t = hot	T=4	*benefit* =12	*benefit* =12
	T=8	*benefit* =36	*benefit* =36
	T=16	***benefit* =99**	***benefit* =100**
	T=32	*benefit* =280	*benefit* =288
S_t = medium	T=4	*benefit* =6	*benefit* =6
	T=8	*benefit* =32	*benefit* =32
	T=16	*benefit* =110	*benefit* =110
	T=32	***benefit* =288**	***benefit* =300**
S_t = cold	T=4	*benefit* =10	*benefit* =10
	T=8	*benefit* =32	*benefit* =32
	T=16	*benefit* =100	*benefit* =100
	T=32	*benefit* =308	*benefit* =308

5.4. Performance tuning of GA

In order to obtain lower computation cost on complicate optimization computing of GA, we study the evolutionary generation that can strike a balance between significantly reducing the computation cost and obtaining a near optimal *WMI* in this experiment. From the result of the experiment 1 (Figure 8), we observe that GA can be generate the optimal *WMI* about tenth generation in the evolutionary process. Thus, the evolutionary scope is studied from 5 generations to 20 generations to find the optimal evolutionary generation. Figure 10 shows the best fitness of GA on different evolutionary generations. From the result, we observe that GA can be generate the optimal *benefit* about eighteenth generation in the evolutionary process for each scenario. Therefore, setting 20 generation for the GA can be applied to most cases to find optimal *WMI*.



(a) T=4 (b) T=8 (c) T=16 (d) T=32

(A) S_t = hot

(a) T=4 (b) T=8 (c) T=16 (d) T=32

(B) S_t = medium

(a) T=4 (b) T=8

(c) T=16 (d) T=32

(C) S_t = cold

Figure 10. The best *fitness* of the GA on different generation.

5.5. Performance tuning of GA

In the last experiment, we compare the computation cost for the two optimization methods, i.e., GA and the enumeration approach. The comparison results for these two methods are shown in Figure 11. From the result, GA obtains lower computation cost than enumeration approach. This is because that GA uses fixed number of evolutionary generation to find the optimal *WMI*. However, the computation cost of the enumeration approach will be increases as the increasing total learning time (T). Compared with the enumeration approach, GA spends quite low computation and is able to obtain optimal *WMI*.

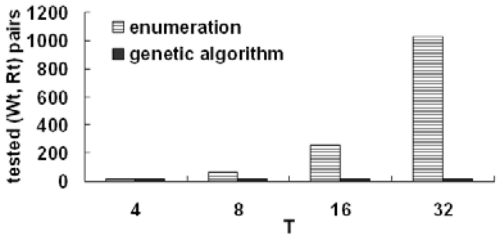


Figure 11. Comparisons of computation cost.

6. CONCLUSION

T-learning is an emerging and popular type of e-learning applications. However, previous T-learning researches do not consider the learning efficiency in limited available time. To resolve this problem, we provide an optimal watching mode $(W_t, R_t)^{opt}$ to retrieve as many distinct courses as possible in limited time. Due to the high computation complexity on computing the optimal watching mode, we optimize the watching mode by using the genetic optimization process to reduce the computation cost. Our experiment results show that the genetic algorithm can achieve very near optimal benefit, and only need quite low computation cost.

ACKNOWLEDGEMENTS

This work is supported by National Science Council of Taiwan (R.O.C.) under Grants 100-2221-E-006-267-MY2.

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PERCEPTIONS OF UNIVERSITY STUDENTS REGARDING COMPUTER ASSISTED ASSESSMENT

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ABSTRACT
Computer assisted assessment (CAA) is a common technique of assessment in higher educational institutions in Western countries, but a relatively new concept for students and teachers in Pakistan. It was therefore interesting to investigate students' perceptions about CAA practices from different universities of Pakistan. Information was collected through a questionnaire, completed by 1877 students. It was concluded that overall sampled students were aware of CAA. Comparatively, female students were found to be more highly inclined towards CAA. Sampled students from different departments (i.e., Commerce, Mathematics and Pharmacy) and from universities D and E showed a particularly positive attitude towards CAA. However, overall sampled students felt that CAA overburdened them, and created some administrative and managerial problems, so teachers should probably avoid using this technique of assessment as routine. Prominent advantages regarding CAA referred to by the students included time saving, being more interesting, and being unbiased. Disadvantages included hardware and software related problems during examination.

INTRODUCTION

Learning is central to education (Desforges & Fox, 2002). The concept of learning may be thought as a 'consumer' oriented term, while 'education' involves producers as well as consumers. Once learning is separated from education, it becomes incidental and could be only for fun (Jarvis, 2002). Assessment is an important factor that reflects and affects the quality of learning and education. Assessment plays a major role in driving student learning (Muwanga-Zake, 2006; Warburton, 2006; McLaren, 2008). According to the National Research Council (2003), 'assessment is high quality information about students' performance that informs teaching and learning'. Assessment identifies learner needs and can influence future planning if linked with appropriate resources. Moreover, assessment is a well organized and well defined measuring tool providing timely feedback for learning outcomes. Debuse, Lawley, and Shible (2008) highlighted the importance of feedback in assessment by characterizing it as informative, specific, personalized, timely, consistent, detailed and legible.

Information and Communication Technologies (ICTs) offer many new possibilities for successful assessment. As ICTs were integrated in learning and assessment, educators demanded more effective, flexible, interactive, customized and just-in-time online instructional and assessment systems. Research exploring the role of ICTs in the teaching, learning and assessment process conclude that online learning and online assessment are impacting pedagogical developments in higher education (Hricko, Howell, 2005). Bach, Hynes and Smith (2007) and Warburton (2006) emphasized the importance of ICTs and explained that 'universities have maintained the level of education for hundreds of years without the use of computer-based technologies, but the dominance of ICTs in the past two decades adds value to this process rather than frustrating it or even preventing it'. Due to the dominant impact of technology, the assessment process is gradually shifting from the traditional pen and paper method to computer based or e-assessment (Dube, Zhao, and Ma, 2009). E-assessment, online assessment, computer assisted or aided assessment; computerized assessment or computer based assessment is any assessment activity which involves the use of computers (Bull, 1999; Chalmers, McAusland, 2002; TAFE Frontier, 2002, Elliot, 2003).

Pakistan is a country of 160 million people with only a 53% adult literacy rate. It relies on conventional means of imparting education within the limited resources of the educational budget, which is merely 2.1% of the GDP (Siddiqui, 2008); certainly not enough compared to international standards. Even with these limited resources, the Higher Education Commission (HEC) of Pakistan has been focusing on equipping higher education faculty with the latest ICT tools and techniques to increase the effectiveness of teaching and learning (HEC, 2010). It was personally observed by the researchers that all teachers from all departments of all public sector universities of Pakistan were assessing their students' progress through paper and pencil based examination systems, except those departments who were offering 'Computer Studies' as a compulsory subject in their curriculum. Regarding this compulsory subject, the computer was partially being used by teachers and students during assessment. CAA

is thus a relatively new term in the context of universities in Pakistan. Some teachers were using computer technologies in the process of assessment on the basis of their own interests and/or expertise, but computer technologies (i.e., construction, administration, marking and reporting directly on and via computer) were not fully implanted in any of the public sector universities of Pakistan. Therefore, it was important to know students' perceptions about online examinations, whether they had experienced CAA before or not.

LITERATURE REVIEW

The pressure for frequent assessment for the measurement of stated learning outcomes especially in those classes where large numbers of students are registered has resulted in the development of CAA. Bull (1999) focused on the impact of CAA on HEIs and proposed strategies for planning and implementation. She proposed that greater collaboration between supporting staff and academics could effectively reduce the implementation problems of online assessment. Bull concluded that CAA had the potential to impact institutions. Specifically, different format and types of assessment were available in CAA, and faster quality and speed of feedback could enhance the capability of academics to pinpoint student progress and learning deficiencies. Bull explained that if CAA is employed correctly, it has the power to ensure that curriculum modifications ensue and lead the institutions to revise existing assessment methods. The perceived validity of CAA and the risks associated with using technology were the major disadvantages highlighted by Bull.

Chalmers and McAusland (2002) explained CAA in the context of pedagogical applications, noting that it enabled teachers to test their students covering a wide range of content, reduced teacher workload especially in the case of double marking, saved time and resources, and helped identify students' learning problems by adapting to match their abilities. Administratively, CAA saves time in supervision, invigilation, marking and double marking, generating reports and communication with students. On the other hand, limitations of CAA were in terms of both pedagogical and administrative issues:

- To construct objective questions needs adequate staff training, which is a time consuming process,
- Frequent use of multiple-choice items can lead to a focus on testing a superficial level of understanding,
- Additional training of IT staff is required for CAA invigilation,
- To attempt an online examination, students should have a basic understanding of IT competencies,
- An issue may rise regarding CAA for students with special needs,
- Security measures are required for: student identification, preventing unauthorized access to question and answer files, cheating and plagiarism,
- A high level of coordination is required among teaching staff, IT staff and administration.

Moreover, Chalmers and McAusland conducted a case study on second year students of Economics which was aimed to understand the impact of CAA on their learning. They found that students' understanding had improved. Their mean CAA score was higher than that from traditional essay-based examination. Students were encouraged by CAA to do some harder deep learning, which in the long run would be more valuable.

TAFE Frontier (2002) designed an online survey to capture a snapshot of online assessment practices in vocational education and training, with a view to using the data to inform a guide to online assessment. A total of 132 survey questionnaires were distributed, from which there were 43 responses via online, face to face or telephone interviews. Respondents defined online assessment as: An efficient and flexible means of conducting assessment and giving feedback; Using online technologies to support, wholly or in part, summative and formative assessment; Active participation by learners in an assessment event independently or as part of a group to achieve course outcomes; assessment where the assessor has not met the assessee; where participants have the opportunity to submit assessments through online channels, providing a more flexible approach to submitting work; demonstration of competency through the completion and submission of assessment tasks through the internet; a confused term and in most instances related to behaviorist views of student learning; Computer marked short quizzes to assess knowledge and online facilitator-marked assessments; to be able to determine the learner's ability to understand the material using the internet; and assessment that involves some kind of electronic component, for example sending out, doing, submitting and collecting information from online resources. Online submission of assignments/essays; Multiple Choice Questions (MCQs), True/False and short answer based quizzes; email, web page design, problem solving, portfolios, journals and spreadsheets were reported as tools of online assessment. In a question about 'suitability of online assessment to a range of study areas', respondents argued that online assessment suited assessment of information retention and underpinning knowledge, rather than practical skills. One of them responded that video conferencing provide opportunities for properly supervised online assessment of practical skills.

Sim, Holifield and Brown (2004) discussed issues related to the implementation of CAA, interoperability of questions, security, test construction and testing higher cognitive skills. Sim et al. explained that there are certain limitations in the different assessment methods of universities because of students' different exposure to IT. They identified 50 various assessment techniques, with examinations and essays the most common among them. They defined CAA by quoting Bull and McKenna, who gave CAA as the most common term for the use of the computer in the assessment of students. They concluded that the most important lesson is that an institutional strategy greatly influences the success of the implementation of a CAA system. Therefore, it was recommended to policy makers to formulate an effective strategy regarding CAA (e.g., security procedures, authentication and invigilation in remote locations). The second important lesson was concerned with staff development and training in test construction within a CAA environment.

In the same direction, Conole and Warburton (2005) comprehensively reviewed the design, delivery and analysis of CAA. They explained that 'computer-based assessment can be subdivided into stand-alone applications that only require a single computer, applications that work on private networks, and those that are designed to be delivered across networks such as the web'. They perceived CAA as high risk but central to the teaching and learning process. They also concluded that the role of technology and its expected impact on assessment was still in its infancy. It was required to develop new models for exploring this, and understanding more about the barriers and enablers in using these tools effectively.

Muwanga-Zake (2006) evaluated the diagnostic value of CAA in the process of teaching and learning. They concluded that learners realized the usefulness of CAA and criterion-referencing as impacting successive learning performance. Results showed that learners improved due to self-assessment and descriptive feedback which enabled them to diagnose and remedy mistakes themselves, through dialogue with or without assistance from the teachers. The free test atmosphere, instantaneous marking, and the diagnostic nature of test items supported self-diagnosis and led learners to request more testing, which ultimately increased competitiveness and excitement, especially when learners were aware of improvement. In case of teachers, they reflected that CAA could show learners' problems and styles of thinking and also can test large number of students in short time. Moreover, CAA data could provide insight on teaching styles and problems.

According to JISC (2008) 'e-assessment is emerging as a major driver for e-learning for both students and staff'. They explained that on-demand testing facilitating the students having more control over their learning and moving toward more personalized learning. JISC added that in regard to questions about e-assessment, people have the following three assumptions:

1. The assessment will be objective only,
2. The assessment will be limited to multiple choice items only,
3. The assessment can only test recall or low level learning outcomes.

While pointing out the falsity of the above assumptions one-by-one, JISC explained that e-assessments has always involved subjective judgment and also reduces judgment bias. ICT has been incorporated into assessment in further and higher education in a number of ways, for example, the analysis of student postings to discussion boards in computer mediated conferencing and automated essay marking. In rejecting assumption 3, they noted that carefully constructed MCQs can assess higher order skills, and it was also possible to create questions, which might be easy to a student who has comprehended the topic whereas one who has not would struggle. JISC has also raised further issues associated with e-assessment:

1. Time required: E-assessment saves time in displaying results including error checks and results analysis. But when the question is to assess the skills, the time and expertise required cannot be underestimated.
2. Misleading clues: frequent quizzes from a particular area of content can mislead the students to guess what is and isn't important.
3. Equity and diversity: these are major issues when computers are involved in assessment process for different student groups relating to language, gender, computer anxiety and exam equivalence.
4. Equivalence: the issues of equivalence between different forms of assessment (i.e., paper-pencil based compared to e-assessment) can affect student performance. Innovations in CAA introduced a new range of variants on this theme.
5. Effects of using a full range of marks: assessment in mathematics and other science subjects which use a full range of marks may lend themselves to CAA.
6. Greater Scrutiny: CAA has produced quality and efficiency gains in assessment, but even then there have sometimes been lower pass rates as compared to essay type assessment.

7. Design of questions: to construct an MCQ-based test for e-assessment requires a higher order of skills and expertise in teachers.
8. Disparity: the use of CAA has a positive impact on the test scores of high attaining pupils, when compared to those from paper-based tests, because higher-attaining students more quickly adapt to new assessment approaches. Lower-performing individuals will be disadvantaged when CAA is used, because a greater workload and additional effort is required to complete a computer-based test.
9. Change in working practices: the time saving advantage of CAA has changed the working practices for academics in terms of acquiring training for designing and construction of e-assessments. Students are also required to train for undertaking CAA, which raise the issue of who should be involved in that training and when it should take place, especially in the context of overloaded curricula.
10. Plagiarism: CAA discourages plagiarism. A high level of imagination and rigor is required for the design of assessment online, compared to that for more traditional forms of assessment.
11. Off-campus assessment: CAA enables the presentation of questions to students in different orders, with distracters in different orders, and if sufficient questions have been compiled of sufficient integrity, then they can be used for different tests. All of this allows for students to sit in adjoining desks in computer laboratories that will at other times be used for learning activities. This is fairly straightforward for on-campus students, but could be more problematic for students taking courses at a distance. However, Rovai (2000) suggests that this difficulty can be overcome by using 'proctored testing', where academics arrange for students to sit online assessments under test conditions in alternative venues.

Debuse, Lawley and Shibl (2008) evaluated educators' perceptions of automated assessment in terms of workload and quality of feedback. They used an automated feedback generator across multiple tutors on assessment items within an MBA course. They concluded that while the workload impact was generally positive with saving in both cost and time, improvements and modifications to the system could further reduce workloads. Specifically, improvements related to initial installation and training would significantly reduce the time required to be able to start using the system. The results indicated that AFG improved timeliness, consistency between markers, and recycling of useful comments.

Similarly, other studies related to CAA were based on strategies for planning and implementation, models for designing CAA, and the role of CAA in formative, summative and diagnostic assessment. But very few studies were found on the topic of perceptions about CAA of students. One example was Sheader, Gouldsborough and Grady (2006), who analyzed the perceptions of staff and students by comparing CAA with traditional methods of assessment in practical Physiology classes. In an experiment, they utilized computer-based short-answer assessments for nearly 300 students and compared it to paper-based assessment of the same students. They concluded that students were generally well-disposed toward CAA (75% of the students responded that they had no preference in assessment methods in the future). Remote access to questions and ease of submission were positive aspects, but lack of internet access was a perceived disadvantage. On the other hand, the most common advantages cited by staff were reduction in marking time and paperwork, the improved quality of feedback to students, as well as the potential for the software to detect plagiarism and administer anonymous marking. The need to tailor questions to the technology and having to adapt answers for marking onscreen were the main disadvantages found by staff. The main difference between the Sheader et al/Debuse et al research studies and the present study is that CAA is not really applied in Pakistan. The above mentioned researches were conducted in situations where CAA was applied. Therefore this study is significant to all of those teachers, students and administrators who are interested in CAA in Pakistan.

THE STUDY

Sampling: In 2008 there were 111 (60 Public Sector and 53 Private Sector) universities in Pakistan (Higher Education Commission, 2008), out of which 36 (20 Public Sector and 16 Private Sector) universities from Punjab Province were delimited for this study. It was felt that this province would give a representative sample compared to other provinces, and it was convenient as the place in which the main researcher was located. Out of 20 Public Sector Universities, 8 (40%) were randomly selected for inclusion in the sample. Private Sector Universities were dropped because of their limited number of students and the great variety of different disciplines they offered. All male and female students from all teaching departments of different disciplines of sampled universities constituted the population of this study. After the selection of the universities, different teaching departments of Pure Sciences, Social Sciences and Languages were randomly selected to be included in the study. However, students of each department could only be chosen if 'available' in their classes. Permission was sought from all of the head of the departments in each university before data collection. In the response of this request, 63% of them allowed to collect data from their students, while the remaining head of the departments were sent another request after 2.5 months to allow the researcher for data collection. At this time only 15% responded and rests were requested again and again after one month and then 15 days respectively. In

all 2200 students were asked to complete the questionnaire. Of these, 1877 (85%) questionnaires were collected successfully after completion.

Questionnaire: The questionnaire was based on questions developed for this study. Each question encouraged a response on a 5-point Likert Scale. All items of the questionnaire were couched in relation to issues emerging in the literature review. The methodology and format of the questionnaire followed the studies of Barbra and Sylvia (1999) and Yavuz (2005). It also stemmed from literature such as Debuse, Lawley and Shibl (2008), Irving, Read, Hunt, and Knight (2000) and O'Hare (2001), who used a 5-point Likert scale model to measure student attitude towards CAA in different experimental studies conducted in different disciplines.

The questionnaire was comprised of two major parts. Part 1 comprised of 12 items was generally for all students, while Part 2 consisted of 17 items and was for students who had some experience of online assessment. Part 2 was extended by adding two open ended questions regarding advantages and limitations of CAA. In Part 1, generally simple items were included, but in Part 2 items were included which were directly related to their online assessment experience.

To explore the issue of validity, the questionnaire was used in two pilot studies. In pilot study 1, the questionnaire was administered to students in three departments (Education, Mathematics and English) of two different universities (A and D). Sixty students including five males and five females in each of six departments completed the questionnaire. During administration of the questionnaire, any difficulties in understanding the terms, required space for answering the items and other questions raised by the students were recorded and then thoroughly discussed with a panel of experts. It was then decided to change the format by replacing some items, and include new items to make the questionnaire more self-explanatory. Due to the changes incorporated, it was then necessary to conduct a further pilot study. Departments of Business & Administrations were included in pilot study 2. Again, sixty students were chosen with equal distribution across departments and of gender. Minor revision was made as a result of the second pilot study. The final draft of the questionnaire was sent to the six different experts in the field of Education and Assessment for their opinion on. These six experts were Head/Director of departments in different universities of Punjab and were knowledgeable in the field of Assessment, Examinations and Computer Assisted Assessment.

Response Rate and Analysis: The questionnaire was administered to 2200 students, of which 1877 (85%) responded successfully. Of these 1877 students, 1055 (56%) were female and 822 (44%) were male. Percentages and Pearson Chi Square (χ^2) tests at $\alpha = 0.05$ were applied to draw conclusions from the collected data. All positive statements in Parts 1 and 2 were weighted from +2 to -2 (Hirsch, Frank, Shapiro, Hazell and Frank, 2004; Desselle, 2005) to analyze students' response and negative statements in vice versa. Where +2 and +1 rated 'Strongly Agreed' and 'Agreed' respectively while -1 and -2 were used for 'Disagreed' and 'Strongly Disagreed' respectively for all positive statements. And '0' was meant by 'Unable to Decide'. All responses to the open ended questions were analyzed in terms of themes emerging, and the frequency of the most commonly emerging themes was indicated in the form of percentages.

FINDINGS

It was found that 1052 (52% female, 62% male) students out of 1877 (56% female, 44% male) sampled students had had experiences of computer-based assessment. The examples they gave of these experiences were Army Medical College Entry Tests (2%); PAF (Pakistan Air Force) entry test (8%); online test or papers conducted by their teachers in universities (20%); computer practical in all computer-based subjects (60%); online NTS (National Testing Service), GAT (Graduate Assessment Test) online, GRE (Graduate Record Examinations) online examination (7%), Microsoft Online Certification Examinations (2%) and online TOEFL (Test Of English as a Foreign Language) online (1%). The data of both parts were interpreted in terms of whether student responses were an overwhelming majority (81% and above), a good majority (71% to 80%), or a simple majority (61% to 70%).

Results from Part 1: Part 1 of the questionnaire was completed by all sampled students i.e., 1877. An overwhelming majority (i.e., more than 80%) of the sampled students reflected a positive attitude towards computer-based system of examinations in statements 2, 7, 11 and 12 (i.e., 'students' should be trained for computer-based system of examinations', 'CAA may help to improve and maintain standards of our examination system', 'CAA is requirement of the time' and 'CAA should be implanted in all universities' respectively). A good majority (70%-80%) of the sampled students agreed that 'CAA is an interesting technique of assessment', 'interactive exercises may help to improve marks', and 'students should be given an opportunity to submit their assignment online' (i.e., statements 1, 3, and 8 respectively). However, a simple majority of the sampled students agreed that 'the computer does not need to be used in tests or exams' (i.e., statement 4).

The positive attitude of sampled students was counted per statement. It was found that all sampled students from universities A and E responded positively to eight different statements. Moreover, all sampled students from Biology, Commerce, Education and Mathematics departments responded positively to seven different statements. The positive attitude of sampled male students was counted per statement. It was found that sampled male students from university E responded positively in seven different statements. Eight positive statements were counted in departments of Chemistry. The positive attitude of sampled female students was counted per statement. Sampled female students from universities A, E and H responded positively to eight different statements. Moreover, female students from departments of Commerce responded positively to eight different statements.

Calculated values of χ^2 showed significantly varying attitude differences between male and female students in statements 1, 2, 5, 6, 9, and 10 (Table 1). From the percentages, 79% male students in statement 1 were more interested in CAA than female (78%), while female students in statement 2 (85%), 5 (78%), and 9 (81%) were more positive towards CAA than to male (81%, 73%, 79% respectively) students. In statements 4 and 7 both male and female students were not clear about their decisions because of the minimum difference in the percentages of their responses. Calculated values of χ^2 showed significantly varying attitude differences between sampled students from different universities in all statements except statement 7 (Table 1). Comparatively, 90% students from University E were more positive towards CAA. Calculated values of χ^2 showed significantly varying attitude differences between the students from different departments in all statements (Table 1). It was observed that 97% of students from departments of mathematics agreed or strongly agreed that CAA saved time.

Results from Part 2: It was found that 56% (1052) sampled students were having experience of online examinations. An overwhelming majority of the students reflected their positive attitude towards CAA, as 'CAA is an interesting technique of assessment', they believe that it 'could support students to maintain their standard in examinations'; 'immediate feedback saves students' time', 'it is reliable because results are always unbiased in online system of examination'; and 'cheating is almost impossible in online system of examination therefore it is much more secure technique of assessment' (statements 1, 8, 10, 13). The same patterns of results were observed with respect to the students of all universities and of all departments.

A good majority of the students declared their positive attitude towards CAA: 'interactive exercises help to improve marks' and 'CAA is helpful in self assessment' (statements 7 & 9). The same patterns of results were found by the students of all universities and all departments except Economics. However, a good majority of the students argued that 'online system of examination overburdens the students to prepare for exams, so teachers should avoid it' and that ' uncertain and unexpected failure of technology during online examinations damages students' (statement 15 and 16). The same patterns of results were found in sampled students from all universities except G and all departments except Biology and Mathematics.

It was found that students of universities D and H and from departments of Pharmacy responded positively to six different statements out of 16 given in Part 2 of students' questionnaire. Male students of universities C, D and H responded positively in five different statements and Business & Administration and Chemistry departments in seven out of 16 statements given in Part 2 of the questionnaire. It was found that female students of D and H universities responded positively and Biology, Commerce, CS & IT (Computer Science and Information Technology) and Pharmacy in seven different statements out of 16 statements.

Calculated values of χ^2 showed significantly varying attitude differences between all male and female students in statements 2, 7, 9, 11 and 16 (Table 2). It was found from the percentages that female students showed a comparatively more positive attitude towards CAA in all of these statements (i.e., 86%, 78%, 52%, 81% and 92%) than male (i.e., 81%, 73%, 48%, 79%, and 90% respectively). Significantly varying attitude differences were found between the students from different universities in all statements except statements 8, 9, and 11 (Table 2). It was found that 92% students from University D showed a more positive attitude towards CAA (statement 9). Significantly varying attitude differences were found between the students from different departments in all statements (Table 2). It was found that 100% students from departments of Psychology and Pharmacy showed a more positive attitude towards CAA (statements 13 and 14 respectively).

The values of percentages regarding advantages and disadvantages, expressed by the experienced students were: CAA could save their time (n=277, 16%); female students were happy to find immediate feedback (n=79, 6%); male students agreed that online assessment is an interesting technique (n=57, 7%); unbiased judgments were available (n=56, 7%); and self-assessment could improve their GPA (n=56, 7%). On the other hand, female and male students estimated that it could be difficult to implement online examination systems (n=177, 11%) in

universities. Female students faced some hardware and software problems (n=62, 7%) during their examinations and expressed that they saw their fellows in trouble because they were not experienced in online examination systems or not trained for using the internet (n=62, 7%). Male students also faced some troubles related to hardware and software problems during their exams (n=68, 9%).

CONCLUSIONS

The research presented in this study investigated students' perceptions of the contemporary utilization of CAA or online examinations in public sector universities of Punjab, Pakistan. IT experts and educationists in Pakistan are working hard to implement and improve computer assisted instruction (CAI) systems, but CAA or online examination methods are still ignored by them. This research has contributed by highlighting the importance of CAA to administrators, educationists and IT experts, who need to plan and implement computer technology in this phase of education. This research has also increased awareness about CAA among students and helped the researcher to plan and implement online examination systems in the near future.

It was interesting to find that students were knowledgeable about online examinations, due to online admission tests of medical colleges; online NTS, GAT, GRE, MS Certification, TOEFL tests and computer-based classroom tests. They felt that online examination was not an exceptional technique of examinations for them. It was observed by the researcher during the survey that in all public sector universities a subject based on computer studies was compulsory for all students of all departments. Teachers assessed their students' skills of computer applications, in that particular subject, online.

From the results of Part 1 (completed by all students either having previously online examination experiences or not) it was clear that overall students had a positive attitude towards CAA. However, students from universities A and E and departments of Biology, Commerce, Education and Mathematics were comparatively more inclined towards CAA. Statistically significant attitude differences between the students of universities and different departments also reflected that the students from university E and departments of Mathematics were more interested in CAA.

Male students from University E and departments of Chemistry were more positive towards CAA than to other males from other universities and departments. Similarly, female students from universities A, E and H and from departments of Commerce were found to be more interested in online systems of examinations than other females of other universities and departments. By comparing the values obtained from the above findings it was found that overall female students were more interesting in online systems of examinations than male students. It was confirmed from the results of χ^2 test showing statistically significant differences between the attitude of male and female students.

From the results of Part 2 (i.e., completed by only those students who had previous experiences of online examination), students were highly interested in CAA. Students from universities D and H and departments of Pharmacy were more inclined towards CAA. Statistically significant differences between the attitudes of experienced students from different universities and different departments showed that students from university D and departments of Pharmacy were more positive towards CAA.

It was interesting to find that a simple majority (in Part 1) felt that 'the computer does not need to be used in tests or exams'. Additionally, a good majority of students in Part 2 stated that 'online systems of examination overburden students to prepare for exams', so teachers should avoid conducting this type of examination routinely. Furthermore, due to the uncertain and unexpected failure of technology during online examination, damage to students' could ensue, and 'CAA is not adequate to apply in Pakistan'.

Here, it is important to identify the two major administrative reasons of students' negative attitude towards CAA. Firstly: problems of load shedding (i.e., breakage in power supply) and secondly: lack of technical staff and insufficient number of computer systems in computer laboratories. Due to these major reasons, students were losing their confidence in online systems of examinations and believed that 'technology is not reliable'. In these situations, students preferred to take paper-based exams and tests. Researchers should help teachers and administrators to overcome these difficulties and make the online system of examinations interesting and valuable to all (students, teachers and academic staff). For example, it is clear from the literature that CAA is not an individual activity but requires collaboration between academic staff, supporting staff and administration (Bull, 1999). Bull further explained that CAA required a university-wide strategic approach and first piloting on

small scale, enabling evaluation of the process and the development of the appropriate strategies to implement on a larger scale.

The most prominent advantage observed during the survey was 'immediate feedback saves student time'. In paper-based examinations students generally wait for a month (and some time more in the semester system) and more than 2 months (in the annual system) for their results. The most prominent disadvantage or limitation was the 'impossibility of computer-based exams implementations in universities due to lack of resources and electricity failure problems.'

It was concluded that CAA is an interesting technique of assessment. However, technological problems made this system of examination unreliable. If administrators of institutions are interested to apply CAA properly, then it will be important to take preliminary steps to control unexpected technological problems. If they are successful in controlling these problems, all teachers, students and administrators will find CAA a most beneficial system of examination.

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APPENDIX

Table 1 - Calculated Values of χ^2 for Part 1

S. No.	Statements	χ^2 (α = 95%)	Male & Female (df=4, 9.49)	Between different Universities (df=28, 41.34)	Between different Departments (df=44, 60.49)
1.	CAA is an interesting technique examination.	χ^2 Sig.	11.89* 0.18	74.03* 0.000	169.79* 0.000
2.	Students should be trained to use computer for online tests/exams	χ^2 Sig.	12.65* 0.013	92.23* 0.000	114.19* 0.000
3.	Interactive exercises help the students to improve marks.	χ^2 Sig.	8.16 0.086	74.79* 0.000	94.94* 0.000
4.	Computer does not need to be used in tests or exams.	χ^2 Sig.	0.56 0.968	58.27* 0.001	98.39* 0.000
5.	If choice is given to me to select one from online testing or traditional examination system; I will prefer the second one.	χ^2 Sig.	13.56* 0.009	59.73* 0.000	101.13* 0.000
6.	I believe that CAA is not adequate in Pakistan.	χ^2 Sig.	9.76* 0.045	54.01* 0.002	79.95* 0.001
7.	CAA may help to maintain standard of examination at international level.	χ^2 Sig.	4.438 0.350	39.61* 0.072	121.84* 0.000
8.	Students should be given an opportunity to submit their assignments online.	χ^2 Sig.	1.99 0.736	50.33* 0.006	122.51* 0.000
9.	CAA is a useless technique for me due to inadequate computer accessibility.	χ^2 Sig.	14.63* 0.005	59.95* 0.000	111.13* 0.000
10.	CAA is a useless technique for me because I have no knowledge about it.	χ^2 Sig.	17.14* 0.002	393.14* 0.000	441.92* 0.000
11.	CAA is the requirement of the time.	χ^2 Sig.	8.09 0.088	187.38* 0.000	201.20* 0.000
12.	CAA should be implanted in all universities of Pakistan.	χ^2 Sig.	6.29 0.178	220.11* 0.000	279.56* 0.000

(* - significant values of χ^2)

Table 2 - Calculated Values of χ^2 for Part 2

S. No.	Statements	χ^2 (α = 95%)	Male Female (df=4, 9.49)	Between Universities (df=28, 41.34)	Between Departments (df=44, 60.49)
1.	CAA is an interesting technique examination.	χ^2 Sig.	4.71 0.319	57.58* 0.001	174.61* 0.000
2.	Online tests/exams always made me confused.	χ^2 Sig.	25.99* 0.000	70.04* 0.000	126.38* 0.000
3.	CAA can improve students' achievements.	χ^2 Sig.	4.25 0.373	55.69* 0.001	86.36* 0.000
4.	Minimum level of computer knowledge is enough to attempt the paper online.	χ^2 Sig.	5.61 0.23	67.68* 0.000	126.98* 0.000
5.	CAA reduces tests/exam anxiety.	χ^2 Sig.	5.94 0.204	82.05* 0.000	115.79* 0.000
6.	I believe that CAA is not adequate in Pakistan.	χ^2 Sig.	6.86 0.143	59.69* 0.000	74.71* 0.003
7.	Interactive exercises help the students to improve the test/examination marks.	χ^2 Sig.	11.30* 0.023	46.89* 0.014	115.68* 0.000
8.	CAA may help us to maintain our standard of examination at international level.	χ^2 Sig.	5.15 0.272	37.39 0.110	100.67* 0.000
9.	CAA helps me to assess my-self.	χ^2 Sig.	11.68* 0.020	38.61 0.087	64.62* 0.023
10.	Immediate feed back in online examination saves our time.	χ^2 Sig.	2.287 0.683	66.09* 0.000	115.18* 0.000
11.	I always lose my confidence while solving the questions online.	χ^2 Sig.	16.72* 0.002	39.99 0.066	92.55* 0.000
12.	I always prefer to take tests or exams online.	χ^2 Sig.	8.25 0.083	45.08* 0.022	98.38* 0.000
13.	In online tests/exams, results are always unbiased.	χ^2 Sig.	0.45 0.978	157.77* 0.000	118.55* 0.000
14.	Online tests/exams are much more secure than paper-based examination system.	χ^2 Sig.	4.16 0.384	214.79* 0.000	202.07* 0.000
15.	Online examination technique overburdens the students, so it should be avoided by the teachers.	χ^2 Sig.	1.77 0.779	151.49* 0.000	176.87* 0.000
16.	CAA damages thinking ability of student during test/exam time.	χ^2 Sig.	14.67* 0.005	243.19* 0.000	308.58* 0.000

(* - significant values of χ^2)

PRE-SERVICE STUDENTS' PERCEPTIONS AND EXPERIENCES OF DIGITAL STORYTELLING IN DIVERSE CLASSROOMS

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ABSTRACT
The purpose of this paper is to analyse an innovative teaching and learning practice in which pre-service student teachers at the CPUT used digital stories to reflect on their experiences of diversity in their classroom. Managing diverse classrooms is one of the main challenges for all teachers. Digital storytelling can help manage such classrooms. It facilitates the convergence of four student-centered learning strategies: student engagement, reflection for deep learning, project-based learning, and the effective integration of technology into teaching. A qualitative research approach was employed whereby twenty-nine written stories and a recording of a focus-group interview with purposively selected participants from the group was the data collection technique. The results indicate that the digital storytelling approach exposed the students to new media literacies which prepared them for the rich and diverse contexts which they will encounter in their teaching.

INTRODUCTION

Storytelling has been used throughout history for teaching and learning. Stories help to make meaning out of a particular practice. In our lives today, with the technological communication explosion and globalisation, we have experienced a shift in our traditional understandings of 'literacies' to exploring diverse modes of meaning-making. Currently children in schools encounter and interact with new digital literacies including blogs, wikis, social network sites, digital texts and digital storytelling. Given storytelling's essential role in learning, meaning-making and knowledge development, it is not unexpected to find digital storytelling being part of an undergraduate curriculum.

At the end of 2010, the final-year pre-service Intermediate and Senior Phase (ISP) students at Cape Peninsula University of Technology (CPUT) were introduced to digital storytelling. As the curriculum presentation was fairly flexible the students were given the option of either completing a digital story or a paper-based portfolio. For those students who chose the digital storytelling process, they had to master the academic content which was to reflect on the seven roles of a teacher (Government Gazette No20844) during their past four years of preparation to be a teacher, and to acquire the necessary reading, writing and digital literacy competences. This was accomplished through situated practice in a computer laboratory on the campus, overt instruction by three educational technology experts from the institution including their regular lecturer and underpinning the whole process was critical framing amongst the students and the academic support team.

Of a class of fifty-nine students, twenty-nine chose to do the digital storytelling. These students came from a diverse cultural, linguistic and class background. 79.31% of the students were aged between 20 and 25 years old, 13.79% were between 30 and 35 years old and 6.89% were older than 36 years. 72.4% of the class was female and 27.6% were male. 79.3% of the class was English first-language speakers while 20.7% was isXhosa first-language speakers.

The paper aims at analysing final year teacher education students' perceptions and experiences of digital storytelling in a multicultural classroom. The following questions gave focus and drive to the paper:-

i. What were the pre-service teachers' perceptions and experience of digital storytelling in their classroom within a teacher education programme?
ii. How do the student teachers perceive the integration of digital storytelling approach into their teaching?

To answer these questions, we used qualitative data collected through focus group interviews with ten pre-service students and their reflections on their choice of teaching as a career presented as digital stories. We adopted an interpretive qualitative research approach to gather and analyse the focus group interviews as well as the reflections. We used an Interpretative Phenomenological Analysis (IPA) approach to gain insights to the way students perceive and experienced digital storytelling in multicultural classrooms. Analysis of the findings of the study shows that as a teaching approach, digital storytelling helped the pre-service teachers develop personally and professionally. The teachers perceived the approach as a valuable technique for challenging issues of diversity in their classrooms. Since most of the classrooms in the urban areas of South Africa are very diverse, teachers in those classrooms need to be equipped with the technique which will aid them challenge the ills of

diversity. The findings of this study therefore could be helpful to instructors in teacher education who are keen to develop and equip diverse classroom teachers to handle their multicultural learners sensitively. The terms "diverse", "multicultural" and "teacher education students'" and pre-service teachers are used interchangeably in this paper.

LITERATURE REVIEW

Since this research project was investigating students' perceptions and experiences of digital storytelling in a multicultural classroom within a teacher education programme, the literature review therefore, discusses the concepts of digital storytelling, diversity and issues of student reflections within the programme.

Digital storytelling in a teacher education programme

Anstey and Bull (2006:1) state that:

> the world is changing in technological, social and economic ways and as a result of this the genres of texts we use change, the way we use literacy will change as purposes and contexts change, and literacy knowledge, skills and processes change. Today the literate person needs to unite and re-unite existing and new literacy knowledge, skills and purposes for new purposes and new contexts using new technologies. Therefore the way we teach and learn literacy will need to change. Students not only need a broader knowledge base about texts and literacy, they also need the resources, attitudes and strategies to adjust to and develop responsive and appropriate literate practices. As a result of this we decided to introduce our students to digital storytelling within their existing flexible curriculum.

Developing digital stories encourages students to engage in both old and new literacies and through the process of creating a movie they construct, examine, and manifest other literacies (Sylvester & Greenidge, 2010:287). Hull and Nelson (in Warschauer, 2009:124) further suggest that combining images and texts transcends rather than combines what is possible in each particular mode. Warschauer (2009:125) affirmed that digital story tellers find a deeper meaning of what they want to say through the process of combining modes.

A digital story is a multimedia text incorporating still images complemented by a narrated soundtrack to tell a story or present a documentary. Using this multimedia approach in a classroom encourages students to engage with each other. Anstey and Bull (2006:14) state that today students have to engage in a range of social and literate behaviours in order to use the information. And in so doing it influences students and shape their voice, personal identity and agency.

As stated by Sylvester and Greenidge (2010:287), Joe Lambert and Dana Atchey combined their backgrounds in theatre, video production and interests in cultural democracy and community arts to develop a business enterprise using digital storytelling. In 1994, they established the Centre for Digital Storytelling at the University of California at Berkeley as a community art centre for new media based on the premise that everyone has a story to tell. The model constructed by Lambert (2002) for creating effective digital stories is based on a combination of the following seven elements:

1. Point of view – digital storytelling allows the storyteller to come close to his audience by expressing personal experiences through first-person point of view;
2. Dramatic question – a plot is developed in a digital story thereby distinguishing it from showing wedding pictures with music and flashy pictures;
3. Emotional content – effective digital storytelling evokes an emotion from the audience. In our research project, the students shared their philanthropic motives for becoming teachers and how they had developed over the four years;
4. Economy – digital storytelling is using approximately 300 – 500 words in a story so one has to be very economical in what you chose to say and how you say it;
5. Pacing – determining the rhythm of a story to sustain an audiences interest;
6. The gift of voice – the pitch, inflections and tenderness of ones own voice is one of the most essential elements that contribute to the effectiveness of digital storytelling; and
7. Soundtrack – using music to enhance the story and create an emotional response.

Sylvester and Greenidge (2010) suggest that when developing digital stories in a university classroom setting, students go through the process of writing a story by traditional methods: using pencil and paper or the word-processing functions of a computer. This becomes the digitized voice-over narration. The story is recorded and preferably as a performance, allowing the audience to hear the personal emotion inflected in the voice. Once the story has been written and read, personal photographs, pictures, scenes or image frames that complement the

narration are included. Music or sound effects are added to enhance the narration. Finally a title frame is included as well as rolling credits to cite sources, and add acknowledgements. If students used media from the internet to enhance their stories, we insisted they acknowledge cited the files and any other copyright information.

Once the movies have been created, showing them to the class, parents, family members, friends and lecturers is the publishing phase. This stage should not be missed as students generally enjoy showing their movies. What viewers see and understand from this publishing phase may influence the way they view their day-to-day social, cultural or ethnic groups differently and may change their behaviour (Anstey & Bull, 2006:9).

Diversity in a teacher education programme

James (2001:1) in the *Manifesto on Values, Education and Democracy Manual for the South African Department of Education*, states that the Constitution commits us to the establishment of a society based on "democratic values, social justice and fundamental human rights". Democracy is at the heart a society's means to engage critically with itself. But critical engagement is not an automatic consequence of democratic institutions. Education is the key because it empowers us to exercise our democratic rights, and shape our destiny, by giving us the tools to participate in public life, to think critically, and to act responsibly.

Today, South Africa is a nation built from the richness of many cultures, languages, traditions and beliefs. Au (2004:393) believes there is a trend towards greater diversity in the student population and teacher educators have an essential role in preparing teachers to teach in multicultural classrooms. However, Smolen, Colville-Hall, Liang and Mac Donald (2006:47), highlight the futility of preparing teachers for diversity if the teacher educators themselves lack multicultural competences. They believe that in America 40% of the school population was racially and culturally diverse and was projected to become more diverse. Many of the white middle-class teachers have a monoculture perspective and they view culturally diverse students as less capable of achieving academically. Valentin (2006:198) states that all students should have the knowledge and skills that will enable them to succeed in both academic and real-life situations and to be skillful as well as professionally equipped to address the learning needs of all students. If such changes are happening in the economical, social and technological worlds then a global consciousness needs to be evident and embraced as the philosophy of an academic environment.

Au (2004:409) concurs saying that teacher educators should teach in a culturally responsive and sensitive manner and make sure that students of diverse backgrounds have the opportunity to participate in instruction that involves them in motivating meaningful learning experiences.

Au (2007:7) proffers two explanations for the gap that educators can work on to improve when dealing with diversity. Firstly, students of diverse backgrounds tend to receive a great deal of instruction emphasizing lower level skills as opposed to higher level thinking. She believes that with the era of globalization, educators must give all students, and especially students of diverse background access to instruction focused on higher level thinking with texts. Secondly, Au believes that schooling fails to connect with the literacy learning needs and interests of students of diverse backgrounds. Typical schooling is centered on content orientated to mainstream students and their perspectives. She concludes by suggesting that the successful use of culturally responsive instruction requires some depth of understanding of both the concepts of culture and instruction.

Reflection in a teacher education programme

Hatton and Smith (1995:4) state that 'reflection' and 'critical reflection' are ubiquitous terms used in the descriptions of approaches to teacher education. They believe many of these terms are loosely defined and embrace a wide range of concepts and strategies. However, Schon (in Hatton and Smith) has narrowed his definition and he discusses the terms 'reflection-on-action' and 'reflection-in-action'. The latter implies that the professional has reached a stage of competence where they are capable of thinking consciously and being able to modify their actions almost immediately. Hatton and Smith restate his idea by saying that knowledge is 'derived from the construction and reconstruction of professional experiences'.

Framework: Interpretative Phenomenological Analysis

This study employs an Interpretative Phenomenological Analysis (IPA) as a framework to understand the CPUT final-year pre-service teachers' perceptions and experiences of digital storytelling in multicultural classrooms. As a qualitative research approach, IPA has its theoretical origins in phenomenology and hermeneutics. The framework was designed by Smith, Jarman and Osborn (1999). A researcher can deploy IPA if the aim of the study is to explore individuals' perceptions as well as understand how they (individuals) make sense of their experiences. IPA aids in the interpretation of perceptions, experiences, events and actions held for individuals in

a study (Chapman & Smith, 2002). The framework helps in explanations that give insights to understand human experience better (Fade, 2004:647).
IPA is both phenomenological and interpretative. It is phenomenological because it "seeks an insider perspective on the lived experiences of individuals," and is also interpretive because it "acknowledges the researcher's personal beliefs and standpoint and embraces the view that understanding requires interpretation" (Fade, 2004:648). That is, while IPA aims at gaining the participants' perspective of the phenomena being studied, the researcher is recognised to be the primary analytical instrument in the process. Through a process of interpretative activity, the researcher's conceptualizations of the phenomena are valued for making sense of the perceptions and experiences of the study subjects (Fade, 2004; Chapman and Smith, 2002).

Purposive sampling is normally used to identify participants for a phenomenological study. Only individuals that can offer meaningful perceptions and experiences on the phenomena under scrutiny are asked to participate. IPA employs qualitative data collection techniques such as focus group interviews, diaries, one-on-one interviews etc that aid in understanding the meanings of the phenomena, the changing behaviours, and conflicts which may not be accessible in quantitative approaches.

RESEARCH METHOD

This interpretive study has used IPA as a framework to conduct and analyse data from focus group interviews and digital stories by final-year pre-service teachers from CPUT. As is dictated by IPA the focus group interview participants were purposively sampled to participate in the conversations. Ten students from different races who participated in the digital storytelling programme were sampled. We wanted different races so we could understand how different people perceive and experience digital storytelling in multicultural classrooms.

In this study as already indicated above, we wished to analyse in detail the perceptions and experiences of the final year teacher education students regarding digital storytelling in diverse classrooms. Focus group interviews were used to engage in a flexible dialogue with the student teachers in the study. Interviews were audio-recorded with the consent from the participants; the interviews were then transcribed verbatim. To establish trustworthiness of the findings, the interviews were conducted by two different researchers. Again, the interview data was triangulated by the participants' digital stories about their choice for teaching career and how they perceive themselves prepared to fulfill the seven roles of a teacher when they go teaching in the following year.

In the process of analysis, we did a detailed systematic qualitative analysis, case by case. We read and examined the transcripts over and over, with each time annotating the text with initial comments. Then we extracted and listed the themes. The themes were then clustered in a meaningful way by looking for connections between them to develop super ordinate themes.

As researchers in a Higher Education Institution we obtained permission from the institution and the students before the study commenced. Permission to use the students written reflections and to interview them was obtained orally and in written form at the beginning of the project. We also obtained consent to record the conversations from the students who participated in the focus group interviews. Privacy and confidentiality were adhered to throughout the research process.

FINDINGS AND DISCUSSION

Using IPA to analyse qualitative data collected through: (i) focus group interviews with ten students purposively selected from the fourth years who participated in the digital storytelling course; and (ii) the students' digital stories, the following super ordinate themes became evident:

- Personal and professional development
- Challenging diversity issues
- Approach created a strong class bond

Personal and professional development

Participants are of the opinion that using digital storytelling in a diverse classroom could help teachers gain insights about issues of diversity from the learners' stories, hence, enhancing the teacher's role of a lifelong learner. In addition, the teacher could be in a better position to know more about their learners. Consequently, the teacher would handle the individual learners accordingly. A student in the focus group interviews narrated that:

> *we are just learning from every child that you get in your classroom, you are going to learn so much and I think being a lifelong learner, like I just want to find out everything about – about them and their*

> *culture. Like that would be so interesting. And it's not that you want to take them in a classroom and like teach them oh this is Indian culture and this is that. It's just that you've got, you've got the children there and you've got real people and their own actual history and context to learn from and use.*

Because they (the participating students) perceive the approach to be good and helpful they wish they were exposed to digital storytelling when they were beginning their training programme. One of the participants said:

> *it would be nice to have Digital Stories in the first year, when you come here. So that by the time we get to the end of 4th year you have such a great respect for the people that you're with, because I now sit here knowing Zantu's story and Charnelle's story and Warren's story, which I haven't known before. …I know why they're here, what has driven them. Maybe this should be done at the beginning of your tertiary studies and at the end*

Some practitioners are of the opinion that the approach is really useful in teacher education classrooms. Robin and Pierson (n.d) after using the approach in their teacher programme, concluded that "digital storytelling … proven to be the solution to our search for a rich technology-integrated teaching and learning model for our undergraduate teacher education students. A key goal of our teacher education program is that our graduates be able to meaningfully use technology to support their curriculum beyond basic productivity tasks; thus, we encourage our students to think beyond the technology tools themselves to educationally-sound uses of those tools".

Analysis of the students' digital stories and the focus group interviews in this study shows that the approach could be good for teacher education students as they could have a chance of reflecting on their choice of career. Through the approach the students had a chance of reflecting on their training as teachers. For instance one student in her digital story said:

> *Over these [past] four years I have learned to be sensitive to the diverse needs of my learners, construct appropriate learning environments, demonstrate sound knowledge of my learning area and more importantly be an inspiration to my learners*

Similarly, another student in the focus group interviews said:

> *I think Digital Stories gave us the opportunity to reflect on the four years that we've been here and why we've chosen Teaching.*

From the reflection the students create the impression that they are going into teaching because they feel it is their calling.

Challenging diversity issues

Analysis of the data shows that the students perceive digital storytelling as a beneficial teaching tool in multicultural classrooms because it encourages the understanding of the differences existing among learners in a classroom. Given resources at the schools they will be teaching, they were enthusiastic to use the teaching approach. Regarding the theme, this is what some of the participants had to say:

> *I think you could also have a story where you have different races and different religions together in one story. Maybe start off with their separate entities where they come from their backgrounds, but end off in way where you have a whole group of learners that are completely different from one another ending off in a way that they combine together and you can send a message across about multiculturalism in that way, where everybody actually comes together and they don't see it as a problem.*
>
> *If your children could do a thing on their family tree for Geography, instead of making a poster, then they must make a Digital Story. And they will learn about each other, and their lives and their problems and their backgrounds. You would get such a healthy respect and it's actually really beautiful and inspiring, to see other people's lives and where they come from.*

Parents of many South African learners do not know much about multiculturalism. Most of them have not yet changed the apartheid mentality where the classrooms were normally monocultural. The students think that by doing the digital storytelling with the learners, lessons about multicultural classrooms could extend to parents. One student in the interviews narrated that:

> *It spreads further than just the learners. Because if you do it in the school like if you take this idea [digital storytelling] into a school and you make the learner – say in Grade 7 and they do a project like this and you expand it and you call their parents in, like we called our parents in to come and watch our stories. …through teaching their kids multiculturalism, you're also teaching their parents because their parents then also get to see their children's perspective of it and they can actually learn from their children.*

In line with the idea of creating learning environments as narrated by the respondent above, one student in her digital story wrote:

> *I do believe learners need to be provided with a supportive and empowering environment. This is also key in the role as a teacher to develop supportive relationships with parents and other key people and organisations in the community.*

The use of technology to bring multicultural awareness to people is also pointed out by Sleeter and Tettegan (2002:1) who show that "previous studies have proved that technology can provide meaningful ways for educators and students to process information and collaborate in order to promote critical thinking and social justice through multicultural education". Similarly, Donaldson and Carter (2000) and Selwyn (2000) noted that some teacher training curricula are now integrating technology-supported courses to connect communities and teach multicultural, social justice, and cross cultural education.

Approach created a strong class bond

From the students' own experience with the digital storytelling approach, they reported to have understood their classmates better through the stories. This knowledge helped them to respect each other as the stories helped to deal with some prejudices and stereotypes they held against one another. Some of the participants narrated that:

> *everybody has their own story to tell. So Digital Story allows you to tell your specific story and share it amongst everybody in your classroom. So yes, if you get exposed to another person's culture, surely you will respect that culture eventually and you will learn about that person and you see that person with more respect and in a better light.*
> *And we've experienced that in our class where you've learnt so much about people. Things that you didn't know and now suddenly you understand them better and you might not even relate but you've already seen it from their point of view. So it's quite a nice tool*
> *And you respect each other's reasons for teaching.*

Analysis shows that the students came to realize that minorities in classrooms may fail to actively participate due to the literacy practices and interaction of their culture being different from those in the classroom. The class-teacher and other students may interpret that those from the minorities are incapable or not cooperative. However, using digital story telling provided a platform to the minorities to make their voices heard and let others know that they are not linguistically poor students. This type of situation is echoed by Anstey and Bull (2006). In addition, Sylvester and Greenidge (2010) agree that "using this multimedia approach in the classroom helps students discover voices, confidence and structure in their writing".

Hammer and Kellner (2000) encouraged the use of interactive multimedia for curriculum delivery to bring individuals to real life; students encounter the "Other" as real individuals in audio artifact, video. They further argued that "these images can personalize individuals; they make it possible to experience the views, practices, and culture of groups outside one's life. In particular, multimedia can dramatize oppression, making intolerance and bigotry vivid, showing the evil effects of racism and prejudice".

CONCLUSIONS AND RECOMMENDATIONS

Given the challenges faced by multicultural classrooms in teacher education in our country, it is surprising that greater attention has not been paid to promoting integration and use of multimedia approach in the classrooms' in particular in the teacher education program. Digital storytelling as a teaching and learning approach has proven to aid creation and build communities, provide platforms for communication and reflecting on one's past.

It is interesting to note that the students who participated in the digital storytelling approach came away with a deeper understanding of one another's ethnic, racial and socio-economic backgrounds. The knowledge about other students enhanced the understanding and respect for one another in the class. The situation gave a practical example of what and how they would handle diverse classrooms when they begin their teaching career next year. Vaughan (2005: 30) also states that pre-service education programmes should recognize that multicultural

teaching is a valuable concept that will help future teachers to function more effectively in the classroom. Teaching students from culturally diverse backgrounds is going to be the norm for teachers in this century so we must prepare teachers to meet these challenges if they are going to be successful. Since it was noted that some students struggled producing their digital stories due to language as they were expected to complete their work in English, we therefore, suggest that culturally responsive instruction is proposed as a possible solution to the diversity issue. We need to be sensitive to the English second-language students and offer the students the opportunity to speak in their digital stories in their mother-tongue while displaying English subtitles.

Digital storytelling and meaning-making both inside and outside the classroom have earned their place by being the forefront of research at our university. While the teacher education students in the study perceived the approach as a technique which was useful in challenging ill issues of diverse classrooms, and therefore, recommended that the digital storytelling be introduced to student teachers right from the beginning of the teacher training programme, it appears that many lecturers are not ready to integrate the innovation in their curriculum delivery. Many have not yet adopted and made use of this new media in their teaching despite the access they have to the new technologies at the institution. Nevertheless, Elliott (2010) argued that "communication technologies have enabled higher education providers including education programmes to expand and enrich teaching and learning opportunities and pedagogies". Recent research in South Africa shows that "though, in most cases today, many lecturers would be familiar with technology in general, many are still not in a position to make informed judgments on the technologies to support their pedagogical goals" (Chigona & Dagada, 2011 citing Mishra & Koehler, 2006).

It is therefore recommended that teacher education programme instructors be equipped with technological pedagogical skills which will enable them to competently integrate the new technologies in their teaching and learning. There is also need for the institutions also to encourage the instructors to adopt the new technologies for teaching. The rationale here is that, since teachers teach the way they were taught (Britzman, 1991), the pre-service teachers would be able to integrate new technologies in their pedagogy if their teacher education lecturers used the technologies in their teaching.

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SAUDI SECONDARY SCHOOL TEACHERS ATTITUDES' TOWARDS USING INTERACTIVE WHITEBOARD IN CLASSROOMS

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ABSTRACT
The research aims at investigating the Saudi Secondary school Teachers' Attitudes towards using Interactive Whiteboard in the classrooms. The research uses the Quasi- Experimental approach, with one group (100) teachers, and limited to the Secondary school Teachers that enrolled in the first semester of (2011/2012) academic year. The research uses Interactive Whiteboard Attitude Survey, observation skill card for using Interactive Whiteboard in the classrooms and structured interviews with students. The results indicated that there were appositive attitude towards using Interactive Whiteboard. But a few number of teachers used effectively the Interactive Whiteboard effectively in the classrooms. These results indicated that the teachers need a professional development program for effective using of Interactive Whiteboard effectively to help them in improving their Teaching skills and the students learning. More details of the results are discussed in the study.
Keywords: Interactive Whiteboard, Teachers Attitude, E-Learning, Teaching Skills, Teacher Professional Development, Students learning

INTRODUCTION

Educational Technology plays an important role in Teaching and learning process, the main issue is how to have an effective using of educational technology in instructional practices in the classroom. Barbara Gruber (2011) investigated Initiative into the Classrooms, she argued that, the successful integration of a new technology is the goal of any educational technology initiative and it's especially critical when the initiative has substantial budgetary impact. (Gruber, 2011, p1).

Each equipments of a new technology has a chance to be involved in teaching and learning process, since the last 20 years, E-learning took a place in the classrooms as a new trend in using education technology. The E-learning is an important development taking advantage of computer technologies and software, communications and information, to be employed in the process of teaching and learning, where it has become one of the alternatives in the dissemination of education and activating the training, whether direct or indirect, overcoming the obstacles of space and time and risk, and provided for the teacher's experiences effectively, enriched the learning and development teaching, and has become a modern teaching method, employing modern communication mechanisms; to support the educational process, enrich and improve the quality. (Hussein, 2011, p43)

E-learning has many faces in classrooms; Interactive Whiteboard is one of many equipments of e-learning. Interactive Whiteboard is a large touch-sensitive and interactive display that connects to a computer and projector. A projector projects the computer's desktop onto the board's surface, where users control the computer using a pen, finger, or other device. (Gruber, 2011, p19).The Interactive Whiteboard software allows for teacher-cued animation; equations and word problems that can be retrieved, dragged, and dropped; projected information that a teacher can highlight, enlarge, or conceal; stored additional resources; and recorded student feedback. The Interactive Whiteboard allow for the creation of collaborative and interactive lessons by combining resources

with a trained instructor‘s ability to move and manipulate objects. (Essig, 2011, P3). In addition, Interactive Whiteboard allows teachers to do many rolls and got many benefits, for example, accessed and presented more relevant scientific content by linking to web resources and videos. Teachers can allowed students to manipulate variables, test predictions, and see phenomena that would otherwise be impossible to observe. (Schnittka ; Bell, 209, p.152).

There is an increasing awareness of the need to understand the match between technology and pedagogy in the development of interactive learning supported by the interactive whiteboard in schools (Glover; Miller; Averis, & Door, 2005, P155). Interactive whiteboard is becoming increasingly popular in schools outside the United States and the United Kingdom, Therefore, Many K-12 and higher-ed schools have made a substantial investment in interactive whiteboard technology. (Digregorio & Sobel-Lojeski, 2009, p255). Now Interactive whiteboards have been part of many Technological initiatives around the world; In Great Britain, Essig (2008) found that the Interactive whiteboards have been part of a nationwide ICT initiative in Great Britain for several years with national studies funded by the British Educational Communications and Technology Agency (BECTA) starting in 2003-2004.

The appearance of interactive whiteboards in schools has been accompanied by research that attempts to analyze their effects on teaching and learning processes. (Yanez & Coyle, 2011, p 446). Many studies related to the use of interactive whiteboards in educational settings have shown that interactive whiteboard technology can enhance presentations and developing student motivation and performance. (Syh-Jong, 2010, p1744). Therefore, the positive claims made concerning the benefits of learning through a pedagogy which makes use of an interactive whiteboard, leading to a rapid acquisition and implementation of the Interactive Whiteboard in schools. (Xu & Moloney, 2011, p 307).

Despite the availability of Interactive Whiteboard technology in a large number of schools, many teachers focus only on technical issues as opposed to pedagogical engagement in an attempt to incorporate the technology. Many researches suggest that the technology is being used for sophisticated transmission-style teaching as opposed to constructivist approaches. (Serow & Callingham, 2011, p 161).

The teacher's role has often been described as one of 'orchestration', and this musical analogy is a powerful one in characterizing the manipulation of features in the classroom setting in order to generate activity or 'performance' which leads to learning. However, a classical view of orchestration would fail to recognize the extent to which effective teaching and learning make use of serendipity and improvisation - characteristics more often associated with jazz. (Beauchamp; Kennewell; Tanner; Jones, 2010, p143). Teachers can use interactive whiteboards for wonderful interactive multimedia presentations for an entire class, combining many types of digital material with the touch of a finger, or they can use the boards with only a couple of students at a time. The presentations and student work can be annotated and saved. Interactive Whiteboards can be used with student response systems, visual presenters, podcasts, and much more. Used properly, they could even be the teaching tool that can compete for students' attention with TV, games, and other exciting external visual activities. (Doe, 2010, p30).

Many studies investigated the using of Interactive whiteboards in the classroom and its impact on Teaching and learning process. (Essig, 2008, p23). Including the effect of interactive whiteboards on pedagogy, motivation, interaction, perception, learning, and achievement. These effects are related to contextual factors such as teacher training, teacher confidence, school culture, technical support, lesson preparation and practice time. And support the classroom learning environment for increases in student motivation, student learning, and achievement. (Digregorio & Sobel-Lojeski 2009, p255).

The Technology integration using Interactive Whiteboard can potentially increase interactivity between teachers and students, enhance student engagement, support motivation and enjoyment, and ultimately increase student achievement, and the most important factor in enhancing learning experience is the perception of the teacher on their instructional methodology. if the teacher perceives that Interactive Whiteboard could enhance instruction and interaction, then the result could be a positive influence on students‘ learning. The most important factor in enhancing learning experience is the perception of the teacher on their instructional methodology. Therefore, if the teacher perceives that Interactive Whiteboard could enhance instruction and interaction, then the result could be a positive influence on students learning. (Essig, 2011, p41).

Many of research highlight that the best using of Interactive Whiteboard require teachers to have full understanding of interactive teaching and technology. Only in this condition, the results can have amazing effect on student learning. Therefore, Making the lessons more placement and enjoyable requires a good trainee teacher

that has a strong professional development program concentrates on changing teacher discourse. Otherwise the result will be very frustrated. (Essig, D, 2011, p41). When interactive whiteboards are used well they can increase student engagement and learning. This means that it is important to educate future teachers in how to use interactive whiteboards and how to incorporate them successfully into their teaching. (Campbell, Chris; Kent, Peter , 2010, p 447).

Gruber, Barbara (2011) examined the impact that a district-wide technology initiative involving interactive whiteboards had on teachers' attitudes, beliefs, and practices and whether this impact was consistent with the overall goals of the initiative. Findings examined patterns of use that emerged when a district-level Promethean board initiative was implemented, teachers' attitudes and beliefs related to the initiative, contextual influences on adoption of the innovation, and factors of social influence which impacted the initiative. The first goal established by the district for use of the Promethean board was generally met with some variations at the school and individual levels. However, the second goal directed at student achievement was poorly communicated and largely unmet. Patterns of use and teacher attitudes and beliefs were most strongly reflected in and influenced by four factors: professional development, school-based leadership, communication channels, and peer interactions. Together, these four factors were identified as the primary influences in the initiative's successes and limitations.

Essig, Dawn (2011). Aimed at making a better understanding of how classroom practices and perceptions change for teachers who participate in professional development. The study focused on how an interactive whiteboard professional development program for three elementary third grade teachers influenced changes in their pedagogy, technology integration of interactive whiteboard, and perceptions of students' learning of math concepts. The qualitative case study designed used interviews, classroom observations, field notes, and interactive whiteboard artifacts. The qualitative data were coded and analyzed using member checking and triangulation. The findings suggested that interactive whiteboard professional development that was ongoing and focused on content can lead to lessons that are highly scaffold, interactive, and interdisciplinary in their design. Findings also revealed that interactive whiteboard usage and purpose changed and teachers perceived that the interactive whiteboard enhanced the learning experience of the students. The social change implications for this study include the identification of an effective model of professional development that influenced change in classrooms.

Yanez, Lorena & Coyle, Yvette (2011) focused on interactive whiteboard use in a different learning context: an English language immersion class in a British primary school in Spain. Focus group interviews and annotated drawings were used with a class of NS and NNS children to identify their perceptions of the interactive whiteboards and how it helps them learn. Issues that emerged from the data included the children's desire to interact more with the interactive whiteboards, their frustration with frequently occurring technical problems, and the importance, particularly for the NNS, of the multimodal properties of the board.

Xu, Hui Ling & Moloney, Robyn (2011) presents a case study research which used both qualitative and quantitative data to collect teacher and student perceptions of the learning of Chinese through an Interactive Whiteboard pedagogy in one secondary school in Sydney, Australia, involving students in three levels of senior secondary school. The findings confirmed previous studies which stated that students endorse the use of new technology in education. Also the students believed that the Interactive Whiteboard was effective in enhancing various aspects of their Chinese language learning. The positive attitudes of the teacher towards the use of new technology in teaching was also found to play an important role in the implementation and success of the use of the Interactive Whiteboard and in turn led to the effective teaching and learning of Chinese.

Syh-Jong Jang (2010) integrates interactive whiteboard technology and peer coaching to develop the Technological Pedagogical Content and Knowledge (TPACK) of secondary science teachers in real classrooms. An interactive whiteboard based peer coaching model was developed. Participants of this study included four in-service science teachers. The sources of data included written assignments, reflective journals and interviews. The results displayed three major findings. First, science teachers used interactive whiteboards as instructional tools to share their subject-matter knowledge and to express students' understanding. Second, the interactive whiteboards helped the science teachers who encountered teaching difficulties in the traditional classroom better implement their representational repertoires and instructional strategies. Finally, the proposed model of integrating interactive whiteboards and peer coaching can develop the TPACK of science teachers.

Coyle, Yvette ; Yanez, Lorena & Verdu, Mercedes (2010) Analyzed the influence of the interactive whiteboard on the language use of a primary school teacher in monolingual contexts where English is the first language for learners, and a group of native speaker (NS) and non-native speaker (NNS) children in an English language immersion classroom. The study revealed that while the teacher used the interactive whiteboard to support the

children's learning by taking advantage of multimedia presentations in Numeracy and Literacy and by creating opportunities for the children to engage in tactile interaction with the board, opportunities to participate in the dialogic interaction beyond the production of one or two word utterances were much more limited and largely restricted to the NS children in the group. Since the failure to promote verbal interaction has important implications for the NNS pupils in the class, it is suggested that teacher education programmes should focus on developing teachers' classroom international competence as well as their technological skills.

Schmid, Euline Cutrim (2010) discusses the findings of a case study conducted with English as a Foreign Language (EFL) teacher at a German secondary school. This case study was part of a research project that investigate**d** the new competencies that EFL teachers need to acquire in order to be able to use the interactive whiteboard to develop their practice, informed by a socio-cognitive approach to computer-assisted language learning. The findings point**ed** towards various competencies developed by the teacher as she integrated the technology into her teaching, namely: (a) the ability to design interactive whiteboard based materials which support opportunities for learner interaction with the whiteboard and with the learning content; (b) the appropriate management of interaction around interactive whiteboards in a way that ensures all learners are provided with opportunities to become actively involved; and (c) the ability to find the 'right balance' of technology use.

Mercer, Neil; Hennessy, Sara & Warwick, Paul (2010) Focused on the use of interactive whiteboards as a tool for encouraging and supporting classroom dialogue. The authors' concern here was with the promotion of 'dialogic' communication between teachers and students, which is now widely recognized as educationally valuable. They investigated how teachers could use the technical interactivity of the interactive whiteboard to support dialogic interactivity. The design of the study was predicated upon a partnership between the authors and three UK (primary, middle school and secondary) teachers. Outcomes include illustrative examples of teachers' effective strategies for using the interactive whiteboard for orchestrating dialogue. Implications for teachers' initial training and professional development are considered.

Campbell, Chris & Kent, Peter (2010) indicates that a teacher's pedagogy or 'how they teach has a major influence on the quality of student learning outcomes. Thus how teachers use ICT' has a great effect on student outcomes. A range of pedagogical models concerned with the concept of authentic pedagogies are commonly used within Australian classrooms. Training designed for pre-service teachers dealing with the pedagogical application of interactive whiteboards is designed to guide and assess the implementation according to these pre-existing and widespread pedagogical models. They examine examples of how interactive whiteboards can be used in teacher education as well as how to integrate their use across courses that pre-service teachers undertake.

Lai, Horng-Ji (2010) explores secondary school teachers' perceptions of interactive whiteboard training workshops in Taiwan. Also sought to identify potential problems associated with the design of interactive whiteboard training workshops in order to improve their effectiveness. He employed observations and interviews to collect research data. Observations were made at the training sites, and interviews were conducted with six secondary school teachers from two junior high schools located in central Taiwan. The results suggest that teachers valued the benefits of using interactive whiteboard in classrooms and recognized the necessity of attending training workshops. And the teachers also emphasized that knowing practical interactive whiteboard uses was extremely important and helpful to them to integrate this promising tool meaningfully into their teaching.

Mathews-Aydinli, Julie and Elaziz, Fatih (2010) Explored the attitudes of students and teachers toward the use of interactive whiteboards in a foreign language teaching and learning context. Also they investigated possible factors affecting teachers' and students' attitudes toward interactive whiteboard technology. Data were collected through questionnaires distributed to 458 students and 82 teachers in different institutions across Turkey, ranging from primary schools to universities. Questionnaire results revealed that both students and teachers have generally positive attitudes toward using of interactive whiteboard in language instruction and are aware of the potential uses of this technology. The result revealed that the more teachers use interactive whiteboards, the more they like this technology. It was also found that as the number of hours of interactive whiteboard exposure increases, students' awareness of the distinctiveness of interactive whiteboard technology increases. Suggestions are made for further research and for administrators considering whether or not to invest in interactive whiteboards.

Lisenbee, Peggy Suzanne (2009) aims to investigate student's behavior, engagement level, and representation during storytelling using an interactive whiteboard. The intention of examining these constructs during storytelling was to provide a way to understand and explain how using an interactive whiteboard influences

students. The research questions were: 1. in what ways does using an interactive whiteboard can influence students' representations of the story during storytelling? 2. In what ways does using an interactive whiteboard can influence students' behaviors during storytelling? 3. In what ways does using an interactive whiteboard can influence students' engagement levels during storytelling?. The purpose of this descriptive naturalistic study was to contribute to understanding of students' use of technology by identifying behaviors, engagement level and representations of thought during a storytelling experience. The researcher observed children storytelling using an interactive whiteboard in their classroom and interviewed them about their experience. The intention of examining these constructs was to descriptively explain the phenomena so a general understanding of student's behavior, engagement level and representations as they used an interactive whiteboard was provided.

Morgan, G. Lyn. (2008) examined the impact the interactive whiteboard use on student engagement and appropriate at-task behaviors of junior high school students. Two hundred twenty-six students at two public schools in northeast Florida were observed during the second quarter of the school year. Data were collected using an at-task checklist, and students completed an attitude survey regarding their perception of their own engagement and enjoyment with interactive whiteboard use. Significant differences were noted in student behavior between instruction without interactive whiteboard use and instruction with interactive whiteboard use. No significant correlations were found between the variables gender and ethnicity and improved student behavior. Results indicated that the use of interactive whiteboard as an instructional tool has a beneficial effect on student engagement in classroom lessons and led to improved student behavior. Suggestions for further research were incorporated as part of the study results.

THE STUDY

The aims of this research were investigating the Secondary school Teachers Attitudes towards using Interactive Whiteboard in classrooms. Moreover, how their performances in using Interactive Whiteboard at classrooms were? The research team selected the sample by sending an online questioner to the most secondary school teachers in Riyadh city which enrollment in the first term of (2011/2012) academic year, to answer if they use Interactive Whiteboard (which called locally smart board) and decided if they want to participate in the research. We received (300) acceptance responses, we chose randomly (100) secondary school teachers to be the research sample, their specialties explained in table (1).

Table (1) the secondary Teachers Specialties

Code	Subject	Numbers
1	Mathematics	30
2	Arabic Language	20
3	English	25
4	Computer	15
5	Islamic	10
	Total	100

The research used three instruments, the first instrument was Interactive Whiteboard Attitude Survey, which developed by the research team from many Attitudes inventories, questionnaires and surveys (for e.g.: Whiteboard Attitude Survey which developed by (Morgan, 2008), The Computer Attitude Questionnaire (CAQ) which developed by The Technology Applications Center of Educator Development). The survey responses were graded according to five point Likert scale (Strongly agree - agree - neutral - refuse - strongly refuse). The validity and reliability were ensuring. The survey final form is composed of (20) items, which divided into (4) Domains (personal view, the Interactive Whiteboard roll in professional development, the Interactive Whiteboard role in devolving the students academic performance, The Interactive Whiteboard role in keeping peace with Technological Innovations). (Appendix 1). The second instrument was observation skill card for Teachers who used Interactive Whiteboard in classrooms (Appendix 2). The third instrument was structured interviews to identify the benefits of using Interactive Whiteboard in classrooms from the viewpoint of secondary school students. In addition, the researches tried to answer the following questions:

1. What are the Secondary school Teachers Attitudes towards using Interactive Whiteboard in classrooms?
2. What are the secondary school teacher's levels in using Interactive Whiteboard in classrooms?
3. What are the benefits of using Interactive Whiteboard in classrooms from the viewpoint of Secondary school students?

FINDINGS

The total Survey items were (20), and then the final score of any participant didn't exceed (100) degrees. Statistical coefficients of the Survey calculated to determine the attitudes of Secondary school Teachers Attitudes towards using Interactive Whiteboard in classrooms; they are shown in the following tables:

Table (2) shows the Attitudes of Secondary School Teachers

		The first domain: personal view	The second domain: Teachers professional development	The third domain: devolving the students academic performance	The forth domain: keep peace with Technological Innovations	Over all
Average		27.11	16.78	21.64	12.95	78.48
Percentage Ratio		67.11	83.9	86.56	86.33	78.48
Std. Error of Mean		.282	.198	.233	.15723	0.676
Standard deviation		2.817	1.983	2.329	1.57233	6.766
Variance		7.937	3.931	5.425	2.472	45.78
Rang		4	3	4	4	37.00
One-Sample t-Test	t	-81.248	-167.553	-121.764	-235.638	42.08
	df	99	99	99	99	99
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000

The previous table shows that Secondary School Teachers revealed positive attitudes towards using Interactive Whiteboard in classrooms. in general terms as the average degree of the group in the scale represents (78.48 degree) (78.48 %) of the total scores. At the Domains level, survey results indicated that there were positive attitudes of the Secondary School Teachers towards using Interactive Whiteboard in classrooms, the highest score was for the Third Domain (the Interactive Whiteboard role in devolving the students academic performance) which representing (21.64 degree) (86.56 %), followed by the forth Domain which representing (12.95 degree) (86.33%), followed by the second Domain (the Interactive Whiteboard role in professional development) representing (16.78 degree) (83.9%), and finally by first Domain (personal view), representing the lowest score (27.11) (67.77 %). And all differences were significant at (0.01) level

About the significant of differences between domains, they showed in the following table:

Table (3) shows the significant of differences between domains of the Teachers Attitudes.

Domain		Sum of Squares	df	Mean Square	F	Sig.
The first domain	Between Groups	1180.950	4	295.237	8.367	.000
	Within Groups	3352.010	95	35.284		
	Total	4532.960	99			
The second domain	Between Groups	187.080	4	46.770	7.421	.000
	Within Groups	598.710	95	6.302		
	Total	785.790	99			
The third domain	Between Groups	71.033	4	17.758	5.303	.001
	Within Groups	318.127	95	3.349		
	Total	389.160	99			
The forth domain	Between Groups	80.457	4	20.114	4.185	.004
	Within Groups	456.583	95	4.806		
	Total	537.040	99			
Over all	Between Groups	29.260	4	7.315	3.225	.016
	Within Groups	215.490	95	2.268		
	Total	244.750	99			

The previous table shows that, the differences between domains of the Teachers Attitudes are significant at (0.001) levels.

The second instrument, the observation skill card for using Interactive Whiteboard in classrooms, revealed that (42 %) of research sample teachers used the Interactive Whiteboard to write on it as a normal Whiteboard, (28%) of teachers use the Interactive Whiteboard to show the power point presentations, (19%) of teachers used the

most feature of Interactive Whiteboard but with out students participations the rest (11%) of teachers the most feature of Interactive Whiteboard with fully students participations. which means (90%) of teachers in research sample doesn't use the Interactive Whiteboard in right way. In general the teachers identified many obstacles in using Interactive Whiteboard in classrooms that refers that they don't have the essential training in using it effectively. This result means that the teachers need urgent, essential and advanced professional development program to use the Interactive Whiteboards in an effective way.

The structured interviews with secondary school students revealed that the student, who studied with teachers using the most feature of Interactive Whiteboard with fully student's participations, concluded that using interactive Whiteboard : raise their motivation, engagement in classroom lessons, lead to improved their behavior, helped them to gain a greater understanding of the subject matter, Increase their motivation to learn, develop their academic performance, and enhance their ability to recall and retain information.

DISCUSSION

These results indicated, firstly the effectiveness of using Interactive Whiteboard in developing the learners' skills, Motivations, perception, attitudes, attention, behavior, level of interaction, learning, pedagogy, and enriching the environment within the learning communities. (Digregorio, & Sobel-Lojeski, 2009); (Yanez, & Coyle, 2011); (Xu & Moloney, 2011); (Coyle ; Yanez & Verdu, 2010); (Schmid, 2010); (Mercer; Hennessy & Warwick, 2010), (Morgan, 2008).

Secondly, the result indicated the secondary school teachers need professional development programs in effective using of Interactive Whiteboard to help them in improve their Teaching skills and the students learning. (Essig, 2011); (Xu & Moloney, 2011); (Coyle; Yanez and Verdu 2010); (Campbell; Kent, 2010); (Schmid, 2010); (Mercer; Hennessy and Warwick, 2010) ;Campbell & Kent, 2010); (Lai, 2010).

Thirdly the students' viewpoint towards the interactive Whiteboard was consistent with (Xu & Moloney, 2011); (Lisenbee, 2009); (Morgan, 2008).Which indicates that, the students will have a positive attitude if the teachers use it in an effective way. Finally the result indicated the need to change the school culture, classroom pedagogy to support enthusiastic and innovation in teaching and learning (Schuck & Kearney, 2007); (Glover et al., 2005a, 2005b, 2007); (Lewin, Somekh, & Steadman, 2008).

ACKNOWLEDGEMENT

the Authors extend their appreciation to the Deanship of scientific research at King Saud University, for funding the work through the research group project No: (RGP – VPP - 132).

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Appendix (1)

Survey of Saudi secondary Teachers Attitude towards Interactive Whiteboard

No	Statement	Responses				
		1	2	3	4	5
1	Interactive Whiteboard gives me more opportunities to teach my student new things					
2	I am tired of technology use in the classroom					
3	interactive whiteboard gives me more time to interact with students					
4	interactive whiteboard help me to teach easier					
5	If I know how to Use an interactive whiteboard I will be able to get a good job					
6	I believe that it is important for me to be able to use technologies such as the computer and the interactive whiteboard					
7	I feel comfortable when I use the interactive whiteboard in Teaching					
8	I feel confidant using interactive whiteboard to design new instructional situations.					
9	Teaching with interactive whiteboard makes student Happy					
10	Using the interactive whiteboard does not scare me					
11	I can concentrate better in teaching practices when I use the interactive whiteboard					
12	Using interactive whiteboard required Hard Work Outside Class					
13	Using interactive whiteboard allows me to share learning resources with other teachers					
14	Using the interactive whiteboard does not make me nervous					
15	interactive whiteboard restrict the movement of students in the classroom					
16	Using the interactive whiteboard is Difficult because its need for an educational model					
17	Using the interactive whiteboard provides Teachers many of the multimedia Resources					
18	Using the interactive whiteboard help me to deal with new technologies.					
19	Using the interactive whiteboard is very expensive					
20	Using the interactive whiteboard Requires high experience in Teaching					

1: Strongly Disagree; 2: Disagree; 3: neutral; 4: Agree; 5: Strongly Agree

Appendix (2)
Interactive Whiteboard Teachers Skills

N	Skills	To what extent The teacher has the skills				
		1	2	3	4	5
	Domain One: Using Interactive Whiteboard System					
1	Using Projector					
2	Using Interactive Whiteboard					
3	Using the Extended Control Panel (ECP)					
4	Using the RCA Connector Pod					
5	Using the laptop computer					
	Domain Tow: Integrating other devices					
1	Adjust Video format					
2	Adjust HD and SD signal format					
3	Adjust Video system signal					
4	Connecting peripheral sources and outputs					
	• Connect a laptop computer					
	• Connect a DVD/Blu-ray player or similar device					
	Domain Three: Maintaining interactive whiteboard					
1	Cleaning the projector					
2	Focusing and adjusting the projector image					
3	Replacing the projector lamp					
	• Removing and replacing the projector lamp module					
	• Resetting the lamp timer					
	Domain Four: Using interactive whiteboard in Teaching					
1	Navigate the operating system.					
2	Save and open files.					
3	Management Files.					
4	Click and Drag.					
5	Dealing with the square of the main tools					
	• Create an new illustration					
	• Opening and closing of the planned demonstration					
	• Save a demonstration scheme					
	• Customize the toolbox: (size - direction - color).					
6	Dealing with the toolbar of demo planned					
	• Insert a new pages .					
	• Jump between pages.					
	• Change the page setup.					
	• Specific page.					
	• Organizer page.					
	• Reset Page.					
7	Dealing with the main toolbox : Store tools .					
	• Instrument in writing texts					
	• Tool for keyboard floating					
	• Revealer Tool					
	• A tool to highlight					
	• Zoom tool					
	• Organization of the tires.					
	• Undo tool - a tool-off (Cancel decline).					
8	Dealing with library resources					
	• Drag and drop					
	• rubber stamp					
	• larger objects					
	• transparency					
9	Dealing with advanced tools					
	• Dice					

N	Skills	To what extent The teacher has the skills				
		1	2	3	4	5
	• Builder fracture					
	• Calculator.					
	• The camera					
	• Pass-through text messaging					
	• Indicator & Observations.					
	• Timer					
	• Sound Recorder					
	• Add an audio file to a library of resources					
	• Dealing with the shortcuts bar					
	• Video					
	• Linking the object in the chart					
	• Show objects and not to show the procedure					
	• Export diagrams to a file (Word, Power point, PDF, Html, Flash)					
	• Import a file (Power point) Presented as a blueprint for a demonstration.					
	• Print the chart illustration with all the options					

1: the low; 5: the best

STORYTELLING SUPPORTED BY TECHNOLOGY: AN ALTERNATIVE FOR EFL CHILDREN WITH LEARNING DIFFICULTIES

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ABSTRACT

This action research aims to investigate how technology improves the conditions of storytelling to help enhance the learning attitude and motivation of EFL children with learning difficulty using power point designs and an online recording system—VoiceThread (http://voicethread.com/). The use of power point designs is to assure children of clear illustrations and print during storytelling. VoiceThread is used to present the story with audio and visual aids to help children review keywords and read aloud simple summarizing sentences. By online practicing, children were more involved in the storytelling and language acquisition process, chances rarely available in the regular class. Twenty Taiwanese EFL children determined learning-at-risk took part in this one-year project; survey questionnaires, storytellers' ethnographic notes, and teacher interviews were collected to examine the progress in terms of their changes in attitude, motivation, and responsiveness to storytelling and English learning. Results showed that the improvement in the task of reading aloud was of small magnitude; their attitude and motivation, however, did improve noticeably in their more active responses to the stories presented using technology and more cooperative behavior in related activities.

INTRODUCTION

This paper describes a one-year remedial storytelling program supported by technology to help enhance the learning attitude and motivation of EFL children with learning difficulty. These children are usually labeled as "underachievers" due to reasons so varied that general remedial interventions are often unsuccessful. Low motivation is the usual explanation for children's lack of success in school, but it is more likely the lack of appropriate methodology and materials that can help motivate their learning interest is to blame. Researchers have argued that learners acquire language by obtaining quantity and quality comprehensible input (Krashen, 1985), and that young children, especially, are not "taught" language in any formal sense along the stages of language development, but acquire it naturally (Chomsky, 1972). Chomsky suggests that adults should encourage children to read and provide them with rich language exposures in "interesting and stimulating situations" (p. 33). Storytelling by adults is considered one crucial step that makes input comprehensible and interesting (Smith, 1988). Therefore, the first question of this study was whether storytelling could serve as a better alternative to help disadvantageous children acquire English.

Instructional technologies involving multimedia tools have been widely used in second language classrooms (Heath, 1990; Meskill, 2005). There also have been trials to use computer for at-risk children who do not seem to be motivated by school based materials and activities (Burns, Griffin, & Snow, 1999; Heath, 1990; Meskill, 2005). Research has found that computer technologies help teachers create a context to "capture and maintain learner attention in ways unlikely to occur offline" (Meskill, 2005, p. 55). The present study, secondly, took the merits of computer technologies to fortify the effects of storytelling for children of similar characteristics in the hope of inciting children's positive change in attitude, motivation and behavior toward learning EFL.

Storytelling and Language Acquisition

Why storytelling? Studies have shown that successful approaches to storytelling, approaches that make the story comprehensible and absorbing, vary according to children's needs, and are tailored to the child's reaction and to the interactional situation between the child and the storyteller. In the studies examining mother-infant dyads, mothers used a variety of elicitation formats during joint picture-book reading with children, e.g. labeling, imitating, expanding, and pointing. These alternatives explain why story reading helps children develop their expressive language, syntactic and vocabulary knowledge (Ninio, 1983; Whitehurst, Falco, Lonigan, Fischel, DeBaryshe, Valdez-Menchaca, & Caulfield, 1988). It has also been found that a picture book reading intervention using these approaches is beneficial to children with low SES background (Akhtar, Jipson, & Callanen, 2001; Lonigan & Whitehurst, 1998).

Regardless of the plethora of studies advocating the benefits of storytelling in L1, research of this sort with EFL/ESL children is rare. One of the handfuls of them is Elley's study in Singapore (1989). It was found that

storytelling resulted in a 15% improvement on vocabulary for ESL children when a story was told once; but their improvement increased to 40% when the story was repeated three times with words clearly explained by teachers. Elley and other researchers maintain that "predictable books" with highly interesting illustrations and repetitive structure and vocabulary are ideal for EFL children's literacy development in the target language (Linse, 2007), believing that EFL/ESL children go through a similar language acquisition process as native speaker children do (Dhaif, 1990). Of great relevance to this discussion is Elley's finding that less proficient children gained at least as much as their more proficient counterparts and that acquisition was confirmed as permanent when measured on a delayed test.

Storytelling as a way of teaching children English has been blooming in recent years in Taiwan. For EFL kindergarteners, Chien and Huang (2000) found that predictable storybooks are effective in building children's oral ability and literacy development. Storytelling is also an equally conducive approach to teaching EFL children of lower ability. Tyan and Shen (2003) reported that less able students were more enthusiastic than their more competent peers about stories read to them by teachers, who helped make the stories more comprehensible. The question that remains is whether storytelling can eventually bring EFL children to the stage of reading independently. The only study that addresses this question is done by Wang and Lee (2007) who documented how 10 EFL children became independent and enthusiastic readers in their fourth year, a phenomenon rarely occurring in language art class in Taiwanese public schools. These children had attended twice-a-week story sessions since grade one, with little English background, hearing stories based on picture books with few words. Starting in year three, a 10 to 15 minute sustained silent reading time was provided. Most children were able to read chapter books, such as *Marvin Redpost* by Louise Sachar.

While Wang and Lee's results may be suggestive because of the lack of an experimental design, one case study with children of low ability has provided more convincing support with language measures and class performance evaluation (Juan & Cheng, 2008). The three children placed in the remedial class read storybooks with a partner who helped explain the story when necessary, three times for each book, for one semester. Results show that all three children improved in the letter identification test, the word recognition test, and the measure of reading accuracy, but one "was able to perform at an above average level in their regular English class after the program was completed."

These studies indicate that the storytelling-to-independent-reading path can serve as a model of EFL classes for children of normal and lower proficiency levels, supporting Trelease's assertion that that read-alouds help build children's aural literacy, which in turn pave the way to independent reading (2006). Once independent reading is achieved, the power of reading will lead the learner higher levels of competence (Krashen, 2004).

The Intervention of Technology

For children in need of special attention and extra help, listening to stories without seeing the illustrations and words could be challenging both aurally and visually. It has been established that illustrations can enhance vocabulary acquisition (Elley & Mangubhai, 1983; Jawitz, 1993). For this reason, "big books" have been developed for the purpose of shared reading in the family or primary education for L1 children (Colville-Hall & O'Connor, 2006). More and more EFL teachers have started to use big books for the same reason, but there are still problems. One problem is physical: For a class of 30 or sometimes more, the teacher has to hold the book, walk around, or place the book in front of the whole class; both are difficult to do. Another problem is the fact that some children have a short attention span. This project attempted to solve the problem by using power point designs. The storyteller can choose the illustrations as well as sections of stories while still maintaining the coherence of the entire story. The story is projected from slides on the big screen in the classroom, and sound effects and motion features are added in order to direct children's attention to the story, the illustrations, and the print. In this way, without holding the book, the storyteller can use his/her body language, voice and gestures to create a vivid storytelling experience, similar to the experience of seeing cartoons or reading manga (See Figure 1).

VoiceThread is an online conversation social network, equipped with a variety of functions and tools for users to create their Internet community, for teachers to design their curriculum, and for learners to do more teacher-directed or self-instructed practices. Because users can practice and listen to themselves repeatedly and revise before publishing their recordings, the VoiceThread system has the potential to give students a greater sense of self-efficacy and task involvement (Ducate & Lomicka, 2009; Stanley, 2006). The main tools applied in this study were the imaging, doodling, and recording functions. On the VoiceThread page, teachers can upload the storylines and pictures as visual aids; then they can record their reading of the story for children to listen to as many times as needed. The doodling function with use of the color marker is designed to direct children's attention along the words and lines. In addition, the icon of each member shown on the same page creates a

feeling of "club membership" (Smith, 1988) and cooperation (See Figure 2), because all children can stay around, hear their peers record their readings, and give support and help.

Using PPT designs to present stories may not be new. The use of the VoiceThread system has also been popular in education at all levels and for many different subjects, including teaching foreign languages (see http://voicethread.com/about/library/ for comments from teachers who have been utilizing the system). No studies have been done, however, to examine the application and usefulness of these technologies for teaching a foreign language to children with learning difficulties. The second aspect of this study thus investigated if using technology helps children comprehend the stories better, improve their learning motivation, and enhance their English learning in the regular English class.

Figure 1. The Power Point Slides of *Little Beauty*

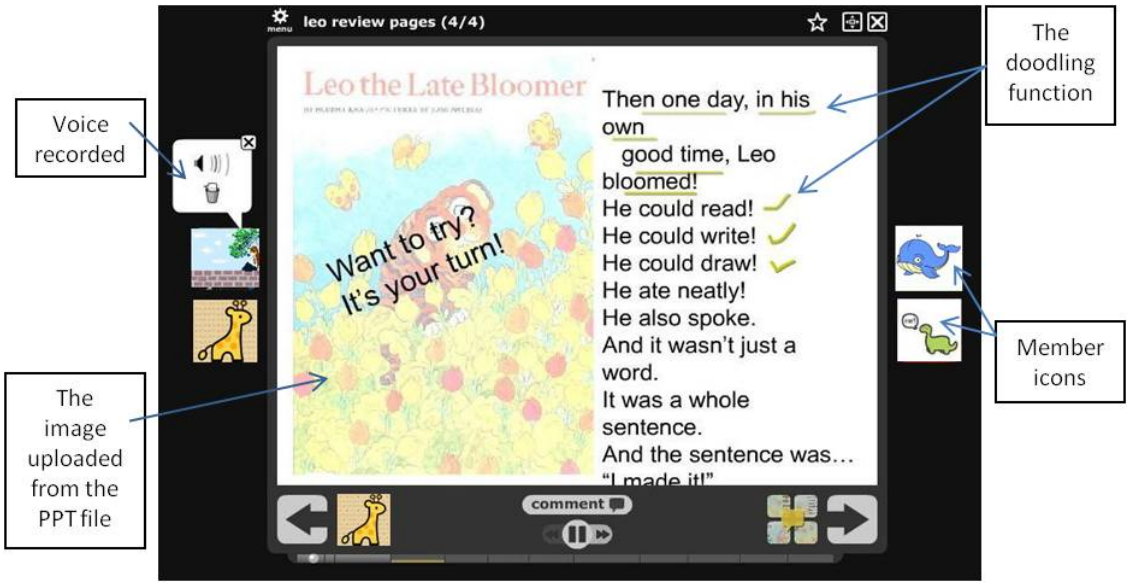

Figure 2. The VoiceThread Page

METHOD

This one year project followed the action research procedure with ethnographic observation and notation to record changes in the children's behavior during the course of the study. The storytelling sessions were held once a week for 35 minutes. A storytelling cycle was designed starting with the storyteller read aloud the story using PPTs, followed by activities to help enhance children's comprehension and interest, and ended with the reviewing and recording practices online.

Pupils

Twenty pupils, 2nd to 6th graders, were "pulled out" from their regular classes to participate in the storytelling sessions. All were recommended by their homeroom teachers and had problems in learning in nearly all school subjects.

The children's family backgrounds were determined through a three-hour teacher interview conducted by the researcher. Eleven out of the 20 children came from families with single parents, mothers from South East Asia and low in Mandarin language competence, or with grandparents as their care givers.

The interviews revealed that the children tended to be uninterested and unmotivated in learning English. They had rarely been read to, either in English or Mandarin, and many of their parents were not readers.

Storytellers

Eight university students, English majors in the Department of Foreign Languages and Applied Linguistics at a national university, were selected to tell stories to children. All of them had taken three courses related to English teaching. They were at the meantime taking other teacher training courses at the Center of Teacher Education during the project. Four of the students had had one year of storytelling experience and could offer suggestions to other storytellers when discipline and emotional problems occurred.

Procedure of Data Collection

Different kinds of data were collected at different stages during the study:

1. The first survey with children was done at the end of the first semester (Jan, 2011), aiming to get children's reactions to storytelling and the related activities.
2. Interviews with the two English teachers were conducted in the second semester (April, 2011), to obtain further background information for each pupil as well as any changes observed in the regular English class.
3. The second survey with the children was done at the end of the second semester (June, 2011) to get more reactions, including their overall response to the weekly storytelling after one year, perception of the impact of storytelling on their English learning, attitudes toward the use of technology and the activities, and their feeling about the storytellers.

4. Storytellers' notes were collected at the end of the first month of the storytelling sessions (October, 2010) and the second semester (June, 2011). These notes recorded children's behavioral, motivational, and attitudinal changes throughout the one year program.

The Storytelling Cycle

There were 12 weeks available for the storytelling sessions, a total of 24 for the academic year. During the first semester, storytellers read and told stories from storybooks, which was followed by review activities (e.g. games, songs, drawing, etc.), and then proceeded with the recording practice with each child. As noted earlier, simple visual presentation of the books were not ideal. When storytellers held the book and acted out the story at the same time, most children were easily distracted and became impatient, complaining that the story was boring. To solve the problem, i.e. to help children concentrate better and view the pages more clearly and comfortably, it was decided to edit the story pages on the power point slides projected to a big white board. The story cycle was thus formed as follows:

1. Week 1: Storytellers told a story using power point slides, explaining the story, words or expressions using drawing, translation, or body language.
2. Week 2: Storytellers did activities related to the story with children, using songs, games (puzzles, Q & A, TPR, etc.), drawing (hand crafted books), story chain (short sentences, key words), and role play (reader theatre).
3. Week 3: Children listened to the story again as well as short sentences that summarized the story on the VoiceThread page, and with storytellers' help children began reading the summary sentences out loud.

At the end of the program, eight stories were read aloud to children, and five recordings were completed. The ratings of the five recordings, however, were unable to show any significant development, due to the fact that some children's voices were too low for raters to give accurate judgments. This part was deleted from the results. Also, recording was not done with the five 2nd and 3rd graders, since the storytellers felt that their English competence was too weak to do this task. Thus, providing input using storytelling was the main task with these lower graders.

RESULTS AND DISCUSSION

Results of Teacher Interviews

The first part of teacher interview was intended to obtain the pupils' family and learning backgrounds and was presented above. In this section, teachers' teaching style and beliefs are discussed.

Both teachers had to follow the school-regulated curriculum using textbooks and would tell one or two stories each semester if time allowed. They acknowledged that children enjoyed hearing stories, but did not seem confident about the impact of storytelling on English acquisition,

> *"It is really difficult to observe any noticeable change in their English ability with this only-once-a-week storytelling activity."*
>
> *"Yes! They'll come and tell me what they heard in today's session excitingly; but their test scores are still at the bottom…"* (translated from Mandarin)

The teachers noticed, however, that the children became very positive about attending this remedial session after a few weeks. Some children told them about the story they were read to that morning and showed more cooperation in the English class. This attitudinal change and change in their responsiveness have been confirmed by storytellers' observations and pupil interviews.

Results of Storytellers' Observational Notes

Storytellers' notes were collected twice, as previously described. The first set of notes contained information related to motivation, behavior, and attitude. The following were selected from the first set of notes:

> *"The children did not know why they had to be away from their classrooms. They often complained about the boredom of the stories and wanted to return to their own classrooms to do the homework they were supposed to have finished before coming to school."*
>
> *"Pupils often ran around the room or fought with others (Tim and Ted), and some just completely ignored the storytellers and played whatever they had brought with them, even a pencil, or strips of papers."*
>
> *"Three pupils (Rita, Bike, & Ted) told the storytellers that they simply did not like English, no matter what storytellers did."*

"Some pupils said they would not come if they had to do recording."

Most pupils exhibited behavioral problems, low motivation and poor attitudes, while others were indifferent.

Notes taken in the second semester revealed a great change in pupils' attitude, behavior, interest, motivation, as well as responsiveness during the sessions:

"Bike initially showed no interest in storytelling, but now gets the keys from the main office and opens the classroom. He has also become quieter in the storytelling sessions and would raise his hands to answer questions."

"Mandy loved stories and told her storyteller that she hoped to improve in English faster. She was now very responsive to the stories and the related games!" (Note: Mandy's English teacher said Mandy was "very" quiet in the regular English class.)

"Pupils were active in taking part in the activities after storytelling, which were often competitive. In order to win the game some pupils helped each other find answers in the stories. Jason would teach Ted how to read when they were on the same team."

"Rita, another child who had hated English, didn't want to take the candy, because she thought that was the last story she'd hear." (Note: Candy and gifts are often given in the last class as a farewell gift.)

"Ted would now ask the storyteller to help him practice the sentence before recording."

"Tim, who had not liked English, now liked both the story session and the English class!" (Note: Tim's teacher did not mention this change in Tim in the interview.)

"David would now visit the school library for the books he was read to before."

"Kevin was much more cooperative in reviewing the sentences and recording his own reading!"

Results of the Two Surveys

The results of the two surveys (Tables 1 and 2) confirmed the changes recorded in the storytellers' notes. The use of power point slides began in the second semester, thus seven questions were added in the second survey to determine how children responded to this new treatment.

Table 1. First survey with pupils after one semester

		No	Not sure	Yes
About storytelling				
1	Listening to stories help me learn new words.	0	7	13
2	Listening to stories help me learn new sentences.	1	7	12
3	Listening to stories help me improve my pronunciation.	0	7	13
4	Listening to stories make me more interested in reading English stories.	6	8	6
5	I feel stressed when the story is told all in English.	9	8	3
6	I prefer the story session to the English class.	4	9	7
About recording				
7	I practice my pronunciation before recording.	2	6	12
8	I feel particularly nervous before recording.	7	2	11
9	I feel nervous when listening to my own voice.	11	7	2
10	I try to imitate my storyteller's pronunciation when recording.	9	6	5
11	I am happy when I can read a complete sentence when recording.	8	6	6
12	I like doing recording.	6	1	13
About the activities				
13	I like the follow-up games and activities after storytelling.	0	2	18
14	I like to hear different stories every week.	8	12	0
15	I like to hear a story followed by activities and games.	0	8	12
16	These activities or games help me understand the language better.	2	7	11
About the storytellers				
17	I like my storyteller.	0	2	18
18	I like to read English because I like my storyteller so much.	9	7	4
19	I like to come to the story session more because of the gifts given by the storytellers.	5	9	6

Table 1 shows that the storytelling sessions had changed children's attitude toward English learning to some extent, compared to their initial reluctance and resistance in the first month. Ninety percent of the children liked their storytellers (item 17), but that did not seem to alter some children's negative attitude toward listening to English stories (45%, item 19). It was encouraging to know that five of the children liked to come to the storytelling session not because of the candy given out. Most children liked the activities designed to review the stories, words, phrases, or short sentences (90%, item 13), and more than half of them liked to listen to stories (60%, item 15) and believed that the follow-up activities did help them understand the language better (55%, item 16). Eight children chose not to listen to different stories every week but preferred the activities done in the following two weeks (item14). This result might indicate that these children need more time to digest the story and these activities are successful in boosting their learning interest.

As for the recording activity, 65% of the children now liked doing recording (item 12), and 60% would practice before recording (item 7). Fifty-five percent felt particularly nervous before recording (item 8), but six felt happy, or had a sense of achievement, when they could read a complete sentence (item 11). Five of the children said that they would try to imitate the storytellers' pronunciation when practicing and recording (item 10). Interestingly, one storyteller noted that

> *"those who were nervous when recording are also the ones who pay more attention to their performance. It reminds me of the 'facilitative anxiety,' or what Krashen called 'optimal' amount of anxiety, that may play a key to successful language learning, or at least better performance."*

Generally speaking, after one semester, more than half of the children became more positive toward English storytelling that involved listening and practicing online. Twelve to thirteen children (60 to 65%) believed that listening to English stories helped them learn new words and remember them (items 1 and 2); they also believed that listening to stories helped improve their pronunciation (65%, item 3). Six of the children (30%, item 4) said that they became more interested in reading English stories, and seven (35%) preferred the story sessions to the regular English classes (item 6).

Table 2. Post survey (questionnaire) with children after the second semester

N = 20	**Disagree**	**Slightly Disagree**	**Slightly Agree**	**Agree**
1. Overall response to the weekly storytelling activity				
a. I am no longer that afraid of learning English	3	0	3	14
b. I have even begun to like learning English	2	0	2	16
c. I want to attend every storytelling session	2	0	3	15
d. I like listening to English stories more and more	1	1	5	13
2. The impact of storytelling on English learning				
a. It helps me do better in English class	1	1	2	16
b. It helps me understand the class material better	2	2	2	14
c. English assignments have become easier	3	1	2	14
d. I have become more interested in participating in Q&A practice in English class	3	1	2	14
e. It makes my teacher's English easier to understand	1	4	3	14
3. About the technological support				
A. About the use of PPT designs				
a. It helps me concentrate better during storytelling	1	0	1	18
b. It helps me comprehend the stories better	1	0	5	14
c. It helps me see the pictures and words in the stories better	1	1	2	16
d. It helps me remember the story better	2	4	3	11
e. It helps me remember the words better	2	1	4	13
f. It helps me remember some simple sentences better	2	1	3	14
g. I become more interested in listening to English stories	1	3	3	13
B. About VoiceThread recordings (N = 15)				
a. I have more opportunity to practice reading (aloud)	3	2	2	8
b. I pay more attention to my own pronunciation	2	0	1	12

c. I practice my pronunciation before recording	3	1	3	8
d. I imitate my storyteller's pronunciation	2	3	1	9
e. I recognize more English words	1	0	5	9
f. I remember some simple sentences better	1	2	1	11
g. I am more likely to respond to questions in the English class	2	0	5	8
h. Reading English (aloud) has become easier	1	3	1	10
i. I am happy when I can read complete sentences when recording	4	1	2	8
j. Listening to stories is becoming easier on the VoiceThread page	3	0	5	7
k. The mobile color markers on the VoiceThread page help me follow along the sentences better	1	2	4	9
l. I feel particularly nervous before recording	1	0	2	12
4. About the follow-up activities				
a. I like the activities and games after storytelling	0	1	1	18
b. The follow-up activities help me review and practice the language in the story	3	0	2	15
c. The follow-up activities help me understand the story told by the storyteller	0	3	2	15
d. The Reader Theater activity is very interesting (for 4^{th} – 6^{th} graders only, n = 15)	1	0	1	13
5. About the storytellers				
a. My storyteller is very friendly	0	0	1	18
b. My storyteller is very patient	0	0	0	20
c. My storyteller reads the stories very interestingly	2	0	0	18
d. I like my storyteller	2	0	2	16

The second survey questionnaire included more items and used a six point Likert Scale, from *Strongly Disagree* (1) to *Strongly Agree* (6). The items, *Slightly Disagree* (3) and *Slightly Agree* (4), were considered equivalent with "*Not Sure*" in the first survey and were intended to probe children's attitude more precisely. In addition, in Table 2, *Strongly Agree* (6) and *Agree* (5) were combined and represented by ***Agree***, a definite indicator of children's positive attitude toward the item. Similarly, ***Disagree*** represented *Strongly Disagree* and *Disagree*. In the original data set, there were more children selecting *Strongly Agree* then those choosing *Agree*.

What Table 2 shows is even more encouraging. It appears that 90% of the children liked the storytelling activity more and even started to like to attend the storytelling sessions. Seventeen to 18 out of 20 (85% to 90%) children felt less afraid of their regular English class and began to like learning English (items 1b and 1c). Since the purpose of a remedial program is to help children do well in the mainstream, it is of interest that most children (80% to 90%) agreed with the statements that storytelling helped them understand class materials and teachers' English in their regular class (items 2a and 2b): they found the class assignments became easier (item 2c); and they became more interested in taking part in the Q & A practice in the English class (item 2d).

The use of power point slides for storytelling began in the second semester. Nearly all of the children (95%) felt that the use of the power point slides had helped them concentrate and comprehend better (items 3Aa and 3Ab). Also, most children found the visual representation helpful for them to remember the words (90%), sentences, (70%), and the whole story better (70%, items 3Ad to 3Af). Four children persisted in their negative opinions about listening to English stories, but the number of children who became more interested in listening to stories and even learning English doubled since the first semester (13-16/20), nearly up to 80% percent (item 3Ag).

More survey items were given to elicit information about how the VoiceThread system helped the children practice reading aloud and learn the target language. Eighty percent or more of the children began to pay more attention to their own pronunciation and more than half were aware that they had more chance practicing reading aloud, a rare opportunity in their regular class (items 3Ba and 3Bb). Listening to stories became easier on the VoiceThread page for 7 children, and 5 children were slightly positive (item 3Bj), possibly because of the mobile color marker moving along the words and phrases that helped them read along (60% to 86%, item 3Bk). Among the older children, most said that the online practices (e.g. listening to the story again and reading the review sentences aloud) helped them recognize more words (60% to 66%) and sentences (73% to 80%), and reading aloud English became easier (66% to 73%, items 3Be, 3Bf, and 3Bh)! Finally, eight children became more

responsive in class and five said they were slightly more so (item 3Bg). Although most felt nervous before recording, many thought that the recording activity was a good chance for them to learn and practice English.

Nearly all children liked the activities that helped them read and understand the stories (95%), and 75% to 85% of the children believed that the activities helped review the story and practice the language (items 4a to 4d). The very last activity was Reader Theater done by the fifteen 4th to 6th graders with the 2nd and 3rd graders the audience. The purpose was to involve all children in reading the lines of the story, *The Giving Tree* by Shel Silverstein. This activity replaced the last recording practice. The children enjoyed the story because they had heard it read to them in Mandarin by their homeroom teacher. Thirteen out of the fifteen children were positive about this activity, even though it involved a great deal of practice.

Comparison between Items in the Pre and Post Surveys

Table 3 shows children's responses to the items appearing in both the pre and post surveys. Results show that the rejection and reluctance seen at the beginning was greatly reduced, and interest and enthusiasm increased: Only one third of the children were interested in English stories after one semester, but twice that number after another semester (30% to 65% and possibly nearly 90%). Surprisingly, more than half of the children felt that listening to stories helped them learn and memorize new words and sentences, even though they were not asked to memorize vocabulary and sentences, after one semester, and several more children agreed with this after another semester (60% to 85%).

Activities, usually games, songs, TPR, or hand-crafted books after a story were done mainly to increase children's enthusiasm for listening to stories in English, and to enhance their motivation in learning English, a mission often fails in the regular class. Children's acceptance of these activities improved noticeably (55% to 85%).

More children tried to imitate their storytellers' pronunciation before recording (25% to 66%), the number of children who felt nervous about recording also increased (55% to 93%). This result could mean that children are getting serious about this practice and need continuing assistance from the teacher.

Table 3. Attitudinal change shown on pre and post surveys

1. Listening to stories help me learn new words.	13 (65%)	3Ae. It helps me remember the words better.	13-17 (65-85%)
2. Listening to stories help me learn new sentences.	12 (60%)	3Af. I remember some simple sentences better.	14-17 (70-85%)
4. Listening stories make me more interested in reading English stories.	6 (30%)	1d. I like listening to English stories more and more.	13-18 (65-90%)
7. I practice my pronunciation before recording.	12 (60%)	3Bc. I practice my pronunciation before recording.	8-11/15 (53-73%)
8. I feel particularly nervous before recording.	11 (55%)	3Bl. I feel particularly nervous before recording.	12-14/15 (80-93%)
10. I try to imitate my storyteller's pronunciation when recording.	5 (25%)	3Bd. I imitate my storyteller's pronunciation.	9-10/15 (60-66%)
11. I am happy when I can read a complete sentence when recording.	6 (30%)	3Bi. I am happy when I can read complete sentences when recording.	8-10/15 (53-66%)
16. These activities or games help me understand the language better.	11 (55%)	4c. The follow-up activities help me understand the story told by the storyteller.	15-17 (75-85%)

CONCLUSION

This action research supports the notion that comprehensible input provided in a more informal form—storytelling—helps improve children's attitude, interest, and motivation toward language learning (Chomesky, 1972; Krashen, 1985; Smith, 1988). The design of the story cycle also helped increase their involvement and responsiveness during the activities. These results correspond well with Juan and Cheng (2008) that children, after being helped with their story reading, felt a sense of achievement and rendered more confidence and willingness in the activities requiring language production.

The use of technology in this project greatly improved the storytelling condition and helped children concentrate better and thus learn the target language better, according to children's perspectives. This is consistent with the

scaffolds illustrated in Meskill (2005) in that the use of computer technologies (a) "reduces the size of the task so the child can complete it" (reviewing and recording); (b) "keeps the child's attention in the moment" (PPTs and the VoiceThread page); (c) "makes salient relevant features" (visual and aural representations of the story); and (d) models ways to accomplish" (story listening, reading, and recording). The teacher interview and storytellers' observational notes confirmed that children had made progress during the storytelling sessions as well as in their regular classes. This study does, however, suffer several limitations.

First, as previously mentioned, there had been an intention to measure children's read-aloud performance from their recording practices. This elementary school was located in a remote area with limited bandwidth and related technical support, which made this impossible.

Second, there was no comparison group involved and no measures of language proficiency were used. This group was too small to apply statistical tests, and more important, using any tests, it was felt, would not be appropriate with these children. In addition, adjustments made during the course of the treatment, typical with action research, made it impossible to do a true experiment.

One problem was the children's obvious nervousness about recording. This was interpreted by the storyteller as a concern for their performance. Caution should be taken not to force children to perform before they feel they are ready. It is clear, however, from the children's increased enthusiasm and obvious sense of achievement after recording, that this kind of technology can be of help for children who have not been able to progress at their own pace.

With the necessary technical support, and most important, more books for storytelling and for a longer term of treatment, it is hoped that projects such as this one will result in increased and continuing improvement, so that these children will be able to return to their regular classes as confident learners, instead of being "pulled-out" incessantly year after year.

ACKNOWLEDGEMENT

The author would like to thank the National Science Council of the Republic of China for financially supporting this research under Contract No. NSC 100-2411-H-305-002.

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STUDENTS' AGE DIFFERENCE OF CONFIDENCE IN USING TECHNOLOGY FOR LEARNING IN HIGHER EDUCATION

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ABSTRACT
Some past studies find that older students have more confidence in using technology for learning than younger students but some other studies find the opposite result. However, it is found that there are a few researches studying on the age difference in the perception of using technology for learning in Hong Kong. Therefore, the aim of the study is to examine the age difference of confidence in using technology for learning in the Hong Kong higher educational institutions. In this study, it employed a survey methodology to collect a total of 211 questionnaires from one of the universities in Hong Kong. The findings show that older students had more confidence in using technology for learning than younger students.
Keywords Age difference; Confidence; Hong Kong higher education

STUDENTS' CONFIDENCE IN USING TECHNOLOGY FOR LEARNING

Students are not motivated to learn if they do not have sufficient confidence in using technology for learning. Besides, they may create fears of the topic, skill or situation because they have negative experience in using technology for learning. In contrast, they might believe incorrectly that they already know it and then overlook the important details in the learning activities (Keller, 2010). To avoid this situation, three strategies are obtained. They are the learning requirements, success opportunities and personal control. Learning requirements is a strategy to build a positive expectation for success. Success opportunity is a method to enhance the students' beliefs in their competence. Personal control is a tactic to let the learners know their success more clearly based on their efforts and abilities (Keller, 2010).

STUDENTS' AGE DIFFERENCE IN USING TECHNOLOGY IN USING TECHNOLOGY FOR LEARNING

Age difference is another personal factor that influences students' motivation in using technology for learning. Age difference in using technology has been reported in some researches. Because of the time constraint and other restrictions of life, distance education becomes popular for people to enhance their knowledge in their area of interest, especially for adults who cannot continue traditional face-to-face classroom education (Dabaj, 2009). Educational technology seems to solve the distance limitation problem. However, Dabaj (2009) revealed that the older students are more likely to attend the traditional face-to-face classes in university than online education. Besides, he also pointed out that older students have difficulty of the nonverbal communication and incompetence of using technology. As the rapid changing in the technology, older students may not adapt the changes and then it will lower their motivation in using technology for learning. However, recent study shows that older student can use the technology to learn than younger students (Maria & Hefer, 2011).
Based on the above evidence, we hypothesize:
H1: Older students have more confidence in using technology for learning than younger students.

PURPOSE AND RESEARCH QUESTION

As it appears that no study has examined the age difference of confidence of using technology for learning in Hong Kong higher education. In this study, the purpose of this study is to fill this research gap and examine the research question "what is the students' age difference of confidence in using technology for learning in higher education?"

METHODODOGY

In this study, a questionnaire survey has been conducted to collect the data in order to examine the gender differences in using the technology for learning. The 'confidence' variable of the modified Fennema-Sherman Attitudes Scales (Kahveci, 2010) has been used in this questionnaire, which is used to investigate the gender difference of students' confidence in using technology for learning. This variable consisted of five questions (Table 1) which were rated from a 5-point Likert type scale, ranging from 1 "strongly agree" to 5 "strongly disagree".

Table 1 – Items of questionnaire

Question	Items	Factor loading
1	I am sure I can do advanced work in technology.	0.712
2	I am sure I can use technology.	0.516
3	I think I could handle more difficult technology problems.	0.711
4	I can get good grades in the courses related to technology.	0.726
5.	I have a lot of confidence when it comes to the use of technology.	0.774

After the questionnaire was finalized, the pilot study was carried out before distributing questionnaires to a large number of people. We had to test the questionnaire and made sure that it works as intended. Piloting questionnaire allows us to judge whether the chosen questions are effective to collect the information. In addition, any problems with the questions can be identified by the pilot study (Lowe 2006). For example, piloting helps to rephrase the wordings of the questions, the order of the questions and the reduction of the non-response rates (Oppenheim 1992). Thus, pilot study is an essential part of the research.

During the pilot study, twelve questionnaires were then distributed to my classmates. They were asked to complete the questionnaires without any explanation in order to find out whether they understood the questions. Then, they were asked to give feedback individually. It was found that some of the questions were similar and difficult to understand. So, the similar items have been removed and some questions were rephrased so that the questions were easier to understand. After the questionnaire was modified, ten questionnaires were distributed to other students. It was found that they understood the content of the questionnaire and they thought the length of the questionnaire was appropriate.

After the pilot study, the questionnaires were distributed to the students. The target group of this study was from the year 1 to year 3 university students in a Hong Kong local university. They have all experienced with the educational technology in the course or in high school. So, the information about the students' motivation in using technology for learning can be collected for this target group.

Then we distributed the questionnaire to this target group via email or during the lecture. Finally a large number of questionnaires were collected.

In total, 350 questionnaires were distributed and 211 copies were returned. Thus, the response rate was:
= collected samples / total numbers of questionnaires distributed
= 211/350 x 100%
= 60.29%

All the returned questionnaires were useful since the data was relevant and the questionnaires were fully completed.

Prior to bivariate analysis and ANOVA analysis, data was examined to ensure that it was amenable to the use of these techniques. This involved examining the responses to each question for invalid responses and missing values. Then reliability analysis including Cronbach alpha, were used to test the reliability of the variable. The Cronbach alpha value of confidence was 0.886. Normally, the alpha value should be greater than 0.7 for well established measures (Nunnally, 1978). As no alpha value in this survey study was less than 0.7, the results were considered to be consistent and reliable.

In addition to Cronbach alpha, a factor loading of the variable was obtained. Factor loadings less than 0.3 were omitted as it is accepted that only factor loadings on the attributes greater than 0.3 were suitable for interpretation (Comrey, 1973). Since the factor loadings for the 5 items of confidence ranged from 0.516 and 0.726 (Table 1), all 5 items were retained.

RESULTS

211 students returned the questionnaire. Table 2 shows that demographic statistics of respondents. Of the questionnaire returned, 51.7% were completed by males and 48.3% were completed by females. 35.1% of respondents were under age 21, 58.3% of respondents ranged between 21 and 25, 4.7% of respondents ranged between 26 and 30, 1.9% of respondents ranged between 31 and 35. 28.4% of respondents were year 1 students, 35.5% were year 2 students and 36% were year 3 students. In addition, 85.8% were full time students, 13.3% were part time students and 0.9% were exchange students.

Table 2 - Statistics of the personal data of respondents

Personal Details	No. of respondents	Percentage of respondents (%)
Gender		
Male	109	51.7
Female	102	48.3
Age		
< 21	74	35.1
21-25	123	58.3
26-30	10	4.7
31-35	4	1.9
Year of Study		
Year 1	60	28.4
Year 2	75	35.5
Year 3	76	36.0
Mode of study		
Full time	181	85.8
Part time	28	13.3
Exchange	2	0.9

Age difference was another personal characteristic in examining the use of technology for learning. In this study, age were divided into four groups aged <21, 21-25, 26-30 and 31-35. The means and standard deviation of four groups were found and shown in Table 3. One way ANOVA was then used for testing the differences between the means of four age groups.

The mean values for four age groups are showed in Table 3. The mean value with aged < 21 was 3.09, aged between 21 and 25 was 2.82, aged between 26 and 30 was 1.72 and aged between 31 and 35 was 1.70. Thus, older students were more confidence than younger student in using technology for learning. This finding was supported by Maria & Hefer (2011).

Table 3 – Means and standard deviation of difference age groups

Age Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
< 21	74	3.0865	.86647	.10073	2.8857	3.2872	1.00	5.00
21-25	123	2.8244	.78619	.07089	2.6841	2.9647	1.00	4.80
26-30	10	1.7200	.41312	.13064	1.4245	2.0155	1.20	2.60
31-35	4	1.7000	.34641	.17321	1.3488	2.2512	1.30	2.20

In addition, the ANOVA test indicated that there was significant difference among four groups ($F= 10.757$, $p < 0.001$).

Based on the survey result, the hypothesis H1 was supported.

DISCUSSION

The survey results showed that older students had more confidence in using technology for learning than younger students and the hypothesis H1 was accepted. This finding was not consistent with Dabaj (2009) and Sue & Robert (2006). However, the finding was supported by Maria & Hefer (2011). They found that part-time undergraduates had more confidence than full-time students in using technology for learning. In this study, most of the older students studied in part-time study mode while the younger students studied in full time mode. Firstly, older students might use technology frequently in their working environment and they adapted different new technologies for the job requirements. Therefore, the older students could build up their confidence in using different technology though their work. For the younger student, they have less opportunity to use the technology in the learning environment and they were encourage to access different software or other course related technology in school only. Therefore, they have less practice in using the new technology. As a result, they had less confidence in using technology for learning.

CONCLUSION

It is concluded show older students are found to have more confidence in using technology for learning than younger students. This study contributed to students' age difference of confidence in using technology for learning in Hong Kong higher education. Based on this study's findings, we can understand more on both younger and older students' perception of confidence in using technology for learning. These findings can also enable the university's educators to integrate technological components in their courses to enhance students' confidence in using technology for learning.

The major limitations of this study were the small sample size and used only the survey technique. In the future study, qualitative technique like interview should be used to explore the reasons why older students have more confidence in using technology for learning than younger students in Hong Kong higher education. In order to improve the generalization, we should focus on all Hong Kong's universities.

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TEACHERS' PERCEPTIONS ABOUT THEIR OWN AND THEIR SCHOOLS' READINESS FOR COMPUTER IMPLEMENTATION: A SOUTH AFRICAN CASE STUDY

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ABSTRACT
This case study, involving 30 participating teachers from six previously disadvantaged South African schools, provides data on teacher perceptions of the challenges related to implementing Information and Communication Technology (ICT). The schools had minimal resources as a residual result of the South African apartheid policy prior to 1994 and are located in areas that lack basic infrastructure. Twenty computers were provided to each of the schools by a donor solicited to support an ICT training intervention conducted by academics at the Nelson Mandela Metropolitan University (NMMU) in South Africa. A quantitative Likert scale questionnaire, qualitative interviews and a qualitative open-ended questionnaire were used to gather data. These data suggest that, despite the fact of the schools were provided with computers and teacher training, several first and second order barriers still exist. Examples of these barriers are insufficient ICT resources for the large classes that have to be taught, lack of project leadership within the schools, and a need for ongoing training and support. These barriers appear to have not allowed the teachers and schools to go beyond an initial integration phase. The data generated, the literature consulted, as well as the involvement of the authors in the ICT implementation and training process over a period of two years, underpin the suggestions made for consideration when attempting to implement ICT focused interventions, particularly in schools with limited infrastructure and support. An implementation heuristic is proposed for consideration by those involved with ICT implementation in comparable situations.
Keywords: Barriers, challenges, ICT implementation, perceptions, ICT enablers, ICT integration

INTRODUCTION

Internationally there are calls by students for technology to play a more integral part in their learning (Conole & Creanor, 2007). However, in South Africa (Department of Education, 2004; Howie, Muller & Paterson, 2005; Mlitwa, & Nonyana, 2008), Africa (Africa Partnership Forum, 2008), Southern-Asia (SEAMEO, 2010), and other less developed countries, schools may have great difficulty in providing children with access to computer hardware and internet connectivity. In the South African context the majority of learners are disadvantaged as their schools are situated in poor township areas where basic amenities are lacking. In spite of progressive curricula introduced since the first democratic elections in 1994, township schools do not have the same resources that more privileged schools situated in middle- and upper-class neighborhoods have and, despite the fact that many of the learners have access to mobile phones, they remain 'digital immigrants' (see Prensky, 2001) with little to no access to computers (Department of Education, 2002, 2004). However, the national curriculum demands that children become computer literate and that schools integrate ICT across the curriculum (Department of Education, 2004). Education authorities have provided a three phase plan for schools to prepare learners to be digitally competent from 2010 (Department of Education, 2004), but the reality in 2011 is that few township schools had been supplied with ICT resources. Also, the governments' *'one laptop per teacher' initiative* (Mail & Guardian, 2010) had not materialized as teachers - who are expected to secure personal financing to buy a laptop, and thereafter claim a subsidy from the Department of Education - are not considered creditworthy by South African banks (Timeslive, 2011).

This study attempted to determine the barriers to ICT implementation (Akbaba-Altun, 2006; Ertmer, 1999; Ely, 1999; Goktas, Yildirim, & Yildirim, 2009; Topracki, 2006; Ogiegbaen & Iyamu, 2005) as perceived by a sample of teachers in six disadvantaged township schools in Port Elizabeth, South Africa. The question that was asked was 'How ready are these participating schools and teachers for ICT implementation and integration as perceived through their own eyes?' The rationale behind this question was to provide data to develop a heuristic that could provide useful guidelines to government, schools, Non-Governmental Organizations (NGO's), and other ICT facilitators when implementing ICT within similar contexts.

Background

A number of assumptions usually underpin studies which elicit teacher perceptions, as well as the attempts made to analyze the data generated. In order to make the assumptions in this paper explicit in terms of what successful integration entails and how it can be best promoted, the first part provide a brief overview of some literature findings related to integration types, phases of integrations, barriers to implementation and approaches to ameliorate these barriers. Thereafter the data generated are presented and used to motivate the heuristic that is proposed.

Types of integration

While the term 'technology' includes digital cameras, mobile phones, dvd players, ipods, etc., only traditional desktop, laptop or netbook technology are implied in this paper. Also, the use of the term 'integration' does not refer to the mere placement of computer hardware in a classroom where the focus is primarily on technology *per se* (Smaldino, Lowther & Russell, 2008), nor does technology integration refer to using computers to support traditional or prevailing methods of teaching, for example learning 'from' the computer through tutorials, drill-and-practice, simulations and hypermedia applications (Morrison, Lowther & De Meulle, 1999; Reigeluth & Joseph, 2002). Rather, technology integration is seen as transcending traditional teacher centered pedagogies where learners use the technology to learn *'with'* and *'through'* computers (Jonassen, Peck & Wilson, 1999).

Hodgkinson-Williams (2006) and Du Plessis (2010) note that three types of integration are prevalent are prevalent in South Africa. The first type is *'Learning about computers'*, focusing on implementation without integration. This approach often results in *'computer literacy'* that merely involves using computer applications without any link to what is happening in the classroom. The second type refers to *'Implementation with integration to achieve traditional goals'*. This type of so-called integration often results in learning *'from'* the computer where the computer becomes a tutor and the result is that the computer becomes the transmitter of knowledge (see Jonassen, Peck & Wilson, 1999). The third type is *'Implementation with full integration within a constructivist learning space or context'*. This type of integration refers to learning *'with'* or *'through'* using computers (Jonassen, Peck & Wilson, 1999) is also referred to as the generative use or mode in which computers or ICT's are used as cognitive, mediational, or transformational tools (Hodgkinson-Williams, 2006). An analysis of the SAIDE (2003) report and the '*Managing ICTs in South African schools: A guide for school principals*' (Bialobrzeska & Cohen, 2005) suggest that generative mode integration is not the norm in South African schools.

Phases of integration

Several extant models or frameworks related to the phases of integration exist. The Apple Classrooms of Tomorrow (ACOT) project concluded that there are five stages or phases of technology adoption, namely entry, adoption, adaptation, appropriation and invention (Sandholtz, Ringstaff, & Dwyer, 1997). Toledo (2005) states that a five-stage developmental model of computer technology integration has emerged in teacher education curricula in colleges and departments of education; namely pre-integration, transition, development, expansion and system wide integration. In the South African context, Miller (1997) developed and implemented the *'Evolutionary Model'* which also describes integration as a five phase process; namely introduction, entry, intermediate, penultimate and creation. The UNESCO (2002) report suggests a four-stage continuum of ICT integration which includes emerging, applying, infusing and transforming, while Kopcha (2008) has suggested a systems-based mentoring model for integration which highlights the importance of mentoring, modeling, apprenticeship, just-in-time assistance and the forming of communities of practice. The apparent acceptance by researchers and institutions that individuals and schools develop through different stages - some faster and some slower – suggest that it would be fruitful to develop a heuristic for teacher preparation and participation which could assist and accelerate the adoption and integration process.

Barriers to implementation

Ertmer (1999) argues that the barriers to ICT implementation can be categorized as first order barriers and second order barriers. First-order barriers are extrinsic to teachers and include aspects such as (1) lack of access to appropriate resources (software, hardware and internet access), (2) lack of time, (3) lack of support and (4) lack of training (Ertmer, 1999; Ely, 1999; Ogiegbaen & Iyamu, 2005; Akbaba-Altun, 2006; Goktas, Yildirim, & Yildirim, 2009; Topracki, 2006). Second-order barriers are intrinsic to teachers and refer to (1) attitudes, (2) beliefs of teaching, (3) beliefs related to learning, (4) practice and (5) inherent resistance in teachers (Ertmer, 1999; Ely, 1999; Ogiegbaen & Iyamu, 2005; Akbaba-Altun, 2006). While access to hardware, time and support are fundamental, attention to second-order barriers are equally important as teachers' pedagogical beliefs about teaching and learning are ingrained and of a personal nature. These beliefs result in a dogged persistence in terms of teaching as they have been taught (Pajares, 1992), and if the positive attributes noted above do not already

exist they are difficult to inculcate and strongly militate against attempts to successfully integrate technology in schools (Cuban, 2001; Fullan & Smith, 1999).

Approaches to ameliorate first-order barriers

Bialobrzeska and Cohen (2005) and Creighton (2003) suggest that one of the starting points when dealing with first order barriers should be the creation of a shared vision of technology implementation and integration, including a technological plan that clearly shows the way ahead. Bialobrzeska and Cohen (2005) highlight using a 'Strengths, Weaknesses, Opportunities and Threats' (SWOT) strategy towards planning in order to avoid a situation where teachers feel *"We're Wired, Webbed, and Windowed, Now What?"* (Trillig & Hood, 1999). Such planning should consider equity of teacher access to technology (Flanagan & Jacobson, 2003) and the provision of the infra-structure; administration and financial support (Surry, Porter, Jackson & Hall, 2004). In the South African context the role of the private sector through sponsorship has played an important role in the past, something which is recognized by Department of Education (2004) and which has official exploration of opportunities to assist teachers to procure their own desktop or laptop and an internet connection at home (see the *One laptop initiative'*; Mail & Guardian, 2010).

Fishman and Zhang (2003, p. 17) suggest that the school vision should focus on "planning for the pedagogical and educational over the technological", i.e. not simply on how to improve traditional ways of teaching (Schiller, 2002). In addition, the preparation for any implementation process should allow for collective planning that includes not only the principal, staff, governing body, parents and community (Fullan & Smith, 1999; Hinson, LaPraire & Heroman, 2006), but also the insights of the learners (Joseph, 2006). Equally important is that ongoing staff development focus not only on technical training, but on classroom integration (Creighton, 2003). Castro and Alves (2006) believe that the establishment of discussion groups, which meet on a regular basis to share successes and challenges in order to establish professional learning communities within the school and among other schools, are vital. Coupal (2004) states that collegial mentorship should be promoted during staff development, i.e. emotional, technical and informational support in order to enhance self-efficacy (Ertmer, 1999). Gibson (2002) and Creighton (2003) proclaim that the role of the school principal is a key feature in the process, and in order to succeed they have to play the role of a technology leader, head learner and initiator, and not merely be a manager of the process.

Weinbaum, Allen, Blyth, Seidel and Rubin (2004) promote reflection as an approach to ameliorate first order barriers to implementation. They see the value of reflection by the school as an organization and personal self-reflection by teachers on their current ICT practice(s) as fourfold. Firstly reflection is seen as a learning activity; secondly reflection helps with school introspection (where the school and the self are currently); thirdly it makes explicit where the school and staff come from technologically; and fourthly it assists with planning how to go forward technologically (Hoban, 2002). They believe that all of these processes should be helpful in taking an ICT implementation process forward.

Approaches to ameliorate second-order barriers

Ertmer (1999), Fullan and Smith (1999), Mouza (2005), and Prensky (2008), amongst others, believe that teachers hold the key to successful technology or ICT integration in schools. However, as noted earlier, they do not change their practices easily (Cuban, 2001). Fullan and Smith (1999) state that for change to occur re-culturing is required and that, in order for this to happen, opportunities must be provided for teachers to challenge their current beliefs. Mumtaz (2000) believes that change could be achieved when teachers become conversant with educational teaching and learning theory related to using technology, and when they experience the fruitfulness of new technological practices. Fullan and Smith (1999) promote the formation of learning communities as a fruitful approach to changing teachers' beliefs and practices.

The aforementioned researchers agree that one cannot *'force'* ICT or technology implementation, and that teacher development is a process. Not all teachers will embrace it in the same manner. Teacher development sessions pertaining to ICT or technology usage and integration planning must aim for increased teacher self-efficacy, i.e. raising personal beliefs regarding the ability to learn or perform ICT related skills and classroom implementation strategies at a certain levels (Ertmer, 2001, 2004). Personal mastery, observing how people model or implement a strategy or practice, verbal and social persuasion as well as emotional arousal are important issues in the process (Ertmer, 1999; Schunk, 2004; Bandura, 1997). Containing anxiety (George & Camarata, 1996) and the creation of a climate care (Havelock & Zlotolow, 1995 are also important. Like Fullan and Smith (1999), Hung and Koh (2004) suggest that the establishment of communities of practice could assist develop teacher self-efficacy, and that adopting a multi-faceted socio-cultural approach that acknowledges school structures, classroom dynamics, teacher beliefs and student (learner) behaviours are important.

RESEARCH DESIGN AND METHODS

Setting

The Dell Foundation was approached by NMMU staff to assist four designated primary schools and two high schools in the Missionvale area of Port Elizabeth acquire computer hardware and software. The result of this solicitation was that each of these schools received 20 desktop computers and a Linux based office suite, drawing software, and paint and mathematics educational software. As these schools did not have any internet connectivity, funds for the installation of 'line of sight' Internet connectivity installation by NMMU ICT specialists was also successfully solicited from the Hermann Ohlthaver Trust.

Participants and ethical considerations

The schools which were considered in this study are similar to many other township schools in South Africa. School principals were asked for permission for their teachers to participate and the Department of Education (Port Elizabeth District Office) was approached *via* a letter addressed to the district director, after the project was discussed telephonically. After a letter of approval had been received the principals and representative teachers from their schools were invited to attend a series of meetings where the research project and its requirements were explained and which preceded a year-long continuous professional development programme run by the researches aimed at ICT integration in the participating schools. The teachers were volunteers and could terminate their participation at any point in the process.

Data collection tools

A seven-point Likert scale questionnaire consisting of 94 statements based upon aspects drawn from ICT implementation literature was designed to determine which first- and second-order barriers (Ertmer, 1999), as perceived by the participants, existed in the schools. Initial data generated reflected the teachers' perceptions before the new sponsored computers had arrived and connectivity was established. A 1 on the scale indicated 'strongly disagree' and a 7 'strongly agree.' Initial inspection of the data revealed that the responses could be grouped. Responses ranging from 1 to 3 were grouped as disagree, responses greater than 3, equal to 4, or equal to 5, were grouped as neutral or uncertain, and responses greater than 5 to 7 were grouped as agree (Ary, Jacobs & Razavieh, 2002). Items which could not be grouped in groups of two or more statements pertaining to the same aspect are presented individually. For the purpose of this paper, only the summary of the first- and second order barrier items (See Table 1 and 3) as well as eight individual items, i.e. items where the Cronbach alpha could not be calculated, are reported.

An open-ended questionnaire allowed the participants to freely voice their concerns and make suggestions related to ICT implementation Follow-up semi-structured individual interviews were also conducted regularly during the implementation process over two years (Rubin & Rubin, 2005). All interviews were recorded on a Dictaphone. Examples of interview questions are "Does your school have a vision for computers? If YES, please tell us what the vision is", "If your school has a vision for computers, how did it arrive at this vision?", "Do you have regular staff meetings to discuss computer issues? What are discussed during these meetings?", "What problems do you foresee for computer integration at your school?", "How computer literate are the staff members? Why do you say so?" and "Do you think that your staff members will be able to manage computer integration well? Explain." The open-ended questionnaire contained question such as "At the moment, can you count on support from the Eastern Cape Education Department or District Office to help with computer integration? Yes or No. Please tell us why you say so." And "What does or should the Eastern Cape Education Department or District Office do to help schools with computer integration. List the things they should do or get in place." Audio recording of the interviews allowed reliability checks (McMillan & Schumacher, 2006, p. 205) and the data provided by the three sources was triangulated to provide a 'snapshot' of the teachers' perceived reality.

Data reliability and trustworthiness

Cronbach alpha (α) reliability scores were calculated for the Likert scale data. Multiple sources of evidence, namely a quantitative Likert scale questionnaire, an open-ended questionnaire, and a qualitative interview were used in order to explore the anticipated barriers and triangulated to validate the findings (Yin, 1994, 2003a, 2004b). While it is accepted that generalizability cannot be claimed for the findings of a case study, it is however possible to make modest extrapolations which could lead to applicability in other similar, but not identical, situations (Patton, 2002). Hence, the results from the case study should provide some insights for dealing with, and planning, ICT integration in similar contexts (Stake, 1995).

RESULTS

The results are framed as first order- and second-order barriers with subheadings indicating a variety of aspects encompassed by these barriers. The reliability of the test items, which range between excellent (α≥0.9) and just greater than unacceptable (α≥0.5), illustrated in Table 1 (George & Mallery, 2003).

First order barriers

The first order barriers as perceived by the participating teachers are illustrated in Table 1 and reported on in the text below.

Limited, but evolving vision, focus and goals

The summarized data from the Likert scale questionnaire revealed (See Table 1) that only 33% of the participants felt that their school had a vision and had identified the goals needed to realize it, while 53% were uncertain. Interview data suggested that where there was a vision, it was very limited and only focused on the initial stage of familiarizing the learners with basic computer literacy and then moving to using the computer for learning. One teacher stated, *"With computers we want to be computer literate and also make our own learners computer literate, and we especially want to teach the kids to search the information on their own. They can do their homework and assignments and do it well."*

Table 1: First order- or extrinsic barriers as perceived by the participating teachers

Summary of items	n	□	Mean	SD	Low 1,3 1<=x<=3		Avg 3,5 3<x<=5		High 5,7 5<x<=7	
Vision & goal setting	30	0.50	4.51	1.19	4	13.3%	16	53.3%	10	33.3%
Computers and related infrastructure	30	0.40	2.97	1.08	15	50%	15	50%	0	0%
Department of Education support and training	30	0.57	2.02	1.20	25	83%	5	17%	0	0%
Support for computer based teaching	30	0.79	6.39	1.01	1	3%	1	3%	28	93%
Existing participation & consultation related to computer integration	30	0.84	3.30	1.35	10	33%	18	60%	2	7%
Importance of participation and consultation	30	0.67	6.30	0.62	0	0%	1	3%	29	97%
Colleagues with computer skills	30	0.77	3.46	0.89	12	40%	17	57%	1	3%

Another teacher mentioned "We would like to have our teachers and community to be computer literate, so that when they go to the working world they know what to do and implement what they have learnt from our school" and another one concurred when stating that the school's vision is "in a developmental process" and he continued, "I can't say it's a clear vision we have but we are trying to get there."

Lack of infrastructure

The summary data from the initial Likert scale revealed that 50% of the participants thought that infrastructure and resources were lacking in their school, while the other 50% were unsure (See Table 1), and that they desired more computers and Internet connection. Examples of interview responses are, *"We need Computers, they are not enough even for learners. We have one computer lab for the whole school. It poses a challenge when you need to practice because computer giants are always using them. Then computer illiterate people are in disadvantage. We do not even have Internet that is another challenge"* and, *"The lab has to be set up. Some of the infrastructures produces have been addressed but a few are still outstanding."* The need for more computers is reflected in the statement, *"As we have big numbers in our classes, learners need more computers so that*

[each] one can have his/her own computer so as to speed up in period." The need for technical support was also articulated: *"The other thing that I think is the problem is the maintenance of the computers. Sometimes the computers are less [due to the fact that some are not working] and when you go to the computer room you'll find out some of them are not working. There are 20 computers and maybe 5 are not working and 15 of them are working*."

Lack of support from the Department of Education

Eighty three percent of the teachers indicated in the questionnaire that leadership, support and training related to computers were lacking (See Table 1). Interview data supported this claim and six interviewees categorically stated that support from the Department of Education (DOE) was non-existent. One participant mentioned that there were "*some promises",* but that this had not materialized. Another teacher mentioned that their assistance came from a NGO, not the DOE. In the open ended responses on the questionnaire regarding DOE support a number of the participants confirmed that they had been assisted by NGO's but not the DOE, and that the DOE was *"full of promises"* and not helpful, as evidenced by responses such as, *"Past experience has taught one that NGOs are the people who develop schools"*; *"Eastern Cape Department is dead as compared to other provinces."*

Need for ongoing support and hands on training

Table 1 reveals that the teachers feel that support is vital, an aspect that was evident during interviews. One teacher stated that support is required all the time; another concurred and added that it has to be ongoing, stating *"You need to not disappear. You need to guide us, constant observation. Look what we are doing because [Name of NGO omitted] made the mistake of giving the computers and then see for yourself what you can do. I say those who organize the training need to be hands on. There is no way you can leave the school."*

Need to improve existing participation and sharing of experiences during the implementation process

Thirty three percent of the participants indicated that they disagreed that there was enough participation and consultation regarding implementation efforts and 60% were uncertain (See Table 1). A deeper analysis of their specific responses revealed that the majority were either uncertain or disagreed with statements such as whether there were opportunities to share their computer classroom experiences – positive aspects as well as challenges, whether there were regular staff development sessions regarding the computer implementation process and development sessions. Interview data indicated that they acknowledged that there had been some form of consultation and discussion in their schools. One teacher mentioned that they often discuss equipment problems and problems that the learners experience in the computer room. However, this was almost always done in an informal way among staff members. A principal of one of the participating schools stated that they discussed as a group *"how effective computer makes us to our schools and the shortcomings that people encounter when they make use of computers."* He also noted that they looked at *"How can we budget to keep the programme sustainable and of course some costs are looked at by the entire school."* A teacher noted that as all staff members are not all at the same computer skills level, this made discussions difficult; *"basically you know as a committee we are not at the same level with one another when it comes to computers. We are more or less focusing on developing our own skills and secondly we look at the challenges that we face at the computers."* He also noted that teachers did discuss *"what content we want to teach."* Another teacher stated that at their school they have meetings, but that the meetings were more like informal discussion groups than formal gatherings. Table 1 also reveals that 97% of the participants highlighted the importance of group participation related to the implementation process.

Need to improve the computer skills of colleagues in the school

The overall summary of the Likert scale questionnaire revealed that 40% of the respondents indicated that teachers in their schools lacked computer skills, while 57% were uncertain whether those who can use computers had adequate computer skills (Table 1). When the raw data were examined in more depth, it was found that only 7% considered the staff members in their schools to be computer literate, 63% of the participants were uncertain and 30% indicated that they were not computer literate. Only 20% of the participants stated that their principals were computer literate, while 47% indicated that this is not the case. Junior staff members were seen to be more computer literate than senior staff members, but overall perceptions of literacy was low (17% of the junior staff members and only 7% of the senior staff member). The importance of more training is also indicated in Table 2, as 93% of the participants stated that there is a need for teachers to be trained regarding computer skills and computer integration.

Table 2: First order- or extrinsic barriers (individual items) *

Summary of items	n	Mean	SD	Low 1,3 1<=x<=3		Avg 3,5 3<x<=5		High 5,7 5<x<=7	
The importance of training for computer skills and computer integration	30	6.73	1.14	1	3%	1	3%	28	93%
Existing time tabling provision for computers	30	3.67	2.14	11	37%	13	43%	6	20%
Enough access to computer room	30	3.83	2.72	11	37%	10	33%	9	30%
The importance of rewards and incentives	30	6.03	1.90	3	10%	3	10%	24	80%
I will learn more about computers if I am rewarded for it.	30	1.73	1.62	25	83%	3	10%	2	7%
Funding available for training	30	2.0	1.51	21	70%	8	27%	1	3%

* No Cronbach alpha calculated, as only one item was used referring to this aspect or item

Interview data confirmed the quantitative data. During interviews two teachers from different schools stated that principals were *"somewhat computer literate."* Another teacher stated, *"If I can rate the on the level of 1; 2; 3; 4. The majority of them I would say are in level 2, meaning that they have the basic skills. Opening, typing and saving the document."* One teacher said that *"I think the principal is computer literate; he is at [name of the university] so I think he must be computer literate and because he had a computer in his office, a laptop and a computer at his house."* Personal school visits also indicated that the principals did have computers in their offices, but that this does not necessarily indicate that they could use them effectively. This observation was supported by a principal who noted during an interview, *"What spoils us as principals is that you have a secretary and when it comes to do some typing you just ask the secretary to quickly do it for you."* The teachers interviewed also felt that junior staff members were more computer literate than older teachers. One teacher mentioned that this was because *"they are younger and more up to date with technology."* Another teacher also said, *"They are quite computer literate, because they are freshly out of tertiary institutions so they actually know what to do."*

Need to address time issues

The data from Table 2 suggests that there are time related aspects that have to be addressed. Only 20% of the participants indicated that their school timetable provided adequate scheduled periods (See Table 2), 43% indicated that they were uncertain and 37% indicated that this was not the case at all. Two primary schools teachers stated very strongly that the timetable did not provide adequate periods for computer room visits by their learners, as there was not enough time. This has to be seen within the following context, as the majority of township schools have more than 800 learners per school. The participating high schools have between 1100 and 1400 learners from grade 8 to 12. During an interview a teacher concurred that time was a problem when he stated, *"I wouldn't say that learners have enough time because there is only one room in the computer lab and we have an enrolment of 1300. At this school there is a ten-day cycle and each learner has one opportunity to use the computer laboratory every ten days."* Other teachers confirmed that at this point in time, large numbers in their schools constrained contact opportunities and that this aspect of promoting ICT in their schools was very challenging, hence highlighting the infrastructure problems referred to previously, i.e. the need for more computers.

Rewards, incentives and training prospects

The importance of rewards and incentives were highlighted by 80% the participants who felt that rewards and incentives were of great importance in terms of motivating teachers to acquire computer skills. At the same time,

83% of the participating teachers felt that there was no reward system in place which would influence other teachers to undergo computer training. In addition, 70% of the respondents highlighted the fact that funding for training was lacking.

Second order barriers

Lack of computer skills

Computer skills are not only an external barrier, but can also be seen as an intrinsic barrier as they may influence how teachers respond to implementation opportunities. The data suggests mixed views on their computer skills. Only 30% agreed that they had the necessary skills, 37% were uncertain whether they have the skills and 33% stated that they saw themselves as not well computer skilled (See Table 3).

Table 3: Second order- or intrinsic barriers

Summary of items	n	□	Mean	SD	Low 1,3 1<=x<=3		Avg 3,5 3<x<=5		High 5,7 5<x<=7	
Necessary computer skills for implementation	30	0.94	4.13	2.00	10	33%	11	37%	9	30%
Confidence, knowledge and skills to use the computer as a teaching tool	30	0.91	3.95	1.43	11	37%	12	40%	7	30%
Positive attitude towards the use of computers as a teaching tool	30	0.49	6.26	1.07	1	3%	4	13%	25	83%

Interview data affirmed these perceptions; “We do need training very much because myself I am not well trained. I did short courses more than 3 times and I like to know more. I’m keen to do everything. We will appreciate training”. The teacher in charge of the computer room at one school stated that one problem is; “I would say a lack of interest”, and added that skill levels are also problematic; “Many could be encouraged and inspired to use the computer lab number one, secondly they need training. And then we can sit down and say we have the computers available this is a school where it is a learning area and just work together as a team. They need to be encouraged and they need training.” He continued “Basic computer literacy, to know how to operate a computer, perhaps that is what will motivate them. Perhaps they have a fear of not knowing how to use a computer.”

Confidence related to learning computer skills

Although the participants did not feel confident initially, the majority (60%) indicated that they felt confident that they were able to learn computer skills. The rest, except one, were uncertain or neutral (See Table 4), probably because of the ‘newness’ of ICT to them and because they might have been uncertain what the training would hold in.

Table 4: Second order- or intrinsic barriers (individual items)*

Summary of items	n	Mean	SD	Low 1,3 1<=x<=3		Avg 3,5 3<x<=5		High 5,7 5<x<=7	
I feel confident that I will be able to learn computer skills	30	5.63	1.56	1	3%	11	37%	18	60%
I feel a bit hesitant to participate in the training of the integration of computers for teaching and learning.	30	2.52	1.72	16	55%	12	41%	1	3%

*No Cronbach alpha calculated as only one item was used referring to this aspect or item

The majority of teachers (55%) indicated that they were not hesitant to participate in the project, but 41% were uncertain (See Table 4). Those who were uncertain mentioned that they did not know what to expect from the training - as one mentioned during an interview, *"I would say I never received any training before; it was something that was new to me."*

Confident that the necessary skills will be acquired

The responses indicated that the participants' confidence in terms of understanding how to use the computer in their classrooms, teaching subject matter, and having the necessary management and ICT skills, was very low (See Table 3) as only 30% stated that they were confident). One teacher mentioned that she perceived the computer as "a rhino", implying that she was in fear of it. Subsequent statements in the Likert scale indicated that, although their current confidence and knowledge related to computer integration were low, a majority (83%) indicated that they needed training on how to manage teaching and learning within the ICT classroom (See Table 3). It is important to note that despite not feeling confident at that present moment, the participants were extremely positive towards using the computer as a teaching tool. Eighty-three percent of the participating teachers were 'very positive' towards using computers as a teaching tool, in spite of their lack of confidence. Ninety-three percent indicated that they would like to be trained to use the computer for teaching and learning, 70% said that they found the use of computers to be practical for their learners, and 83% indicated that they thought that computers should be a necessary part of teaching and learning.

DISCUSSION AND RECOMMENDATIONS

This study reveals the many first- and second order barriers to ICT integration that the participating teachers experience, even after having had some access to ICT resources over two years. These barriers include limited resources, time constraints as a result of large class sizes, limited ICT related vision, lack of support from the Department of Education, not enough computer skilled teachers as well as a lack of rewards and incentives.

The schools all appeared to be at Level 1 or Phase 1 of implementation at the beginning of the project, and there is little reason to believe that this is not the case for a majority of township schools. After two years of participation, the data reported above, and discussions with school principals and teachers, suggest that after the two years of ICT training sessions and provision of a limited number of computers (20), the following is in place:

- A basic school ICT policy
- A vision that requires revisiting
- An internet school usage policy
- Time tabling that makes provision for classes to visit the computer classroom

It is also evident that the following aspects are still in need of attention on an on-going basis:

- Training sessions
- School support visits
- Exposure to different ICT strategies
- Providing a web repository with ready-made ICT resources and lesson plans
- Helping teachers to obtain laptops and internet connections to be used at home in order to prepare for classroom implementation
- Securing data projectors
- Securing netbooks that can be used in any classroom
- Providing opportunities for teachers to share their experiences, positive as well as negative (challenges)

As such, it can be said that by the end of the second year of the intervention process the schools had only reached Level 2 of implementation (see 'Phases of integration' section for a description of the levels). This finding challenges the South African Department of Education's stated aim that ICT and technology integration within the South African context should *'jump'* the initial phases of adoption (Department of Education, 2004), and suggests that within the current context of limited support, this aim is highly unlikely.

Our experiences suggest that the majority of South African disadvantaged township schools have similar needs to those described above, and that it is likely that the majority disadvantaged schools experience similar barriers. Nevertheless, the findings of this study can also help juxtapose the context within which these schools operate against the more general findings in the literature, and motivate the following suggested heuristic regarding the implementation of ICT within such schools.

A major aspect that is considered in the heuristic is the plea that integration should be tackled by a multi-faceted approach taking into account a socio-cultural view to ICT integration (Hung & Koh, 2004). This view suggests that focusing on first and second order barriers alone will not have the desired integration effect. Rather integration should focus on inter-related enablers, namely school structures, classroom dynamics, teacher beliefs and student behaviours (Hung & Koh, 2004). The heuristic in figure 1 is offered as a response to their plea, and takes into account the findings of the researchers noted in this paper and the data generated in this study. The heuristic and stepwise process that is described below is aimed at those (for example NGOs and Departments of Education) who wish to drive an ICT implementation strategy, and who have at least some access to the structures/resources that make it possible to implement:

- Step 1: Create of a passionate ICT support Team which is made up of people who want to make a difference, people that will walk the extra mile, and who believe in the potential of ICTs.

- Step 2: Conduct a SWOT analysis that focuses on school structures, classroom dynamics, teacher beliefs and student (learner) behaviors; i.e. the possibilities that ICT integration offers, the possible threats of zones of discomfort that ICT integration might bring, and exploration of how to address these issues.

- Step 3: Survey the schools needs by means of quantitative and qualitative data which provides detailed personal insights. These include ICT skills analysis in order to determine teacher and learner needs.

- Step 4: Plan an adaptable workable strategy related to the implementation process based on the teachers' and schools' needs, which includes a shared vision, goal setting, time lines as well as the envisaged teaching styles/strategies that could be followed to serve the envisioned needs.

- Step 5: Select 5 to 10 volunteers per school. Keep in mind the possible support capability/capacity that the support team can offer, i.e. be realistic. Equally important, start with those teachers who are committed and want to participate. Do not force the process on all teachers.

- Step 6: Provide teacher training related to using computers in context. Start with basic computer literacy where necessary. Allow teachers to see the administrative value, online resource usage and teaching planning possibilities that ICTs offer. Allow the participants to experience as much success as possible in order to raise self-efficacy.

- Step 7: Reward participating teachers with the necessary equipment such as laptops and internet connectivity that can also be used at home where possible by soliciting, or helping them to solicit, support from all potential sources.

- Step 8: Provide ongoing training and school based onsite support as well as onsite classroom visits to support participants implement their strategy. Monitor and managed the process on a weekly basis.

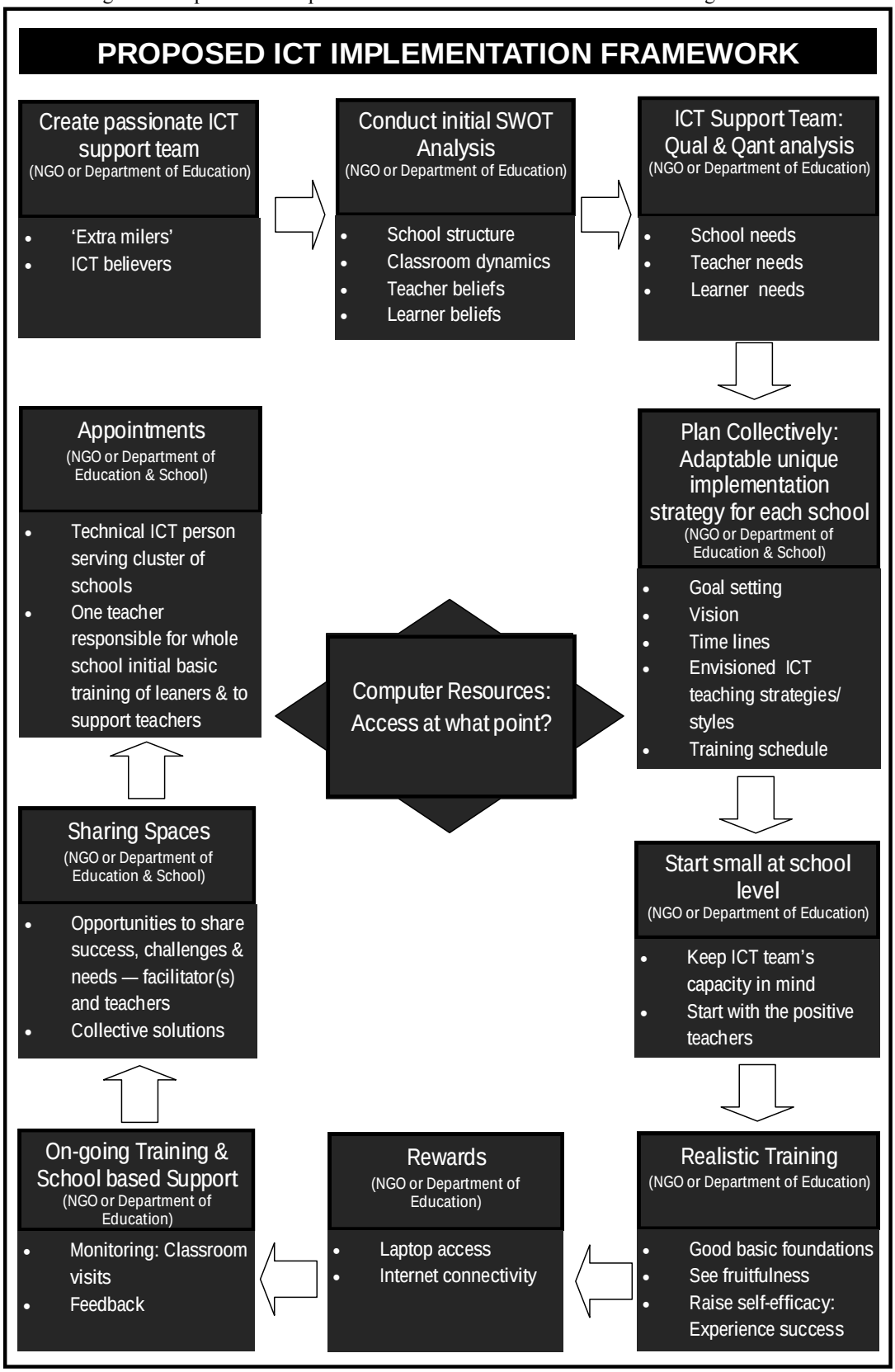
- Step 9: If in a resource provision mode, allow access to the computers for teaching only after the vision, goal setting and time tabling is in place, and only after the participating teachers had be well trained.

- Step 10: Provide opportunities for participating teachers to share – within the school and among neighbouring institutions – success stories as well as the challenges they experience. Enable participating teachers and the ICT support team to discuss, brainstorm and model strategies or practices that can be tried out in order to address their particular challenges.

- Step 11: Appoint a technical persons who is responsible for servicing the school's ICT infrastructure who can also train interested teachers with trouble shooting and basic ICT trouble shooting skills. Appoint one teacher leader responsible for initial basic learner ICT training and teacher assistance for the whole school.

The stepwise procedure above suggests that much will have to take place before the envisioned integration appears to materialize, and experience suggests that the integration process is something that will probably not happen within a calendar year. It will take, in the words of Leggett and Persichitte (1998) in their article titled, 'Blood, Sweat and Tears!'

Figure 1: Proposed ICT implementation heuristic for schools in disadvantaged contexts



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THE ADOPTION OF E-LEARNING: AN INSTITUTIONAL THEORY PERSPECTIVE

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ABSTRACT
Several models have been proposed in the literature to understand e-learning acceptance in which social environmental factors are not primarily addressed. This paper aims to improve understanding of what social forces influence employee's attitude and intention of e-learning adoption within an organizational context. Drawing upon the institutional theory, this study proposes a model to examine three social environmental factors of coercive, normative and mimetic pressures within the e-learning context. An empirical study involving 172 subjects and the partial least square method was conducted to test this model. The results indicate that normative and mimetic pressures significantly influence the attitude and intention of adopting e-learning, while coercive pressures appear not to. Attitude plays a mediating role between both normative and mimetic institutional pressures and e-learning adoption. For organizations, the results suggest that training managers may need to build an e-learning community to create normative expectations and provide success stories of high profiles employee's e-learning experience to promote the adoption of their e-learning. The paper contributes to a deeper understanding of the social factors that promote the use of e-learning in on-job training.
Keywords: e-learning, institutional theory, technology adoption, beliefs

1. INTRODUCTION

In the era of the knowledge economy, knowledge workers need to enhance knowledge and skills continuously to advance their career development. "E-learning" has been expected to play an important role in providing continuing education for knowledge workers. A new and important learning model (Keller & Cernerud, 2002; Tosun & Baris, 2011), it is now a fundamental tool for organizations to gain a competitive edge. Many corporate-organizations are embracing e-learning as a means to provide learning and to enhance the skills of knowledge workers (Shachtman, 2000; Fletcher, 2004; Nelson, 2003; Marki, Maki, Patterson, & Whittaker, 2000; Longworth & Davies, 1996; Govindasamy, 2002; Yilmaz, 2012). In the training and human resource development literature, e-learning is regarded as a training medium (Salas, et al., 2002), instructional strategy (Burgess & Russell, 2003), or learning environment (DeRouin, Fritzsche, & Salas, 2005) to deliver the training to employees by the use of computer and web-based technologies.

E-learning provides both organizations and employees with benefits. On the one hand, by offering e-learning, organizations can reduce the cost of training, increase the availability of training, and offer new possibilities to integrate various types of learning contents (Gasco, Llopis, & Gonzalez, 2004; Rosenberg, 2001; Wilson, 2004; Moore & kearsley, 1996; Chiu & Wang, 2008; Little, 2001). On the other hand, e-learning can be extremely beneficial to employees, especially by providing courses to employees on demand, anytime and anywhere (Burgess & Russell, 2003); tailoring learning courses based on learners' needs (Ely, Sitzmann, & Falkiewicz, 2009); and being compatible with the learners' preferred learning styles (Atack, 2003; Forman, Nyatanga, & Rich, 2002; Haigh, 2004; Yu, Chen, Yang, Wang, & Yen, 2007; Moore, 1996; Little,2001; Zhang, Zhao, Zhou, & Nunamaker, 2004; Trombley & Lee, 2002; Zhang & Zhou, 2003).

Owing to the enormous benefits, both organizations and employees have been motivated to adopt e-learning, respectively. Govindasamy believed that e-learning offered another avenue to enhance teaching and learning (Govindasamy, 2002). In fact, the percentage of America's enterprises using e-learning in the employee training programs rose from 8% in 1999 to 29% in 2006. Worldwide, e-learning has experienced rapid growth (Bersin, 2007).

Besides considering the potential of e-learning as a tool to enhance education and training performance, we need to create more advanced Internet technologies to facilitate the development of e-learning. It is still a great

challenge to persuade an organization and its employees to accept this new technology in their on-the-job training. Not surprisingly then, a variety of theoretical models have attempted to develop explanations of the determinants of individual acceptance and the use of e-learning systems. Within these studies, a central construct and recurrent theme is the notion of an individual's cognition about the outcomes associated with the use of the e-learning system, also referred to in the literature as beliefs (e.g. Ajzen & Fishbein, 1980; Ajzen & Madden, 1986; Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). Beliefs represent the cognitive structures that an individual develops after collecting, processing, and synthesizing information about a technology system, and they incorporate individual assessments of various outcomes associated with technology use. Beliefs have been shown to have a profound impact on subsequent individual behaviors toward technology system usage. Hence, the belief formation process is clearly worthy of further investigation (Agarwal, 2000).

Although prior empirical studies have traced some of the factors that drive beliefs (Agarwal, 2000), most of these studies have been chosen to focus upon a specific and limited set of antecedents (Agarwal & Prasad, 1999; Venkatesh, 2000; Venkatesh & Davis, 2000). For example, a number of studies investigated two systemic beliefs: perceived usefulness (PU) and perceived ease of use (PEOU) of e-learning, using the Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw,1989; Selim, 2003; Raaij & Schepers, 2008; Chen & Hsu, 2007; Yu & Yang, 2005; Pituch & Lee, 2006; Liaw, 2007, 2008; Ong, Lai, & Wang, 2004; Stoel & Lee, 2003; Lee, Yoon, & Lee, 2009; King & He, 2006). Chang and Tung combined the innovation diffusion theory (IDT) with the technology acceptance model to propose a new hybrid technology acceptance model to find out learners' behavioral intentions to use e-learning. They introduced compatibility, perceived usefulness, perceived ease of use, perceived system quality and computer self-efficacy as core determinant beliefs of learners' behavioral intentions to use e-learning (Chang & Tung, 2008). Roca and Gagne applied the self-determination theory (SDT) to examine the effects of motivational factors affecting TAM constructs in e-learning in a work setting. They reported that three determinant beliefs (i.e. perceived autonomy support, perceived competence, and perceived relatedness) influenced perceived usefulness, playfulness, and ease of use in e-learning adoption (Roca & Gagne, 2008). Other determinant beliefs such as learner computer anxiety, instructor attitude toward e-learning, e-learning course flexibility, e-learning course quality, and diversity in assessments also seem to affect learners' satisfaction (Sun, Tsai, Finger, Chen, & Yeh, 2008). Perceived usefulness and self-efficacy were shown to influence behavioral intention to use e-learning (Liaw, Huang, & Chen, 2007).

However, due to the exposure to the social environment, social actors (e.g. individuals, groups and organizations) are likely to develop their beliefs, attitudes and behaviors consistent with those of their environments (Carley & Kaufer, 1993).

The fundamental argument made in this research is that individuals form beliefs about e-learning adoption within a milieu of influences emanating from the social context in which they interact with technology systems. However, extant research has not examined how social factors shape individual beliefs about e-learning system adoption.

The primary purpose of this study, therefore, is to draw upon institutional theories to present empirical evidence that coercive, normative, and mimetic social forces exhibit significant and differential impacts on individual beliefs about the use of e-learning systems.

After the introduction in section 1, the paper is organized as follows. In Section 2, a theoretical background and conceptual model are presented. Section 3 provides an overview of the methodology. The results of the data analysis are discussed in Section 4. Finally, the managerial and theoretical implications, limitations, and conclusions of the study are presented in Section 5.

2 THEORETICAL BACKGROUNDS AND CONCEPTUAL MODEL

2.1 Theoretical Background

Several theoretical bases inform the conceptual framework of this study, which essentially suggests that an individual's beliefs about technology use are influenced by two dominant sources of influence at varying distance from internal psychological processes: individual factors and social influences (Lewis, Agarwal, & Sambamurthy, 2003). It is important to point out that we are not hypothesizing that the belief drivers themselves are causally related. Rather, we are suggesting that it is useful, from a conceptual perspective, to begin using a taxonomy of such factors by categorizing them on the basis of how distal they are from the target of technology acceptance, videlicet, the individual user. Beliefs about technology use represent the core dependent variables for this research. The discussion below elaborates upon each of the key factors.

Perceptions about the characteristics of technology are not invariant across individuals. Indeed, individuals perceive a new technology from the vantage point of their own internal cognitive processes and develop beliefs about them. In order to sort out the range of factors that shape beliefs mental models, Lewis, Agarwal, and Sambamurthy (2003) proposed a conceptualization of concentric sources of influence, staring with the most proximate set of factors (i.e. individual characteristics), outside which lies a more distal set of influences factors (i.e. social milieu within which the individual is situated and institution forces that surround the individual).

In the literature, there are several technology acceptance behaviors that consider the importance of beliefs (Table 1). Such beliefs have been utilized to explain both system usage (Adams, Nelson, & Todd,1992; Moore & Benbasat, 1991) and usage intentions (Davis, Bagozzi, & Warshaw, 1989; Mathieson, 1991). As shown in Table 1, although most of the technology acceptance models consider various social influence factors, such as subjective norms in TRA, TPB and TAM, social factors in MPCU and UTAUT, and images in IDT, the discussion is generally fragmented and there is a lack of specific focus on social issues (Venkatesh, Morris, Davis, & Davis, 2003; Yang, Chiu, & Chen, 2011).

It is important to emphasize that this study is focused on the use of technology by individuals embedded within an organizational context. In the effort to understand technology use, numerous attributes of organizations have been studied; these studies suggest that institutional factors have a highly significant influence on individual technology use (Fuerst & Cheney,1982; Leonard-Barton,1987; Raymond,1988; Sanders & Courtney,1985; Boynton, Zmud, & Jacobs, 1994; Delone,1988; Leonard-Barton & Deschamps,1988; Monge, Cozzens, & Contractor, 1992).

Shared beliefs, attitudes, and behaviors are some of the most fundamental characteristics of a social group. The theory of social contagion claims that these beliefs, attitudes, and behaviors similarities are caused by social actors (e.g. individuals, groups and organizations) adapting their beliefs, attitudes, or behaviors to those of other actors in the network to which they are linked (Leenders, 2002).

To be more specific, within the technology acceptance context, social contagion refers to the social actors' attitudes of technology adoption that are significantly influenced by other actors (e.g. family and colleagues for individuals, customers, suppliers and partners for companies) who have direct connections or share similar social networks.

The underlying logic of the influences of social ties on social actors' beliefs, attitudes, and behaviors towards technology acceptance is that the social ties may have built up a collection of implicit rules, which may be both imposed on and upheld by the actors' beliefs, attitudes, and behaviors.

Table 1 The Literature of Technology Acceptance Behaviors

Model (Theory)	behavioral intentions are determined by (Beliefs)		proposed by	remark
	individual factors	social influence factors		
The theory of reasoned action (TRA)	individual's attitude	subjective norms	Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975	
The theory of planned behavior (TPB)	individual's attitude individual's perception of behavioral control	subjective norms	Ajzen, 1985 ; 1988 ; 1991	
The technology acceptance model (TAM)	perceived usefulness perceived ease of use	subjective norms	Davis, 1989; Venkatesh & Davis, 2000	an adaptation of TRA
The Model of Personal Computer Utilization (MPCU)	technology complexity facilitating conditions	social factors	Thompson et al, 1991	based on Triandis' theory of human behavior (Triandis, 1977)
computer	outcome expectations–		Compeau &	applied and

utilization	performance outcome expectations– personal self-efficacy affect anxiety		Higgins, 1995	extended the Social Cognitive Theory (SCT)
Innovation Diffusion Theory (IDT)	relative advantage ease of use visibility compatibility results demonstrability voluntariness of use	image	Rogers, 1995; Moore & Benbasat,1991	
The Unified Theory of Acceptance and Use of Technology (UTAUT)	performance expectancy effort expectancy facilitating conditions	social influence	Venkatesh et al., 2003	an unified model which integrates elements across the eight models
The Technology Readiness Index (TRI)	Innovativeness Optimism Discomfort insecurity	none	Parasuraman, 2000	

In the literature, there are several innovation adoption theories that consider these implicit and implied rules. The institutional theory points out that the beliefs, attitudes and behaviors of individuals and organizations are strongly influenced by various networks and interactions (Scott, 2001). It also addresses the role of institutions in understanding the behavior of social actors, and provides a perspective which can help assess the institutions' formal and informal rules that can strongly shape the beliefs, attitudes and behaviors of social actors (North, 1989; 1990; Burkhardt, 1994).

The institutional theory holds that the institutions' influences on the beliefs, attitudes and behaviors of social actors are secret but pervasive. Scott noted that institutionalization should be better viewed as the 'social process by which individuals came to accept a shared definition of social reality' (Scott, 1987) and defined institutions as 'social structures that have attained a high degree of resilience' (Scott, 2001).

Once internalized, or encoded into actors through a socialization process, institutions transform into a particular pattern of attitudes and behaviors, which will shape actors' future attitudes and behaviors and provide stability, order, continuity and meaning to social life. When institutions are established, they become authoritative guidelines for social behaviors (Scott, 2004). Thus organizational structures and processes become ingrained in the organization, and become 'taken for granted' as 'the way these things are done' (Scott, 1987). Therefore, the actors may not even realize that their behaviors are in fact partly shaped by institutions.

The emphasis of institutional theory on social actions is taken mean gaining legitimacy rather than monetary or utility optimization (Harcourt, Lam, & Harcourt, 2005; DiMaggio & Powell, 1983). A common means of gaining legitimacy is to align with some rationalized institutional myth (Meyer & Rowan, 1977), which is occasionally manifested by the adoption of structural attributes displayed by other significant organizations through some isomorphic process (DiMaggio & Powell, 1983).

It suggests that once institutions are established, they create constraints that are locally rational in an economic sense, but collectively they may be suboptimal. From this point of view, institutional theories are totally different from the rational economic perspective, which emphasizes economic optimization, individual self-interest, and conscious decision making.

Although the institutional theory has been primarily applied at the organizational level (DiMaggio & Powell, 1983; Ang & Cummings, 1997; Liang, Saraf, Hu, & Xue, 2007), it was nonetheless applicable at the individual level. Scott pointed out that institutions could operate at the level of 'localized interpersonal relationships' (Scott, 2001). Therefore, in this study, the institutional theory has been drawn on to organize social factors and to expand the depth and breadth of their work.

2.2 Conceptual Model and Hypotheses

Drawing upon the institutional theory, this study proposes a conceptual model, as shown in Figure 1, to investigate how institutional forces influence the acceptance of e-learning by individuals. In this model, we postulate that three institutional forces influence both the attitudes and the intention of e-learning.

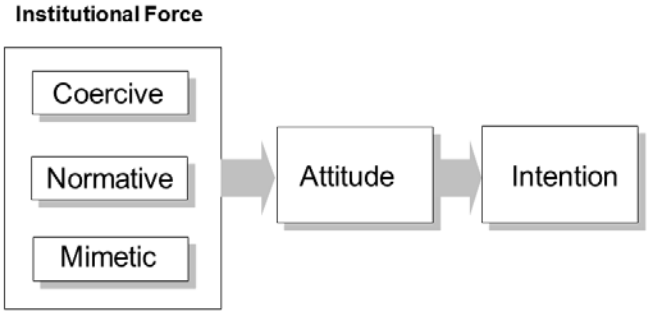

Figure 1 Conceptual Model

2.2.1 Attitude and intention

Attitude and intention are two widely examined variables in the literature of technology acceptance. Attitude indicates a person's general feeling of favorableness or unfavorableness toward some particular technology system (Ajzen, 1991; Morris & Dillon, 1997; Ajzen & Fishbein, 1980; Fishbein & Azjen, 1975). Behavioral intention refers to a user's intention to use a technology system. According to the original definition, behavioral intention encompasses the user's motivational factors that influence technology system usage behavior. These factors indicate how much effort a user will put forth in using a technology system (Ajzen, 1991). Most existing theories empirically verify that individuals' social behaviors are motivated by their behavioral attitudes. For example, TAM postulates the attitudinal explanations of intention to use a specific technology or service (Davis, 1989). In addition, the TRA and TPB models also posit that adoption intention is jointly determined by the attitude toward subjective norm and perceived behavioral control (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975; Ajzen, 1991).

Empirically, several studies have also confirmed that attitude has a significant influence on the intention to accept e-learning system usage (Yu, et al., 2007; Yu, 2006; Raaij & Schepers, 2008; Ong, Lai, & Wang, 2004; Alenezi, Karim, & Veloo, 2010). Therefore, we propose a hypothesis as follows:

H1. Learners' attitudes will positively influence their intention to accept e-learning system usage.

2.2.2 Institutions

In TAM, two systemic beliefs (i.e. perceived usefulness and perceived ease of use) are determinants of attitude, while no determinant is incorporated to explain attitude in the original TRA and TPB. Chang and Tung (2008) combined IDT and TAM by proposing compatibility, perceived usefulness, perceived ease of use, perceived system quality and computer self-efficacy as determinants of attitude in the e-learning context. However, as discussed above, those proposed determinants of attitude are technical and individual level factors. In this study, we postulate institutional forces as determinants of attitude.

The institutional theory focuses on the pursuit of legitimacy in the eyes of important societal stakeholders and accentuates the significance of the institutional environment as attitudes and behaviors of social actors (Grewal & Dharwadkar 2002). The theory indicates that in modern societies, social actors are typified as systems of rationally ordered rules and behaviors (Weber, 1946; Teo, Wei, & Benbasa, 2003). Therefore, there are general social conceptions of appropriate structures, beliefs, attitudes and behaviors. Early studies in the institutional theory identified three mechanisms by which institutional changes occur that promote similarities in structures and processes. As introduced by DiMaggio and Powell and Scott, these mechanisms for isomorphism are coercive, normative and mimetic (DiMaggio & Powell, 1983; Scott, 2001). These three mechanisms move 'from the conscious to the unconscious, from the legally enforced to the taken for granted' (Hoffman, 1997).

2.2.2.1 Coercive pressures

Coercive pressures are defined as both formal and informal pressures exerted on social actors to adopt the same attitudes, behaviors and practices, because they feel pressured to do so by more powerful actors (DiMaggio & Powell, 1983). The previous empirical evidence suggests that, at the organizational level, coercive pressures may stem from a variety of sources, like regulatory agencies, suppliers, customers, parent corporations and other key constituents (Teo, Wei, & Benbasa, 2003). In general, there are two types of coercive pressures, which are

regulation and competition. Regulatory pressures may rise from government and professional regulatory agencies (Harcourt, Lam, & Harcourt, 2005). Competitive pressures arise from the threat of losing competitive advantage. Early studies have cited the influence of coercive isomorphism pressures on innovation acceptance. For example, Zhu et al. indicated that the regulatory environment plays an important role in e-business diffusion (Zhu, Kraemer, Xu, & Dedrick, 2004). Wang and Cheung (2004) found that coercive pressure was positively related to travel agencies' adoption of e-business.

At the individual level, it seems unlikely that there are coercive pressures from regulatory agencies and other key constituents identified at the organizational level. However, at the individual level, e-learning individuals may still face coercive pressures from other sources, like management commitment and support. For example, employees may perceive coercive pressures to use e-learning for on-the-job training when their manager has already been using e-learning. Therefore, we propose a hypothesis as follows:

H2. Individuals who perceive higher coercive pressures are more likely to use e-learning.

2.2.2.2 Normative pressures

Normative pressures, associated with the professionalization of fields and disciplines, occur when social actors voluntarily, but unconsciously, replicate other actors' same beliefs, attitudes, behaviors and practices. The institutional theory proposes that social actors are more likely to copy a certain action if that action has been taken by a large number of other actors. Social actors are then been forced to adopt certain behavior due to their expectation for legitimacy and not necessarily for suitability (Flanagin, 2000). However, this copying or imitation is not coerced by any powerful actors, nor is it conscious. Instead, attitudes, behaviors and practices demonstrated for a long time by most actors in the same social context become so legitimized as the 'right' way things are done that individuals often come to believe that these practices and behaviors indicate the 'only' way to do things (Harcourt, Lam, & Harcourt, 2005; Johnson, Dowd, & Ridgeway, 2006). The normative pressures may guide social actors who have not adopted the innovation to experience discord and hence discomfort when peers whose approval they value have adopted the innovation (DiMaggio & Powell, 1983; Van Den Bulte & Lilien, 2001). Several studies have demonstrated this imitation in the past. For example, Krassa and Granovetter suggested that decisions to undertake in a particular behavior depended on the considerable number of similar others in the environment which had already done likewise (Krassa, 1988; Granovetter, 1978).

In the context of e-learning, normative pressures indicate that individuals will be more likely to adopt e-learning if they perceive that a considerable number of other individuals in their workplace had already adopted e-learning, as individuals may be afraid that they will be loneliness and lack of competitiveness if they do not adopt e-learning. In many cases, individuals may be afraid that they will be deemed 'old fashioned' if they do not follow the current trend. These phenomena have been described before as Bandwagon theories (Abrahamson & Rosenkopf, 1993) and theories of fads (Abrahamson, 1991). Therefore, we propose a hypothesis as follows:

H3. Individuals who perceive higher normative pressures are more likely to use e-learning.

2.2.2.3 Mimetic pressures

Mimetic pressures force social actors to seek examples of established behaviors and practices to follow through voluntarily and consciously copying the same behaviors and practices of other high-status and successful actors (DiMaggio & Powell, 1983), due to the belief that actions taken by successful actors will be more likely to get positive outcomes. In addition, through imitating, actors can reproduce with a minimal effort on search costs and experimentation costs, and avoid risks inherent from being the first-movers (Teo, Wei, & Benbasa, 2003).

In the e-learning context, individuals may selectively imitate the attitudes and behaviors that have been adopted by higher status individuals. Individuals may believe that they may get promoted to the higher position by mimicking what their supervisors or high-ranking managers are doing, i.e. benchmark learning. It indicates that individuals will be more likely to adopt e-learning if they perceive high status people have already adopted e-learning. Therefore, we propose a hypothesis as follows:

H4. Individuals who perceive higher mimetic pressures are more likely to use e-learning.

2.2.3 Control variables

Demographic variables may have the potential to influence e-learning adoption, especially when social factors are considered. We have included age, gender and income in our research model as control variables.

In recent years, researchers have suggested that age and gender play the important roles when examining social factors (Mazman, 2011; Dabaj, 2009). For example, older individuals tend to be more likely to be salient to social influences (Morris & Venkatesh, 2000). Older people tend to be more cautious and to seek greater certitude than younger people before they act (Botwinick, 1973). Similarly, women tend to be slightly more

persuadable than men (Copper, 1979) and more sensitive to others' opinions and thus more salient to social influences (Venkatesh et al., 2003; Venkatesh & Morris, 2000). Ong and Lai (2006) also found that men's perceptions of usefulness were more significant and more salient than women's in determining behavioral intention to use e-learning. In addition, wealthy individuals appear more likely to use e-learning. Individuals with high income may perceive higher time value (Goldman & Johansson, 1978; Stigler, 1961); thus the usage of e-learning may bring more benefits to those individuals. Therefore, this factor may suggest that they may be more inclined to adopt e-learning. Rogers suggests that e-learning is more likely to be adopted if the innovation meets a felt need. Therefore, we speculate that individuals with higher incomes are more likely to adopt e-learning (Rogers, 1995).

3 RESEARCH METHODOLOGIES

3.1 Measurements

To ensure the content validity of the scales used, the questionnaire was designed based on an intensive review of the literature. It was then reviewed by academic researchers with expertise in innovation adoption, e-learning, and survey methodology. Wherever possible, existing measures that had been used in previous studies were adopted. The questionnaire was also pre-tested on organization's employees who had e-learning experiences. The feedback from the pre-test was used to improve the readability and the quality of the questions in the instrument. The questionnaire is shown in the appendix, and the design of the measurement items is described below.

The measures for the institutional forces (i.e. coercive, normative and mimetic) were adapted from Teo, et al. (2003) and Liang, et al. (2007). Specifically, for coercive force, the respondents were asked the degree to which e-learning was required for their on-the-job training. For normative forces, the respondents were asked to indicate the degree to which others in their social network were using e-learning. For mimetic force, the respondents were asked the degree to which they agreed that individuals who were using e-learning had a high status. In all these measures, a Likert-type scale of 1-7 was used. A score of 1 indicates 'strongly disagree' with the statement, whereas the score of 7 indicates 'strongly agree' with the statement.

The scale with four items for attitudes was adapted from Davis, Lee, Park, Chatzoglou, et al., Demet, et al., and Venkatesh, et al. (Davis, 1989; Lee, 2010; Park, 2009; Chatzoglou, Sarigiannidis, Vraimaki, & Diamantidis, 2009; Demet, Cigdem, & Fethi, 2011; Venkatesh et al., 2003). The scale with three items for adoption intention of e-learning was adapted from Demet, et al., Chatzoglou, et al., Lee, et al., Bhattacherjee, and Liu, et al. (Demet, Cigdem, & Fethi, 2011; Chatzoglou, et al., 2009; Lee, Hsieh, & Ma, 2009; Lee, et al., 2011; Bhattacherjee, 2001a,2001b; Liu, Chen, Sun, David, & Kuo, 2010). Similarly, a Likert-type scale of 1-7 was used for these measures.

The measures for controls of age, income, and gender were adapted from Venkatesh et al., Demet et al., and Chatzoglou et al. (Venkatesh et al., 2003; Demet, et al., 2011; Chatzoglou et al., 2009). The respondents were asked to identify the pre-defined groupings of their age, gender, and income.

3.2 Data Collection

The sampling methods used in this survey were convenient sampling and snowball sampling. The questionnaire and the system information were disseminated to a convenient sample of respondents and contacts in their social networks. Respondents were chosen from different organizations of various size and sectors such as private companies (eq. Quanta Computer Inc., Trend Micro Inc., Delta Electronics Co., Alibaba.com, and Gemtek Technology Co.), research institutes (eq. Institute for Information Industry, Industry Technology Research Institute, and National Applied Research Laboratories), and the public sector (Science & Technology Advisory Group, Ministry of Economic Affairs, and Ministry of Education Affairs). Each organization had implemented e-learning and most respondents had experience in using it. The participants used in this study were all full-time knowledge-work employees with several years of working experience. Therefore, the samples were considered as appropriate.

A total of 200 questionnaires were distributed. Individuals were informed that participation in the study was voluntary and that their responses would be confidential and be analyzed only at the aggregated level. A total of 172 questionnaires were returned. Thirteen of them were partially completed and consequently excluded from the data analysis, resulting in a total of 159 effective responses (80 per cent).

The respondent profile is presented in Table 2. Among the 159 respondents, 98 per cent respondents were using various e-learning, and 2 per cent were not using any e-learning. Regarding gender and age, 47 per cent were male, 53 per cent were female, 1.3 per cent were under 24 years old, and 88.7 per cent were between 25 and 50 years old. As for income, most of them had monthly incomes between NTD 10,001 to 80,000, among which 19.5

per cent were between NTD 10,001 and 20,000, 22 per cent were between 20,001 and NTD 40,000, 22.6 per cent were between NTD 40,001 and NTD 60,000, and 28.3 per cent were between NTD 60,001 and NTD 80,000.

Table 2 Demographics of the Respondents (N=159)

Demographics	Item	Frequency	Percentage
Gender	Male	75	47.2
	Female	84	52.8
Age	Under 24 years	2	1.3
	25-34 years	65	40.9
	35-49 years	76	47.8
	50 or over years	16	10.1
Income (per month)	Less than NTD 10,000	3	1.9
	NTD 10,001-NTD 20,000	5	3.1
	NTD 20,001-NTD 40,000	39	24.5
	NTD 40,001-NTD 60,000	69	43.4
	NTD 60,001-NTD 80,000	23	14.5
	NTD 80,001 or more	20	12.6
Education	High school	1	0.6
	College	7	4.4
	University degree	55	34.6
	Master/Doctoral degree	96	60.4
Working Experience	Under 2 years	11	6.9
	2-5 years	31	19.5
	6-10 years	35	22
	11-15 years	36	22.6
	16 or over years	46	28.9

4 DATA ANALYSES AND RESULTS

4.1 Instrument Validation

The partial least square (PLS) method was used for assessing scales validity and testing the hypotheses. Unlike LISREL-type structural equation modeling (SEM), which is based on the covariance structure of the latent variables, PLS is a component-based approach for a predictive research model (Jöreskog & Sörbom, 1993; Lohmoller, 1989; Chin, 1998a) and thus can avoid two problems: inadmissible solutions and factor indeterminacy (Fornell & Bookstein, 1982). PLS examines the significance of the relationships between research constructs and the predictive power of the dependent variable (Chin, 1998b); thus, it is better suited for explaining complex relationships and building theories. As Wold argued, 'In large, complex models with latent variables PLS is virtually without competition' (Wold, 1985). In addition, PLS places minimal restrictions on the sample size and residual distributions (Anderson & Gerbing, 1988; Chin, Marcolin, & Newsted, 2003; Chin 1998b).

PLS analyzes simultaneously a measurement model describing the relationships between a research construct and the indicators used to measure the construct (i.e., factor loadings) and a structural model depicting the relationships between research constructs (i.e., path coefficients)(Fornell & Bookstein, 1982).

We display descriptive statistics for the measurement items in Table 3. Unlike LISREL-type SEM, which provides global good-of-fitness indices, PLS provides t-statistics for factor loadings. As shown in Table 3, all of the t-statistics of the factor loadings are significant at the $p < 0.001$ level.

Table 3 The Measurement Model

Construct	Item	Loading	Std. Error	t-Statistic	CR	AVE	Cronbach's α
Coercive	CF1	0.8721	0.0293	29.8036	0.888	0.726	0.822
	CF2	0.7786	0.0675	11.5293			
	CF3	0.8999	0.0277	32.4686			
Normative	NF1	0.8835	0.0252	35.0326	0.931	0.818	0.885
	NF2	0.9319	0.0137	68.2707			
	NF3	0.8979	0.0246	36.4701			
Mimetic	MF1	0.9228	0.0180	51.3621	0.945	0.852	0.913
	MF2	0.9417	0.0103	91.7620			

	MF3	0.9034	0.0178	50.8604			
Attitude	BE1	0.8087	0.0311	26.0348	0.918	0.737	0.876
	BE2	0.8312	0.0363	22.9071			
	BE3	0.9005	0.0244	36.8968			
	BE4	0.8901	0.0193	46.0846			
Intention	IN1	0.8856	0.0150	58.8732	0.933	0.822	0.896
	IN2	0.9313	0.0190	49.0050			
	IN3	0.9031	0.0258	34.9559			

Note: All t-statistics are significant at the 0.001 level; CR=Composite Reliability; AVE=Average Variance Extracted; NA: not applicable to single-item measures

Based on the results of the measurement model, we analyzed the convergent validity, discriminate validity and reliability of all of the multiple-item scales, following the guidelines in the literature of Fornell and Larcker (Fornell & Larcker, 1981). We assessed reliability in terms of item reliability and composite reliability. Item reliability was examined by means of factor loadings of the items of the construct. It is widely accepted that items with loadings of 0.7 or more have adequate item reliability. Table 3 shows that all factor loadings are higher than 0.7, indicating acceptable item reliability. Construct composite reliability is similar to and superior to Cronbach's alpha because it considers the actual factor loadings instead of assuming an equal weight for each item (Fornell & Larcker, 1981). The composite reliabilities in our measurement model ranged from 0.888 to 0.945, which were all above the recommended value of 0.7, suggesting adequate construct reliability (Nunnally, 1978).

We assessed convergent validity in terms of average variance extracted (AVE), which explained the variance that was measured by the construct in relation to the measurement error. Convergent validity requires an AVE of no less than 0.5 (Fornell & Larcker, 1981). Table 3 shows that all AVE values were above the recommended value of 0.5 (ranging from 0.726 to 0.852), thus demonstrating adequate convergent validity.

Discriminate validity was assessed by comparing the AVE of each individual construct with the shared variances between this individual construct and all of the other constructs. A higher AVE than shared variance for an individual construct suggests discriminate validity (Fornell & Larcker, 1981). Table 4 shows the inter-construct correlations of the diagonal of the matrix. A comparison of all of the correlations and square roots of the AVEs on the diagonal indicated adequate discriminate validity.

Table 4 Correlations of Latent Variables

	Coercive	Normative	Mimetic	Attitude	Intention
Coercive	**0.852**				
Normative	0.539	**0.905**			
Mimetic	0.480	0.402	**0.923**		
Attitude	0.335	0.393	0.408	**0.859**	
Intention	0.471	0.432	0.394	0.737	**0.907**

Note: Diagonals represent the square root of average variance extracted, and the other matrix entries are the factor correlation; NA: not applicable to signal-item measures.

4.2 Structural Model Estimation and Hypotheses Testing

The structural model was assessed by estimating the path coefficients and the R2 values. Path coefficients indicate the strength of the relationships between the independent variables and dependent variable. R2 values indicate the amount of variance explained by the exogenous variables and measure the predictive power of the structural models (Barclay, Higgins, & Thomson, 1995). We calculated path coefficients and t-statistics for hypothesized relationships using a bootstrapping technique. Results of hypothesis testing are presented in Figure 2 and discussed in the following paragraphs.

The significant path coefficient from attitude to adoption ($b = 0.735$, $p < 0.001$) provided support for H1. As indicated by path coefficients, normative and mimetic forces had significant influences on attitude ($b = 0.244$, $p<0.01$ and $b=0.276$, $p < 0.001$). This result confirmed our theoretical expectation and provided support for H3 and H4. However, as indicated by path coefficient, coercive forces had no significant impacts on attitude ($b = 0.071$, NS), suggesting rejection of H2.

Regarding controls, the paths from age, income and gender to e-learning adoption were all insignificant ($b = 0.012$, 0.016, 0.019, respectively). As shown in Figure 2, our model explained 23.2 per cent of the variance in

attitude and 54.4 per cent in e-learning adoption intention. The magnitude of these R2s provides additional evidence in support of the research model.

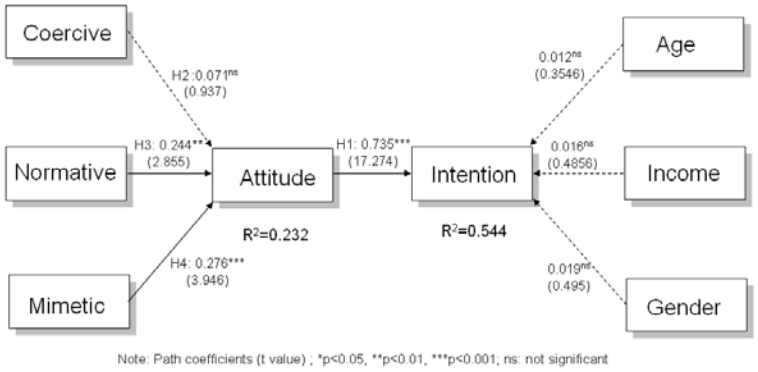

Figure 2 Results of Conceptual Model

4.3 Mediating Effect Analyses

As demonstrated in Figure 2, normative and mimetic forces relate significantly to attitude, and in turn attitude relates to e-learning adoption. This causal chain signifies the mediating effect of attitude on the relationship between institutional forces and e-learning adoption. To test this mediating effect, we followed Baron and Kenny's procedure to examine two more models (Baron & Kenny, 1986).

The first model (see Figure 3) removes the mediator of attitude and connects all three institutional forces to adoption directly. The second model connects all three institutional forces directly to e-learning adoption in addition to the mediating links, as shown in Figure 4. Another run of PLS analysis was conducted to test these two models. The model shown in Figure 3 yielded significant links from coercive, normative and mimetic forces to e-learning adoption. In addition, the explained variance of e-learning adoption significantly drops from 0.544 to 0.306. The results of the model shown in Figure 4 demonstrate that the direct effects of normative and mimetic forces on e-learning adoption are insignificant. Meanwhile, the explained variance of e-learning adoption only slightly increases from 0.544 to 0.594. These results jointly indicate that the influences of normative and mimetic forces on e-learning adoption are completely mediated by attitude.

However, in the model we tested, although coercive forces had no significant influence on attitude of e-learning adoption, they had direct significant influence on e-learning adoption when not mediated by attitude. This remains an interesting question for future research.

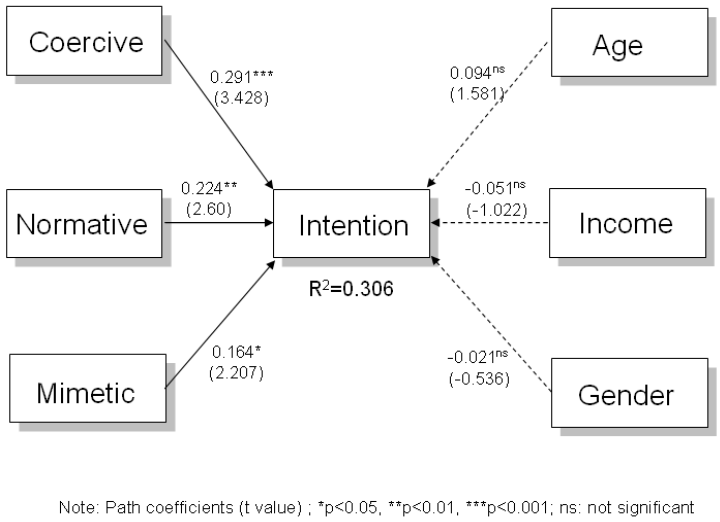

Figure 3 Result of Model with Direct Effects Only

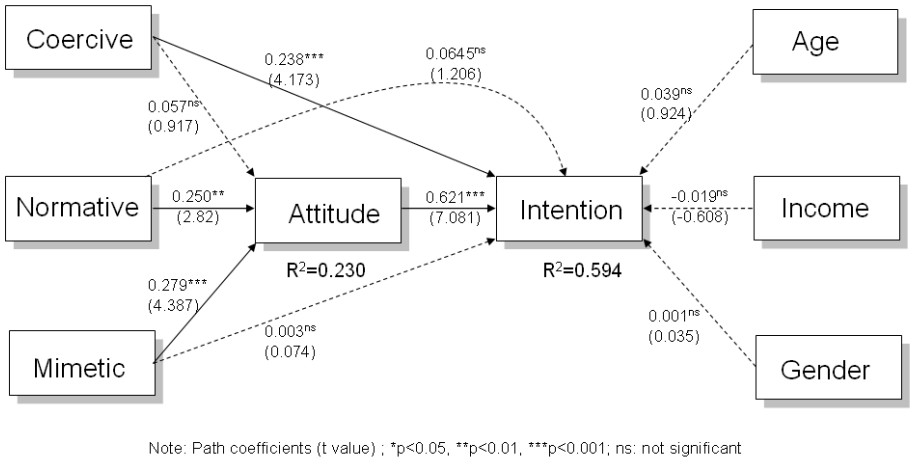

Figure 4 Results of Model with both Direct and Indirect Effects

5. DISCUSSION AND CONCLUSIONS

This study examines social factors by applying the institutional theory. The analysis results have provided insightful managerial and theoretical implications as discussed in the following.

5.1 Implications

With the preceding analysis results, we demonstrate how institutional forces influence attitude and intention of using e-learning. The results have managerial implications for training managers in human resource development and theoretical implications for researchers.

First, our analysis illustrates that two types of institutional forces, normative and mimetic, have a significant influence on attitude and intention to use e-learning. These findings may shed light on how training managers could better plan their e-learning program and thus accelerate the rate of adoption. The results indicate that e-learning can benefit from social influences that could result in an organization's employees jumping on the e-learning bandwagon. When an increasing number of employees do that, organizational investments in human capital could be more efficient. To be specific, training managers may need to work on improving normative and mimetic forces. Regarding normative forces, training managers may need to build an e-learning community and conduct referral champions to create normative expectations. Regarding the mimetic forces, it appears that the high-profiles of e-learning adopters may influence e-learning adoption of others with lower profiles. Training managers may provide success stories of the e-learning experiences high-profile employees and enhance word of mouth marketing in the e-learning context.

Secondly, our results reveal that mimetic pressures have higher influences on attitude and intention than normative pressures (b = 0.276, 0.244, respectively). This finding suggests that it may be more efficient for training managers to exert mimetic forces than normative forces to promote the adoption of their e-learning.
Thirdly, our analysis demonstrates that attitude plays a mediating role between institutional forces and intention. This finding clearly depicts a mechanism in which the institutional forces, particularly normative and mimetic, influence the formation of employee's attitudes toward using e-learning, which in turn determine the intention of using e-learning. It suggests that training managers should improve their e-learning to promote the employee's positive attitude. It is evident that social factors, in particular the normative and mimetic forces, are key determinants of attitude.

Fourthly, our analysis shows no significant influence of coercive institutional forces on attitude or intention of using e-learning, but it has significant influence on e-learning adoption directly. This finding suggests that organization may provide certain training courses available only on the Internet and provide incentives for e-learning users to improve their attitude.

Fifthly, the control variables of age, gender and income demonstrate no significant impact on the intention to use e-learning. This is consistent with previous studies on e-learning. For example, Cheng et al. analyzed the invariance across TAM constructs and found that age, gender, prior experience, and work experience difference had no significant influence on attitude and intention to use e-learning (Cheng, et al., 2011). This finding

suggests that the training managers may not need to be segmented in terms of demographic characteristics when promote e-learning on-the-job training.

Lastly, this study contributes significantly to the literature in several areas. To the best of our knowledge, our study is a trial study of applying the institutional theory at the individual level, unlike most previous studies, which applied institutional theory at the organizational level. In addition, our study also contributes to the technology acceptance literature by examining institutional factors in e-learning settings, while previous studies examine e-learning primarily from technical and individual perspectives. Although previous studies also investigate social factors, such as social norms and image, our model incorporates a richer set of social factors with expanded depth and breadth.

5.2 Limitation and Future Research Directions

Although this study makes significant contributions to the literature and provides valuable insights, it has also several limitations. Our findings must be interpreted in the light of these limitations.

First, our sample involved only the specific and limited organizations in a particular geography. The findings may not be fully generalized to other organizations in other geographies. Special caution should be taken when generalizing or extrapolating these findings to different cultural and social environments.

Secondly, the research model explains 54.4 per cent and 23.2 per cent of the variance of intentions and attitudes, respectively. The 45.6 per cent and 76.8 per cent of the variance left unexplained suggest that some factors important to the acceptance of e-learning are omitted in the study. Future studies may use a richer set of variables, including not only social factors but also individual factors, as predictors to provide better explanatory power for e-learning behaviors.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the National Science Council of Taiwan, R.O.C., for their partial support of this research under Contract No. NSC 101-3114-Y-307-019, NSC 100-3114-Y-307-015 and NSC 99-3114-Y-307-008.

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APPENDIX

Appendix A. Questionnaire items used in this study

Items	Mesures
Coercive forces (adopted from Teo, et al., 2003 and Liang, et al., 2007)	
CF1	Many of my on- job training requires me to use e-learning.
CF2	Many training courses can be accomplished only when using e-learning.
CF3	My learning interactions with my company, friends, and other businesses force me to use e-learning.
Normative forces (adopted from Teo, et al., 2003 and Liang, et al., 2007)	
NF1	I have seen what others do using e-learning.
NF2	Many people in my social network (friends, family, workmates, and classmates) use e-learning.
NF3	E-learning is very visible in my social network (friends, family, workmates, and classmates)
Mimetic forces (adopted from Teo, et al.,2003 and Liang, et al., 2007)	
MF1	People around me who use e-learning have more prestige than those who do not
MF2	People around me who use e-learning have a high profile
MF3	Using e-learning is a status symbol for people around me
Attitude (adopted from Davis, 1989 and Lee, 2010 and Park 2009 and Chatzoglou, et al., 2009 and Demet, et al., 2011 and Venkatesh et al., 2003)	
BE1	Using e-learning is a good idea
BE2	I would feel that using e-learning is pleasant
BE3	In my opinion, it would be desirable to use e-learning
BE4	In my view, using e-learning is a wise idea intention
Adoption intention(adopted from Demet, et al., 2011 and Chatzoglou, et al., 2009 and Lee, et al., 2009 and Lee, et al., 2011 and Bhattacherjee, 2001a,2001b and Liu, et al., 2010)	
IN1	I would continue to use e-learning for my learning needs
IN2	Continuing to use e-learning for handling my on-job training is something I would do in the future
IN3	I would continue to see myself using e-learning for handling my on-job training.

Appendix B. Factor Structure Matrix of Loadings and Cross-Loadings

Scale Items	MF	CF	ATT	NF	GEN	IN	AGE	INCOME
MF1	**0.9228**	0.4872	0.3842	0.4239	-0.0249	0.3768	0.0097	-0.0147
MF2	**0.9417**	0.4298	0.4107	0.3377	-0.0347	0.3480	0.0716	0.0661
MF3	**0.9034**	0.4106	0.3259	0.3520	-0.0280	0.3693	0.1141	0.0944
CF1	0.3225	**0.8721**	0.2972	0.4979	-0.0059	0.4098	0.0363	0.0844
CF2	0.2663	**0.7786**	0.1268	0.3282	-0.0018	0.3266	-0.0511	0.0981
CF3	0.5545	**0.8999**	0.3464	0.4951	0.0964	0.4402	-0.0000	0.0109
BE1	0.2612	0.3550	**0.8087**	0.3665	-0.0592	0.5711	0.0281	-0.0231
BE2	0.4512	0.3238	**0.8312**	0.4036	0.0910	0.5927	0.0174	0.0652
BE3	0.3212	0.2377	**0.9005**	0.3031	-0.0882	0.6696	0.0769	0.0350
BE4	0.3577	0.2423	**0.8901**	0.2812	-0.0168	0.6909	0.1288	0.0763
NF1	0.3125	0.4484	0.3229	**0.8835**	0.0521	0.3002	0.0721	0.1869
NF2	0.3893	0.5009	0.3332	**0.9319**	0.0940	0.4119	0.0480	0.0947
NF3	0.3830	0.5081	0.4003	**0.8979**	0.0755	0.4454	-0.0509	0.1054
gen	-0.0318	0.0469	-0.0197	0.0821	**1.0000**	0.0013	-0.1129	-0.1346
IN1	0.3532	0.3446	0.8070	0.3780	0.0080	**0.8856**	0.0150	0.0108
IN2	0.3714	0.4830	0.5936	0.4045	-0.0099	**0.9313**	0.1175	0.1128
IN3	0.3444	0.4862	0.5362	0.3939	0.0034	**0.9031**	0.0862	0.0349
age	0.0679	0.0064	0.0745	0.0198	-0.1129	0.0732	**1.0000**	0.5313
income	0.0505	0.0617	0.0469	0.1403	-0.1346	0.0540	0.5313	**1.0000**

Appendix C. Structural Model

	Entire Sample estimate	Mean of Subsamples	Standard error	T-Statistics
NF->ATT	0.2440	0.2296	0.0855	2.8550
CF->ATT	0.0710	0.1098	0.0758	0.9371
MF->ATT	0.2760	0.2702	0.0699	3.9458
ATT->IN	0.7350	0.7404	0.0425	17.2742
GEN->IN	0.0190	0.0463	0.0384	0.4947
AGE->IN	0.0120	0.0468	0.0338	0.3546
INCOME->IN	0.0160	0.0472	0.0329	0.4856

THE DEMAND FOR HIGHER EDUCATION IN TURKEY AND OPEN EDUCATION

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ABSTRACT
Failure to meet considerably high demand for higher education in Turkey has always been one of the most significant concerns of Turkish Higher Education System for many years. In this respect, Anadolu University Open Education Faculty has played a significant role in the attempts to overcome this problem in Turkey for the last three decades. In this study, the development of the demand for higher education in Turkey and that of the open education system in parallel with this demand are examined and the specific reasons why this system is preferred by the students enrolled in the system are analyzed and the results obtained are evaluated from a scientific point of view.

INTRODUCTION

Obtaining the right to attend a higher education institution is an important part of the agenda in Turkey just like in other countries. For Turkish young people who are old enough to attend a higher education institution, whether to take part in business life or to continue education life by attending a university is an important decision they have to make. Unfortunately, since the current demand is considerably higher than the available capacity, access to higher education is now a serious problem in Turkish context. When the fundamental functions of higher education are considered -such as contributing to personal development of individuals, equipping learners with creative, scientific and critical thinking skills in addition to training them for a specific occupation-, it should be an important objective for governments to provide opportunities for as many people as possible to access higher education.

Due to the importance given to modern education since the foundation of Turkish Republic in mid 1920s and the steps taken since then by the ruling governments accordingly, the demand for education at every level increased considerably. Similarly, during this period, the number of faculties and universities established also increased, however; this increase was far less than that of newly established secondary level educational institutions; namely secondary schools and high schools. In addition, there was a considerably high interest in receiving college level vocational education for certain jobs, which resulted in higher demand for certain faculties related to such jobs. As a result, the available quotas allocated for higher education failed to meet this increasing demand, and finally, the higher education institutions started to accept their students by administering a kind of placement test organized by each institution seperately. However; unprecedentedly increasing applications made for higher education institutions led to an ultimate solution; which was a centralized student selection and placement exam administered across the country by a center called “Student Selection and Placement Center”
Today, many solutions are offered to meet this increasing and diverse demand for higher education, and related educational policies are discussed thoroughly; however, permanent solutions cannot be put into practice yet. It is clear that simply increasing the capacity of formal (face–to–face) higher education is not sufficient enough to solve the problem completely. Although various suggestions might be offered for permanent solutions, the following ones are listed among the mostly agreed ones in Turkey: restructuring the secondary education, realizing structural, administrative and functional changes in higher education and improving open education system.

The discussions regarding educational systems mostly focus on the following criticisms: formal education’s failure to meet individuals’ demands for basic education, especially when the popular concept “lifelong learning” is considered; and the fact that those who do not access to formal education are deprived of education. Open education system, which is currently used or in the process of implementation and development in many countries including Turkey, is an outstanding educational model proven to be effective in meeting the demand for higher education and in offering equal opportunities in the field of education. Because of the popularity of distance education all around the world today, first of all, it is necessary to know what distance education is. There are some definitions, which describes distance education (Rüzgar 2004). Michael Moore (1989) defines distance teaching as "the family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in a contiguous situation would be performed in the learner's presence, so that communication between the teacher and the learner must be facilitated by print, electronic, mechanical or other devices. On the other hand, Keegan makes one of the meaningful definitions of distance education. For Keegan (http://home.anadolu.edu.tr/~udemiray) there are six elements to be considered for a unifying definition of distance education:

1. The separation of teacher and learner, which distinguishes it from face to face lecturing,
2. The influence of an educational organization, which distinguishes it from private study,
3. The use of technical media, usually print, to unite teacher and learner and carry the educational content,
4. The provision of two-way communication so that the student may benefit from or even initiate dialogue,
5. The possibility of occasional meetings for both didactic and socialization purposes,
6. The participation in an industrialized form of education, which if accepted, contains the genus of radical separation of distance education from other forms.

When the distinctive features of distance education stated in the above mentioned definitions and the unique practices applied (making use of technological advancements and integrating them into the system) are considered, it is crystal clear that distance education is likely to serve as an effective solution to aforementioned concerns. Especially, the implementation and intense use of e-learning practice in both traditional and distance education institutions strengthen this argument to a great extent.

In parallel with the solutions sought to balance increasing demand for higher education, open education techniques were initiated in Turkish Higher Education system as of 1970s. In this context, "correspondence teaching " and "mass higher education institution (YAYKUR)" were among the first applications for mass distance higher education. As to be discussed later in this paper, such applications were not continued although they received considerable demand at the beginning. Open Education Faculty, which was established in 1982 by Anadolu University, has been offering distant higher education for almost 30 years and still provides considerable support in meeting this increasing demand.

In a country like Turkey, where there is no comprehensive and stable long-term planning in the field of education and education policies are continuously revised and manipulated according to current conjuncture, it is worth examining such a system in detail which has been applied for such a quite long time. Today, Anadolu University is considered a "mega university" with its over one million graduates since its foundation and over one and half million currently attending students. This accomplishment and the demand for the system constitute the main focus of this study. It would be unfair and one-sided analysis to accept that only those who do not have the chance to be enrolled in formal education prefer open education system (despite the fact that it is an important reason). All institutional factors such as the programs offered, simple registration procedures, learner support services and well-established organizational structure and, of course, obtaining students' opinions regularly through various data collection tools should be taken into consideration while accounting for the demand for open education system. Therefore; this study aims at determining the factors leading to this considerable demand for open education system in Turkey and contributing to the development of further distance education projects and applications in the country.

Anadolu University, as a "mega university" with its over one million graduates and currently enrolled students assumes significant responsibilities in the field of distance education and plays important roles in overcoming the current problems of Turkish Higher Education System and meeting the intensive demand. Since its establishment in 1982, there has been considerable increase every year in the number of students enrolled in open education programs due to the demands from different parts of the society for higher education. These diverse needs or demands for education from different levels of the society in parallel with the changes in the prevailing conditions of the period have been met successfully despite certain restrictions due to the diversity of needs and available conditions; and therefore, Anadolu University has, now, been considered as a mega university and presented as a successful model in the field. In this regard, there are many components of this system that are worth examining in its 30 year-history. It is expected that a thorough analysis of Anadolu University distance education system regarding the registration procedures and kinds of enrollment and the introduction of the technical solutions applied to potential and experienced problems will provide insights and models for similar programs and applications worldwide.

Within this framework, this study examines the development of the demand for higher education in general and for open education in specific. To achieve this purpose, the detailed data regarding the reasons of the students enrolled in open education system for preferring this system are obtained through the administration of a questionnaire. The main scope of the study is to interpret the components determining this demand for Turkish Open Education System, which has proven to a be great success in the literature with its more than one million students as of today, through the analysis of the data obtained from the questionnaires.

The Demand for Higher Education in Turkey and its Development

Revising and restructuring the education system to keep up with the conditions of modern world was one of the primary objectives of newly established Turkish Republic in mid 1920s. It was fortunate that there was an

immediate and considerable support for this restructuring process from the society since, at those times, majority of the population were living in villages, overall education level of the society was quite low and the available educational institutions were quite diverse. This support resulted in a continuously increasing demand for education at every level. For the purposes of this study, the focus, henceforth, will be on the development of higher education and open education and the demand for these two systems in Turkey.

The development of higher education in Turkey

In order to achieve the objectives of the new republic in terms of the modernization of education, different models of university systems from the West were taken as models rather than simply improving already available "madrasah" system. Initiated with the establishment of Dar-ül Fünun in 1900, the historical development of Turkish Universities continued with the foundation of new universities and faculties in Ankara and İstanbul until 1950s and, later, in different cities located in Anatolian part of Turkey. One of the important challenges faced during this period was the number of students in higher education. During this period, Turkey and France shared the third place in the rank (with an annual increase of 7 %) among OECD countries in terms of the annual rate of establishing new schools. However; the annual capacity increase was far from meeting the increasing demand. The number of students enrolled in secondary level educational institutions, which was 17.000 in 1930, increased to 20.000 in 1940, to 34.000 in 1950, to 55.000 in 1960, to 152.000 in 1970, to 321.000 in 1980 and finally to 387.000 in 1990. Similarly, the percentage of higher education institutions except universities increased to 33 % in 1966 and to 40 % in 1969 from 3 % in 1958 (Güvenç, 2009).

Until the regulations initiated following the enactment of Higher Education Law numbered 2547 in 1981, the following situations were prevalent in Turkish higher education system: diversity among universities in terms of administrative and financial autonomy and the presence of other higher education institutions apart from universities (State Academies of Engineering, Academies of Economic and Commercial Sciences, State Academy of Fine Arts, Sports Academies, Vocational Schools established by the Ministries and Educational Institutes etc) due to arising different needs and demands. In 1980 – 1981 academic year, there was a total of 166 higher educational institutions in Turkey including 19 universities (Gürüz 2003).

Higher Education Law enacted on November 6th 1981 was an important step to restructure Turkish Higher Education. The objectives and scope of the law are stated as follows: "to organize the regulations related to education, learning, research, publication, academic staff, students and other personnel in higher education institutions; to determine the objectives and principles for higher education as well as the procedures, duties, responsibilities and authorizations of all higher education institutions and the related organizations they are affiliated to. The institutions administered by Turkish Armed Forces and Turkish Police Department are exempt from such regulations".

Following the enactment of the Law numbered 2547, which might be considered one of the most fundamental regulations in the history of Turkish Higher Education System, eight more universities were founded, which increased the number of available universities in Turkey to 27 in 1982. In the following years, this number continuously increased in order to meet the demand and to make higher education available across the country. Today, there are 159 universities - including 94 state universities, 45 private universities, 7 private vocational schools, 5 military higher educational institutions, 1 educational institution administered by Turkish Police Department, 5 universities in Turkish Republic of Northern Cyprus and 2 state universities with Special Status. All these institutions accept their students according to the results of a "student selection and placement examination" administered every year in Turkey.

General Demand for Higher Education in Turkey

Following the foundation of the republic, Turkish Higher Education system has shown considerable improvement in terms of the opportunities offered and the number of students. The main reason this increasing demand for education is the need for qualified individuals due to rapid social, economic and social development after the declaration of the republic and the increasing enthusiasm and willingness to keep up with world agenda and latest developments. During this process, Turkish Education System inevitably developed into a system taking the demands by the society into consideration rather than simply guiding social change (Tekeli, 1980).

Since this newly established education system are, to a great extent, based on the demands from the society, more and more higher education institutions were founded in many cities, and a considerable number of faculties and academies were established accordingly. During this period, the quality of the higher education provided was also discussed thoroughly among scholars in parallel with the quantitative increase. However; the continuing demand for higher education urged the establishment of more and more new institutions in the country. Until 1960s, the capacity of higher education institutions was sufficient to accept all the applications made by high

school graduates, however; after 1960s the capacity of higher education institutions was not enough to meet the demand from high school graduates. In 1960, 19.197 of 23.535 students who graduated from high schools were able to register in a higher education institution. As the years passed the situation became worse. In 1973, only 41.789 of 89.359 high school graduates were able to obtain the right to enroll in higher education institutions (Dökmen, 1992). In other words, only 47 % of high school graduates obtained the right to register in a higher educational institution in 1973, which was 82 % in 1960.

As of the late 1960s, the gap between the capacity of higher education institutions and the demand for it became larger and larger (Mıhçıoğlu 1974). The solution offered at this point was to admit students by administering a type of examination. First application, which was a "central examination", covered only some of the universities, and later the practice was extended to all the universities except METU (Middle East Technical University) and ITU (İstanbul Technical University) under the organization by Ankara University in 1964 – 1965 academic year. The reasons lying behind the administration of such a country-wide centralized examination were as follows: the rapid increase in the number of students applying higher education institutions; artificial increase in the number of candidates, local examinations and the complexity of procedures; failure to fill up the quotas predetermined for the departments at universities; and the problems occurred due to not administering the exams in certain centers under the supervision of experts (Dökmen 1992). Above mentioned concerns required the administration of a country-wide selection and placement examination.

Until 1974, this central examination was organized by different universities each year. In 1974, however, "Inter-universities Student Selection and Placement Center" was established and therefore given the authority to administer this examination. This institution was later was renamed as "Student Selection and Placement Center" in 1982 and affiliated to Higher Education Council. The distribution of the numbers of students who applied to and were placed in higher education institutions since 1974 according to years is as follows:

Table 1. The Number of students who applied to and placed in universities (Formal Education) between 1974 and 2009

YEARS	APPLIED	PLACED	YEARS	APPLIED	PLACED	YEARS	APPLIED	PLACED
1974	--	37254	1986	503566	96674	1998	1359579	254542
1975	--	68511	1987	628113	100912	1999	1479562	266689
1976	--	40767	1988	--	107333	2000	1414823	277827
1977	357511	36613	1989	691676	108822	2001	1473908	296101
1978	373865	37438	1990	773837	112865	2002	1823088	368010
1979	--	40622	1991	738955	116968	2003	1596879	347564
1980	--	41572	1992	837766	146375	2004	1902132	393220
1981	--	56010	1993	1088393	173013	2005	1851618	423106
1982	408621	72983	1994	1193159	204816	2006	1678383	417918
1983	210940	89881	1995	1212580	216123	2007	1776441	437638
1984	--	100580	1996	1386611	225223	2008	1646376	562981
1985	480747	96086	1997	1398596	253602	2009	1451350	585998

Resource: The data was obtained from OSYM (Student Selection and Placement Center) http://osym.gov.tr

When the above mentioned statistics are examined, it can be clearly seen that admitting students according to the results of a central examination did not produce an effective solution to the concerns related to accessing higher education. The simplified procedures to apply for a central examination and low cost led to an incredible increase in the number of students who want to attend a university. Similarly, these advantages also affected those who would like to change his or her current higher education institution; therefore increasing the number of students who want to attend a different department or university for some reasons (Serter 1986). Application / placement ratio, which was around 20 % for a long time, increased only a little bit in early 2000s due to the emergence of evening education in universities and the new policy of Vocational High Schools which does not require students to take any examinations. Today, the ratio increased to around 40 % due to rapid increase in the number of newly established universities and quota increase for certain faculties and departments.

It is really necessary to search for a solution for the problem by increasing the available capacity. However, such practices bring about quality concerns by initiating various discussions ranging from campus capacity and shortage of equipment and academic staff. Such discussions and solutions offered are multi-dimensional and mostly focus on the structure of higher education system, the programs offered, the teaching methods and procedures used, the legislations applied, the principles determined for obtaining registration rights, and financial issues. These issues will not be dealt with here since they are not within the scope of this study. However; it is obvious that the solution would be possible only when the function of higher education in social and cultural life is redefined; primary, secondary and higher education systems are restructured in such a way that they complete each other; and finally when the changing and developing needs of the society are satisfied. Indeed, numerous solutions suggested in the related literature focus on above mentioned conditions, and open education is highly likely to be an indispensible alternative among the models suggested.

OPEN EDUCATION

The fact that the durations of primary and secondary education were extended according to the prevailing conditions and multi-program secondary education models and "preparation school" practices for universities were available more and more in Turkey caused individuals to spend more years in educational institutions, which also encouraged the willingness among young people to continue for university education. Similarly, the increasing importance of "having a diploma" due to new developments and changes in working life also affected this process. Therefore; in today's world, those who are employed in higher education system have to deal with heterogeneous groups of young people and adults who have different backgrounds, interests, personal skills and preferences compared to those in the past. This development and new situation requires the restructuring of higher education with two important concepts in mind: lifelong learning and continuous education.

When the problem is analyzed from an educational dimension, it is observed that "pre-adult education process", which was once carried out traditionally by higher education, started to develop into a new concept called "lifelong learning" and is still changing accordingly in today's world. Moreover, the meaning of "learning" for students now is not "being an absolute goal" itself but just a "tool" to reach a predetermined goal. Moreover, it is now observed that "elite higher education" mentality and practices are being replaced by "mass higher education" (Alkan, 1981). In this regard, the determining factor of this development is the advancements in information and communication technologies, which showed considerable acceleration as of 1960s. Education, of course, is one of the sectors which are positively affected by such advancements. At this point, distance education was designed as a concrete model which might satisfy individual and social needs, and meet the demand for lifelong learning and basic education by using technological advancements as effectively as possible. During its initial phases of development, open education was thought to be just an alternative low quality education and criticized accordingly due to certain learning channels employed at the beginning. Although the point achieved today has not been able to completely overrule these critiques, the concerns were solved to a great extent. Moore and Kearsley proposes five phases regarding the development of open education (Moore and Kearsley, 2005, p.24-46).

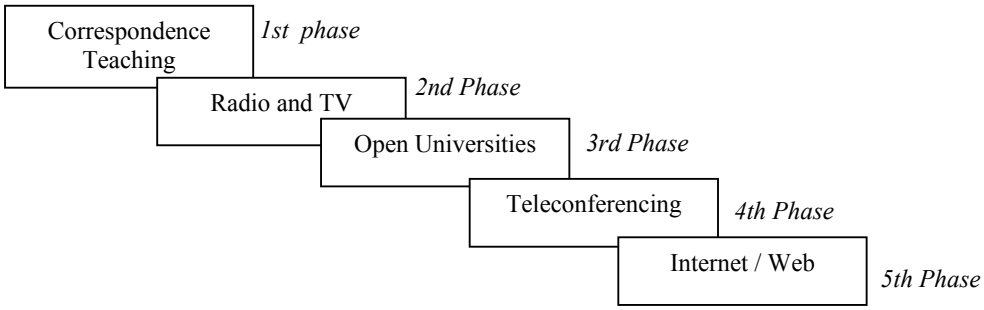

Figure 1. The Phases of the Development of Distance Education

The first phase is "correspondence teaching", which were initiated in the late 19th century. The educational activities in this method are based on printed materials and the feedback provided by the learner for the instructor or the institution through letters sent via snail mail.

The second phase is "teaching through radio and television" – in which radio was used in 1920s and television in 1930s as the primary medium of presentation.

The third phase is "Open Universities", which might be defined as a new organization type rather than an innovative communication technology. Open Universities have been an effective tool in organizing the available technology and human resources, and in developing new educational techniques and theories as well as finding solutions to emerging problems thanks to their expert staff who commit themselves to distance education and educational designs. They also benefit from economies of scale since they have quite high number of students enrolled in their programs.

Teleconferencing, which is acknowledged as the fourth phase, has been an important component in the development of distance education since it allows learners and teachers living in different places to communicate and interact. In contrast to one-way communication like in "correspondence teaching" and "teaching through radio and television", teleconferencing was able to initiate an important change in the presentation of distance education thanks to developmental phases it passes throughout its history: from "audio-teleconferencing" used at the beginning to "interactive video-conferencing" and "interactive video" and "two-way video conferencing" techniques employed depending on the available technological advancements of the period.

The fifth phase, which is called internet and web-based education, brought a new dimension to distance education. Bayrak (2001, p 61) claims that the redefined structure, management and learning environments of education due to the effects of globalization is a paradigmatic transition period for educators, students, administrators and policymakers, so he suggests that web-based education should be examined in terms of the processes followed during this transition. Due to increasing popularity and accessibility of internet, web-based education brought a dynamism, growing interest and an innovation to distance education with its new presentation channels where writing, sound and video are combined in one single communication tool and finally with its constructive, "learner-centered" and process-oriented teaching methods.

Each phase mentioned above such as "correspondence teaching", "teaching through radio and television" and "teleconferencing" changed the organizational structure of distance education to a certain extent. In parallel with the changes and transitions in open universities, today some institutions which only provide face-to-face education are planning and even implementing a dual education system by integrating open education into their programs. New technologies opened the way to the emergence of electronic (online) universities and allowed the accessibility of distance education to masses through collaborations and mergers among institutions.

The use of mass communication devices for educational purposes is not a new practice in Turkey. However; there were some considerable differences regarding the following issues: why they are used; the level of technology employed, how are they adopted and perceived; and finally the effects they created (Açıkalın, 1985). İşman (2011), in his article, lists the problems in Turkish Education System under 13 categories: physical conditions, equipment – materials, qualified teachers, quality education, standard education, number of students, attendance, rapid population growth, lack of interest in education by families', interests and skills, level of learning, modern methods and the retention of what has been learned. He suggests that information technologies should be employed as an alternative solution to overcome such problems. He further highlights "distance education" as a new education model that uses information technologies effectively and offers this model as a solution to all 13 problems listed above (İşman, 2011).

The first system using distance education principles in Turkey in order to satisfy the high demand for higher education is "correspondence teaching", which was initiated in 1974 – 1975 academic year. A total of 53.000 students were initially enrolled in the system, which was organized by a unit affiliated to National Ministry of Education. 15 months later, this practice was abandoned due to certain problems and continued by the Mass Higher Education Institution (YAYKUR) in 1975 -1976 academic year with a total of 85.000 students enrolled in 20 different programs (Serter 1986). According to this model, two-year associate degree education was planned, in which the first year would be carried out according to distance education principles and the second one face–to face in the schools affiliated to "formal higher education office". However; this practice was also abandoned in 1978-1979 academic year due to limited number of students, low success level and the fact that graduates were not able to find jobs (Serter 1986; p 7).

Following the enactment of Higher Education Law numbered 2547, Eskişehir Academy of Economic and Commercial Sciences, which was established in 1958, was entitled to be university called Anadolu University. The paragraph "h" of the article "5" of the law is about "open education and teaching" in terms of the planning and realization of higher education, and similarly the paragraph "d"of 12th article – which defines the responsibilities of higher education institutions – writes "… providing education for the society especially regarding the modernization of industry and agriculture through formal, mass, continuous and open education". Based on this law, Anadolu University was authorized to implement and organize open education programs as of

July 20th 1982. On November 1982, "Regulations on Open Education" was published on "Official Gazette" numbered 17860, which gives Anadolu University Open Education Faculty the responsibility to provide "central open education" in Turkey.

In order to fulfill this important mission effectively, Anadolu University mobilized all its human resources ranging from the technical and expert staff employed in "The Institute for Teaching through Television" to the academic staff employed in its faculties and departments. In addition, the collaborative projects were carried with the academicians and expert from other universities for the following issues such as course book writing, television program design, script writing and filming and academic counselling services. Anadolu University had already been experienced in open education practice and the use of mass communication tools in education even before it was given this responsibility (Curabay and Demiray, 2002). Both close circuit education TV, which was founded thanks to the self-sacrificing contributions by the staff of Eskişehir Academy of Economic and Commercial Sciences in 1970s, and "Institute for Teaching through Television", which was established later on, formed the basis for distance education at Anadolu University.

After the basic requirements were fulfilled, Anadolu University launched distance education system through printed materials, TV programs, and face-to-face education opportunities in the fields of Economy and Business Administration in 1982-83 academic year, when a total of 29.445 students were enrolled in the system. Since then, the number of students enrolled increased due to the increasing demand for higher education in Turkey. Today, 43 % of all the students enrolled in higher education in Turkey are registered in open education system.

The Demand for Open Education

Anadolu University Open Education Faculty has been offering various programs at university level for a wide range of individuals with different backgrounds for almost three decades. The programs offered are quality enough to meet the demands from all parts of the society. The university offers more than 60 various higher education programs ranging from special educational programs for the Police Department and Armed Forces to English Language Teaching and pre-school Teaching programs at undergraduate level, from special training programs offered for Call Centers to Theology and Veterinary and Health Laboratory Services and finally from associate degree and lisence completion programs for teachers employed by National Ministry of Education to those who are already placed by Student Placement and Selection Center and prefers undergraduate and graduate transfer. The demand for such a system in today's world cannot be simply accounted through the argument that people who are not able to obtain the right to attend a formal face-to-face education program prefer open education programs. In this study, students enrolled in the system were given questionnaires to obtain data about their reasons for preferring open education system.

METHODOLOGY

The population of the study consists of students enrolled in Faculty of Open Education, Faculty of Economics and Faculty of Business Administration which offer open education programs at Anadolu University. Of these students, 66.953 students were contacted through random sampling method during 2008-2009 academic year. The questionnaires that were sent as optical forms and completed by the students were processed through optical readers by Anadolu University Computer Research and Application Center and later prepared for analyses. The variables which are not included in the questionnaire but included in the analyses such as age, gender, the place of residence, faculty, department and year were obtained from the database of the Computer Research and Application Center.

The data collected were presented as frequencies and percentages. Certain analyses were made through cross relationships formed among some variables.

FINDINGS

The numerical data distributions for the participants who filled out the questionnaire in 2008–2009 academic year were examined and following results were obtained:

Table 2. Demographic Data about the Participants (2008 – 2009)

Faculty	Frequency	Percentage	Gender	Frequency	Percentage
Open Education	19.012	% 28,4	Male	30714	45,9
Economy	20.065	% 30	Female	36239	54,1
Business Administration	27.876	% 41,6	Military Service	Frequency	Percentage
Age Ranges	Frequency	Percentage	Exempt	1.519	5,2

24 and below	31.589	47,2	Completed	7.343	24,9
25 – 29	16.809	25,1	Suspended	16.771	57
30 – 34	8.097	12,1	In progress	227	0,8
35 – 39	5.410	8,1	Cyprus Quota	5	0
40 – 44	3.014	4,5	2nd Higher Education	1.292	4,4
45 and above	2.034	3,0	Age limit exceeded	2.285	7,8
Employment	Frequency	Percentage	Unknown	1	0
Unemployed	26.599	41,1	Total	29.443	100
Employed	38.162	58,9			
Total	64.761	100			
Not answered	2.192				
			General Total	66953	

The students who participated in the study were asked to mention three most important reasons for preferring open education system. The total number of replies given to this item was 181.050. The distribution of these replies according to faculties is as follows: 42 % Business Administration, 30 % Economy and 26 % Open Education Faculty. Of these students, 23.6 % stated "to obtain a university diploma" as the reason to prefer open education system and 19.9 % "to find a job". Only 1.4 % of male participants replied that they preferred open education system just to "suspend military service". The distribution of other reasons stated by the participants is displayed in Table 3.

Table 3. The Distribution of "The Reasons for Preferring Open Education" according to "Faculties" (2007-2008)

The Reasons for Choosing Open Education	**Frequency**	**Percentage among those who preferred**	**%**	**Open Education Faculty (%)**	**Economy (%)**	**Business Administration (%)**
To find a job	36.084	19,9	59.7	0.24	0.34	0.43
To obtain a university diploma	42.795	23,6	70.8	0.26	0.31	0.43
To suspend military service	2.55	1,4	4.2	0.1	0.33	0.57
To receive promotion at work	21.188	11,7	35.1	0.32	0.23	0.45
To access knowledge about a subject I am interested in	22.028	12,2	36.6	0.32	0.27	0.42
To regain the education opportunity I missed in the past	18.899	10,4	31.2	0.34	0.29	0.38
My family's reluctance to allow me to receive education in other programs	2.14	1,2	3.6	0.3	0.38	0.33
Not having enough financial power to afford formal education.	7.742	4,3	12.9	0.27	0.35	0.39
Getting sufficient point only to be enrolled in distance education programs	13.358	7,4	22.2	0.28	0.38	0.34
Lack of obligation to attend lessons	14.266	7,9	23.7	0.28	0.27	0.46
Total of Preferences stated	**181.05**	**100**		**0.28**	**0.30**	**0.42**

It is observed that the students enrolled in Faculty of Business Administration (43 %) has the highest percentage for the the reason "to find a job". Similarly, the highest percentage for the reason "to obtain a university diploma" belongs to Faculty of Business Administration (43 %). The highest percentage (57 %) for the reason "to suspend military service" is for the students enrolled in Faculty of Business Administration.

When Table 3 is examined, it is found that only 4.2 % of 30.714 male students enrolled stated that they preferred open education "to suspend military service", which was once believed to give the system a negative reputation. The results obtained in this study clearly disprove this belief.

The distributions of the reasons for preferring open education system according to age groups are given in Table 4. The percentage of the students who are 24 years and younger is 48 % while the percentage for those who are 45 or above is 3 %. 64 % of those who prefer open education "to find a job" (19.9 %) are 24 years old or younger. Similarly, the percentage of 24 year old or younger people who prefer open education "to obtain a university diploma" (23.6 %) is 50 %. Those who prefer open education "to regain the opportunity I missed in the past" are mostly from the age group between 24 and 34 years old.

Table 4. The Distribution of "The Reasons for Preferring Open Education" according to "Age" (%)

The Reasons for Choosing Open Education	**<= 24**	**25 – 29**	**30 – 34**	**35 – 39**	**40 – 44**	**45 +**
To find a job	64	26	7	2	1	0
To obtain a university Diploma	50	24	12	8	4	2
To suspend military service	62	35	3	0	0	0
To receive promotion at work	29	25	19	14	9	5
To access knowledge about a subject I am interested in	50	26	10	7	4	3
To regain the education opportunity I missed in the past	22	29	21	15	8	6
My family's reluctance to allow me to receive education in other programs	65	22	7	4	2	1
Not having enough financial power to afford formal education.	55	27	9	5	3	1
Getting sufficient point only to be enrolled in distance education programs	68	21	6	3	1	1
Lack of obligation to attend lessons	30	26	17	13	8	6
Average	**48**	**25**	**12**	**8**	**4**	**3**

As Table 5 shows, 42% of those who replied the questionnaire are not employed, and 31 % of those who are employed work in private sector companies. 59 % of those who state that they preferred open education "to find a job" are not employed and 28 % work in private sector. 45 % of those who replied that they preferred open education "to receive promotion at work" are employed in state-run institutions and 39 % in private sector. 72% of those who state that they preferred open education because of "lack of obligation to attend lessons" are employed. Finally, 63% of those who say that they preferred open education because of "the family's reluctance to allow them to receive education in other programs" are not employed.

Table 5. The Distribution of "The Reasons for Preferring Open Education" according to "Employment"

The Reasons for Choosing Open Education	**Unemployed**	**Employed**	**State**	**Private Sector**	**Own Business**
To find a job	59	1	5	28	7
To obtain a university Diploma	44	1	19	30	7
To suspend military service	29	1	19	36	14
To receive promotion at work	12	1	45	39	3
To access knowledge about a subject I am interested in	45	1	18	28	8
To regain the education opportunity I missed in the past	31	1	29	31	7
My family's reluctance to allow me to receive education in other programs	63	2	7	23	6
Not having enough financial power to afford formal education.	45	1	10	36	8

Getting sufficient point only to be enrolled in distance education programs	60	1	8	24	7
Lack of obligation to attend lessons	28	1	33	32	7
Mean	**42**	**1**	**20**	**31**	**7**

The data regarding the reasons for preferring open education system and the expectations from open education system are given in Table 6. When the first main reason regarding the preference for open education – "to obtain a university diploma" (Table 3) - is examined, the highest percentage was found for "I have no expectations" as 20.2%. The highest percentage for the second highest reason - "to find a job" - was "high expectation" as 17.8%. Finally, the third highest reason - "to access knowledge about a subject I am interested in"- has the highest percentage for "high" expectation from the program as 14.3%.

Table 6. The relationship between "The Reasons for Preferring Open Education" and "The Level of Expectations from the Education"

The Reasons for Choosing Open Education	**How would you grade your expectations from the education you will receive in the department / program you enrolled in? (%)**			
	High	**Middle**	**Low**	**I have no expectations**
To find a job	17,8	14,5	10,2	7,9
To obtain a university Diploma	15,9	18,2	19,3	20,2
to suspend military service	3,7	4,2	6,3	6,4
To receive promotion at work	9,9	11,2	11,5	12,8
To access knowledge about a subject I am interested in	14,3	11,0	8,3	8,7
To regain the education opportunity I missed in the past	12,2	12,9	12,4	13,2
My family's reluctance to allow me to receive education in other programs	3,6	3,4	3,8	3,2
Not having enough financial power to afford formal education.	6,1	5,5	5,8	4,7
Getting sufficient point only to be enrolled in distance education programs	8,7	9,3	10,4	7,9
Lack of obligation to attend lessons	7,8	9,8	12,0	14,9

The data regarding the relationship between the reasons for preferring open education system and how much they know about this system are displayed in Table 7. When the table is examined, for the first reason stated for this preference – that is "to obtain a university diploma"- it is found that the total percentage for the options "I have somewhat information" and "I have detailed information" is 33.4. The same total percentage for the second highest reason, which is "to find a job" is 30.6. Finally, as for the third reason, which is "to access knowledge about a subject I am interested in", a total of 26.1 % of those who replied say that "they know the system partly or in detail".

Table 7. The relationship between "The Reasons for Preferring Open Education" and the replies given for the question "How much do you know about Open Education System?"

The Reasons for Choosing Open Education	How much do you know about Open Education System?"		
	I have no information	**I have somewhat information**	**I have detailed information**
To find a job	16,0	15,9	14,7
To obtain a university Diploma	17,8	17,2	16,2
to suspend military service	4,3	4,1	3,8
To receive promotion at work	10,4	10,5	11,5
To access knowledge about a subject I am interested in	11,6	12,3	13,8
To regain the education opportunity I missed in the past	12,5	12,5	12,8

My family's reluctance to allow me to receive education in other programs	3,5	3,6	3,4
Not having enough financial power to afford formal education.	6,2	5,8	5,2
Getting sufficient point only to be enrolled in distance education programs	9,4	9,1	8,1
Lack of obligation to attend lessons	8,4	9,0	10,4

The data regarding the relationship between the reasons for preferring open education system and the frequency of entering university entrance exam are presented in Table 8. When Table 8 is examined, it is observed that the students took university entrance exam more than once. On the other hand, those who state conscious reasons such as "to find a job", "to obtain a university diploma, "to receive promotion at work", "to access knowledge about a subject they are interested in" and "to regain the education opportunity I missed in the past" were found to take this exam only once.

Table 8. The relationship between "The Reasons for Preferring Open Education" and "the Frequency of Entering University Entrance Exam"

The Reasons for Choosing Open Education	**The Frequency of Entering University Entrance Exam**		
	Once	**Twice**	**Three or more times**
To find a job	16,8	16,6	14,6
To obtain a university Diploma	17,6	17,3	16,9
to suspend military service	3,0	4,1	4,6
To receive promotion at work	10,2	10,0	11,2
To access knowledge about a subject I am interested in	14,0	12,6	11,3
To regain the education opportunity I missed in the past	12,0	11,2	13,7
My family's reluctance to allow me to receive education in other programs	3,4	3,6	3,6
Not having enough financial power to afford formal education.	5,8	5,8	5,8
Getting sufficient point only to be enrolled in distance education programs	8,9	10,1	8,6
Lack of obligation to attend lessons	8,4	8,6	9,7

CONCLUSION

Among the solutions to meet the increasing demand for higher education in Turkey, establishing more universities is considered the primary solution to the problem. This solution seems to be a tangible one since it is necessary to find a permanent solution somehow; however, the challenges for this solution are likely to be the insufficient physical conditions and educational materials and the quality concerns. However, due to rapid population growth and the high percentage of young population in Turkey, these inadequacies are considered only a secondary problem, and therefore no serious attempts are made to find effective and permanent solutions to this problem. Today, it is clear that Open Education system in Turkey experiences similar problems to those of Turkish Higher Education System. However, it is also true that the considerable improvements and achievements in Turkish Open Education System in the last three decades has played an important role in being an alternative to reduce the demand that once used to be impossible to meet, and to offer opportunities to ensure equality in the provision of education to masses. After the inititation of the restructuring process as of 2010 in open education system provided by Anadolu University, all the programs and learning channels have been revised. The transition process to the credit system and semester-based system started, and the testing system has been improved by adding different testing methods in most programs such as oral exams, written exams, e-portfolios and even online exams in order to remove the dependence on mere multiple choice testing system. This reorganization process is expected to be completed by 2012 – 2013 academic year.

In order to achieve a considerable success in this process, it is essential to determine the factors leading to the high demand for the system. One of the important criticisms made for the system - though it does not deserve this due to the achievements made for more than 30 years – is the negative attitude towards the system by the society in general, which reflects an existing prejudice that this system is inferior to the others. With this new reorganization process, it is expected to remove this prejudice to a great extent. In this respect, obtaining data about the reasons for preferring open education system will be invaluable in planning the attempts to achieve more effective restructuring process and to analyze the system by moving beyond mere numerical data.

The current study, which aims to achieve this purpose, provides information about the development of the demand for Turkish Higher Education system and the precautions taken to meet such demand as well as the developments in open education systems in Turkey and the world. It further presents data obtained from the questionnaire administered to the students enrolled in 2008 – 2009 academic year.

The analysis of the data obtained reveals that the main reasons for preferring open education system are "to obtain a university diploma" and "to find a job after completing their education". These reasons are similar to those stated for preferring formal face-to-face education as well. The third reason stated is "to access knowledge about the topic they are interested in". Among the reasons which are specific only to open education system are "to receive promotion at work", "to regain the education opportunity I missed in the past" and "lack of obligation to attend lessons".

It is also necessary to examine how potential outsiders, in addition to students, are likely to affect the demand for open education sytem. At this point, it won't be wrong to predict that this demand has the potential to soar since there is a growing interest in open education system since its establishment and there are still free quotas in traditional universities for some reasons. The reasons for this potential can be summarized as follows:

- Considerable cost-effective advantages of the system compared to traditional universities due to economies of scale created,
- The that fact that learning becomes easier and more accessible thanks to the advancements in information and communication technologies,
- The opportunity given to the learners to determine their learning processes due to flexible learning environments,
- The integration of open education system into higher education at both national and international level (such as the accreditation with Bologna process). In other words, the integration of valid academic standards established for higher education into open education system,
- The availability of coursebooks, synchronized and asynchronized academic counselling services, TV programs, e-learning environments and the provision of academic and administrative support services through open education buroeus located in all the cities across Turkey,
- The availability of environments which make learner-learner and learner-institution interactions possible,
- Increasing importance and awareness of lifelong learning and the fact that open education system is the most signficant alternative for lifelong learning practices,
- Simplified procedures for the transfers between open education and traditional (formal) education,
- The variety and number of vocational training programs offered through open education system.

The increasing demand for open education worldwide (or the most recent and popular term used: "online learning") also clearly supports these arguments. According to the plan published by Sloan Consortium in 2006: Nearly 3.2 million students were taking at least one online course during the fall 2005 term, a substantial increase over the 2.3 million reported the previous year. This more than 800,000 additional online students is more than twice the number added in any previous year (Elaine and Seaman 2006, pp.1,2). A study published in 2011 by the U.S. Department of Education found that "From 2000 to 2008, the percentage of undergraduates enrolled in at least one distance education class expanded from 8 percent to 20 percent, and the percentage enrolled in a distance education degree program increased from 2 percent to 4 percent (Alexandria 2011, pp.3).
Finally, it might be concluded from the results that students consciously prefer the open education system, which has almost equal distribution of male – female population and mostly employed students. When this reorganization process is completed successfully, open education system integrated into both Turkish and international higher education systems will play more significant roles in solving the problems of Turkish Higher Education System.

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THE EFFECTS OF READING FROM THE SCREEN ON THE READING MOTIVATION LEVELS OF ELEMENTARY 5TH GRADERS*

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ABSTRACT
This study aims to explore the effects of reading from the screen on elementary 5th grade students' reading motivation levels. It used the randomized control-group pretest-posttest model, which is a true experimental design. The study group consisted of 60 students, 30 experimental and 30 control, who were attending the 5th grade of a public elementary school in Sakarya during the second term of the 2010-2011 school year. Three narrative and three expository texts were selected from the 6th and 7th themes of the Turkish text book which was used in this school. The texts were typed on the computer to be used with the experimental group. Data were collected by using the reading motivation scale designed by the researcher. The results showed that the reading motivation levels of students who read the texts from the screen were significantly lower than those of students who read the printed material, both in the subscales and the overall scale.
Keywords: Reading, Reading from the Screen, Motivation, Reading Motivation.

INTRODUCTION

The main goal of reading instruction in elementary education is to equip children with the skills of using the language of writing and drawing effectively for communication purposes (Akyol, 2006). Individuals should use the reading skill obtained in this way and improve it to keep up with the demands of the age. The significance of reading and its associations with other skills makes it necessary to understand its definition. Reading is a complex skill that requires the coordination of several relevant sources of information and meaning construction from the text. Reading affects people of all ages and enables them to improve their thinking, understand social events, and enter a healthy process of communication (Sever, 2000). People who read within a society want to share their views and opinions on everyday events. In recent years, technological advances and the spread of the internet have made it possible to share readings or obtain information via the computer, telephone, and TV. Students in our day are growing up in an environment that is radically different from that of the previous generations. They mature with the internet and many instant communication devices that could not be imagined 20 years ago (Wagner, 2008). Also, new technologies caused a changed certain issues such as all of the existing learning-instruction theories, instruction methods, environmental design in parallel to the technology (İşman & İşbulan, 2010).

These technological changes point to a change in literacy from paper to the screen. Thus it is important to understand the role that digital technologies play in the education of current and future generations. Clemmitt (2008) stated that while reading books lay the foundations of 20th century literacy, it is possible that 21st century literacy will involve instant messaging and obtaining information by blogging and following online images and sounds in addition to using text. In other words, today's readers need to go beyond old reading habits based on traditional publication, and explore and acquire novel and progressive approaches that explain the nature of electronic texts. In line with the rising popularity of digital libraries, the act of digital reading forces students to change their beliefs about reading from paper (Brown, 2001; Parrot, 2003).

The act of digital reading brings to mind the concept of reading from the screen. This concept is a skill that needs to be defined by referring to the digital culture. Reading from the screen is an act of reading electronically or digitally texts viewed from a screen such as a computer monitor. The most distinct characteristic of reading from the screen is the presentation of a certain portion of printed text from a screen (Güneş, 2009a; 2009b). As readers are familiar with computers, they efficiently obtain information from and read screen-based presentations (Meyer & Poon, 1997).

A direct relationship cannot be established between new skills concerning technology-related literacy methods and habits and whether these will affect people's reading education positively or negatively. This is because reading instruction cannot be treated in isolation. As a whole, reading instruction includes factors that affect reading such as comprehension or motivation. Reading is a skill that requires effort and forces students to make a

* This research is a part of first author's Master Thesis.

choice between doing and not doing. This requires motivation. An understanding of the concept of reading motivation first requires a definition of the concept of motivation. Owing to its complex structure, motivation is hard to explain in one dimension. It is thus difficult to agree on a single definition of motivation. It has been defined as a stimulus that triggers purposeful behaviors and intentions (Harmer, 2001; Ryan & Deci, 2000), willingness and a desire to reach a goal (Ames, 1990); the degree of people's efforts and their choices (Keller & Song, 2001); and fuel for the tools that people use for learning and information (Atkinson, 2000). Reading motivation includes people's reading-related behaviors.

Previous research shows that motivated children at the level of elementary education spend more time on reading (Guthrie, Wigfield, Metsala & Cox, 1999; Wigfield & Guthrie, 1997). At the same time, children who are motivated to read and spend more time on it were found to be better readers than other children. Motivation seems to affect students' views about reading positively. Readers are motivated to read in different ways, and construct new understanding by making use of their knowledge from previous experiences. They thus engage in different social interactions by reading. People who are motivated to read will be more interested in reading (Guthrie, Van Meter, Mccann, Wigfield, Bennett, Poundstone, Rice, Faibisch, Hunt & Mitchell, 1996) and have more positive ideas about reading (Mathewson, 1994; Mckenna, Kear & Ellsworth, 1995).

Pintrich and Schunk (1996) conceptualized the questions students asked themselves: "Can I become a good reader?" and "Why do I want to be a good reader?", and stated the skills, values and beliefs studied by motivation theorists in the dimension of reading. These questions are directly related to motivation. Competence and skills are not enough to maximize success. The question "Do I want this?" is a part of intrinsic and extrinsic motivation. "Intrinsic motivation" triggers personal curiosity for an activity. From a different perspective, when faced with the question why they read, individuals with intrinsic motivation respond as "I read to learn". "Extrinsic motivation" on the other hand, refers to being motivated to see through an activity for a reward or with someone's support (Ryan & Deci, 2000). In other words, students with extrinsic motivation read because their teachers want them to read, they want good grades, the text is easy, or they want to act in unison with their friends. As grade level proceeds, the reasons for decreasing amounts of reading need to be explored and students' reading motivation needs to be accurately evaluated so that their needs for reading instruction can be met. By evaluating reading motivation, students' individual differences in reading may be understood better.

It is essential to identify elementary students' reading motivation because it is through such work that they can be turned into effectively literate individuals in the future (Atkinson, 2000). This can also enable intervention into their reading success. Research on motivation and reading motivation has shown that students' intrinsic motivation is more strongly related to the amount of reading than other motivation types (self-efficacy, extrinsic motivation and social motivation) (Lau, 2009). Guthrie and Alao (1997) studied the design process to increase reading motivation. They found that the following were necessary for this environment: including elements that motivate reading, appealing to cognition, being integrated, systematically interrelated, practical, easy to implement in the long run, useful for students, cost-effective, and appropriate for the class and school environment. Edmunds and Tancock (2003) studied the effects of incentive on elementary 4th graders' reading motivation. According to the findings of this study, no significant difference was observed between the students who received incentives and others. Marinak and Gambrell (2008) studied the effects of award possibility and selection on the reading motivation of 3rd grade students. The most noteworthy finding of the study was that carefully selected awards can increase reading motivation. Ülper (2011) studied the affective side of reading, and asked students factors that motivate reading. The results showed that the determining factors for motivating students to read, were the teacher, family, friends, book, the environment and activity. It was also found that factors other than the book and activity were more influential on girls than boys.

Similarly, Grimshaw, Dungworth, Mcknight and Morris (2007) stated that different types of electronic storybooks did not have an effect on children's reading comprehension levels or reading pleasure, and that reading took longer in the electronic environment. Conversely, Ertem (2010) found that electronic storybooks caused a significant difference in students' reading comprehension levels. Şahin's (2011) study revealed no statistically significant difference in students' reading comprehension levels when reading occurred on the screen or from paper. Greenlee-Moore and Smith (1996) found higher reading desire and reading comprehension scores among children who read long and difficult texts electronically. As can be seen, comprehension and motivation studies seem to be intertwined and mutually supportive when reading from the screen is concerned. Thus, starting from the link between motivation and reading comprehension, the studies reviewed here also contain reading comprehension studies. As no Turkish study has yet explored the effects of reading from the screen on student motivation, the possible results are open to debate. This study was necessitated by the fact that the effects of reading from the screen on reading motivation had not been studied.

The purpose of this study was to identify "The effects of texts read from the screen at elementary 5th grade on reading motivation levels". In line with this purpose, an answer to the following question was sought.
Is there a difference between the reading motivation levels of experimental and control group students?

METHOD

Research Model

This study used the experimental model. Experimental models are the most valid and reliable model that tests the causal relationship between variables (Fraenkel and Wallen, 2006). The true experimental model of randomized pretest-posttest control group model was preferred. One group was assigned randomly as the experimental group and the other one as the control group. In order to compare the two groups before and after the trial, pretest and posttest measurements were made.

Study Group

The study group consisted of 60 students attending the 5th grade of an elementary school located in Sakarya during the 2nd term of 2010-2011 school year. The experimental and control children were selected randomly. The school where the trial was to take place had continuous internet access, and a computer lab or classroom with enough number of computers. It was also ensured that the students to take place in the trial had basic computer literacy.

Table 1. Computer Use Levels of Experimental and Control Group Students

			Computer Use		
			Yes	No	Total
Group	Experimental	N	30	0	30
		%	100	0	100
	Control	N	27	3	30
		%	90	10	100
Total		N	57	3	60
		%	95	5	100

Table 1 shows that the selected students knew how to use a computer.

Data Collection Tools

The "Reading Motivation Scale for Texts" designed by the researchers were used in order to identify the reading motivation of students. When the scale was being developed, the researcher examined certain motivation scales in the literature to identify reading motivations of fifth grade students.

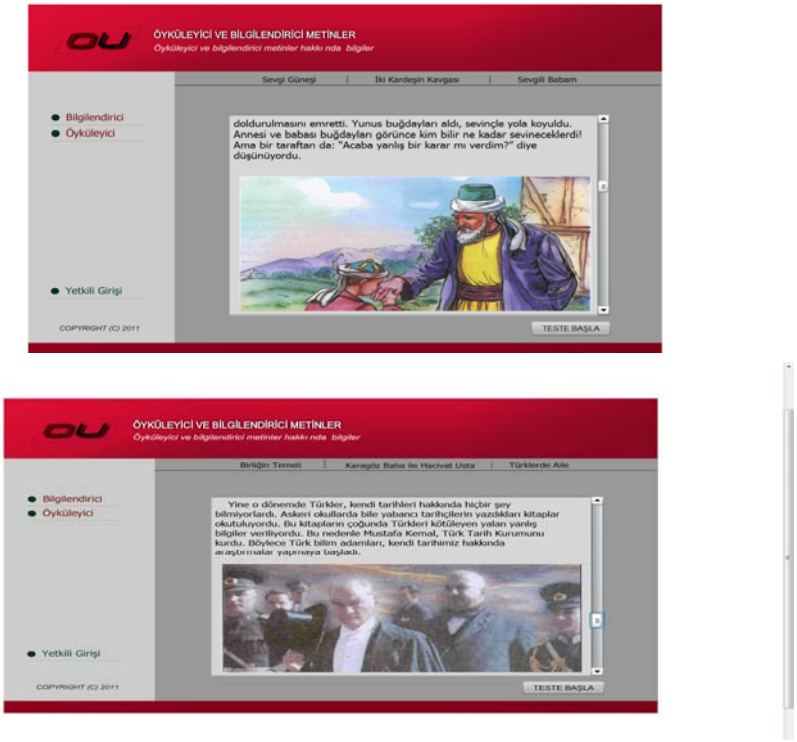
The scale development process started with a literature survey and a 60-item pool was formed. During validity studies, expert views were obtained for content validity (4 lecturers from the educational sciences department, 5 from the elementary education department, 1 from the computer education and instructional technology department, and 3 from the Turkish education department). Twenty teachers were given teacher opinion forms to collect their views about the scale, and 40 students were given student opinion forms. For construct validity, confirmatory factor analysis was undertaken. The results revealed a valid and reliable scale with 22 items in the following four factors: "Perception of Reading Difficulty", "Reading Competence", "Effort/Recognition for Reading" and "Social Aspects of Reading". The factor loading value in the "Perception of Reading Difficulty" subdimension varied between .62-.80; that in the "Reading Competence" subdimension varied between.41-.67; that in the "Effort/Recognition for Reading" subdimension varied between .54-.74; and that in the "Social Aspects of Reading" subdimension varied between .56-.70; the factor loading value of the 22-item scale varied between .41-.80; the four factors of the scale explained 46.23% of the total variance. Total internal consistency coefficient was .81. These values show that the scale explained 5th grade students' text-based reading motivation well.

The Trial

Prior to the trial, pretests were performed to see whether students' reading motivation would change after the experiment. In the experimental group, each student read from the screen unedited expository and narrative texts chosen from the text book. Examples of these expository and narrative texts are presented below (Image 1). In the control group, class teachers were contacted and the same texts that were read weekly in the experimental

group were read from the book. The reading motivation scale was used as a posttest in order to explore the effects of reading from the screen on reading motivation.

Image 1. Sample Experimental Group Screens



Findings

The experimental and control groups undertook pre and posttests so that the effects of the trial on reading motivation could be established. Two-factor ANOVA was used to ascertain whether the pre and posttest results differed meaningfully. The subdimensions were studied first in order to explore whether they had changed significantly.

Table 2. Pre and Posttest Mean and Standard Deviation Values of Experimental and Control Groups in the Perception of Reading Difficulty Subdimension

Group	P.R.D. PRETEST			P.R.D. POSTTEST		
	N	$\bar{x}$	S	N	$\bar{x}$	S
Experimental	30	23.50	4.03	30	21.67	4.44
Control	30	21.97	5.83	30	20.07	5.32
Total	60	22.73	5.03	60	20.87	4.92

The pre and posttest values of experimental and control groups in the dimension mentioned are presented in Table 2, and show a decline in the mean values of both groups.

ANOVA Results of Experimental and Control Groups in the Perception of Reading Difficulty Subdimension

Source of Variance	Sum of Squares	df	Mean Square	f	p
Between groups	2227.20	59			
Group(Experimental/Control)	73.63	1	73.63	1.98	.164
Error	2153.57	58	37.13		

Within groups	797.99	60			
Measurement(Pre-Posttest)	104.53	1	104.53	8.74	.004
Group*Measurement	**0.03**	**1**	**0.03**	**0.03**	**.958**
Error	693.43	58	11.96		
Total	3025.19	119			

Table 3 reveals that no statistically meaningful difference existed in the scores of the two groups obtained in the subdimensions of the scale ($F_{(1, 58)}$= 0.03, p.>.05).

Table 4.
Pre and Posttest Mean and Standard Deviation Values of Experimental and Control Groups in the Reading Competence Subdimension

Group	R.C. PRETEST			R.C. POSTTEST		
	N	$\bar{x}$	S	N	$\bar{x}$	S
Experimental	30	44.17	3.78	30	43.67	3.46
Control	30	43.23	4.65	30	41.17	8.04
Total	60	43.70	4.23	60	20.87	6.26

Table 4 offers pre and posttest data of experimental and control students in the abovementioned subdimension and reveals a decline in the mean values of both groups.

ANOVA Results of Experimental and Control Groups in the Reading Competence Subdimension

Source of Variance	Sum of Squares	df	Mean Square	f	p
Between groups	2421.09	59			
Group (Experimental/Control)	88.41	1	88.41	2.20	.144
Error	2332.68	58	40.22		
Within groups	997.50	60			
Measurement (Pre-Posttest)	49.41	1	49.41	3.08	.084
Group*Measurement	**18.41**	**1**	**18.41**	**1.15**	**.288**
Error	929.68	58	16.03		
Total	3218.59	119			

Table 5 shows that no meaningful statistical difference existed between the scores obtained by the two groups in the subdimension mentioned ($F_{(1, 58)}$= 1.15, p.>.05).

Table 6.
Pre and Posttest Mean and Standard Deviation Values of Experimental and Control Groups in the Effort/Recognition for Reading Subdimension

Group	E/R.R. PRETEST			E/R.R. POSTTEST		
	N	$\bar{x}$	S	N	$\bar{x}$	S
Experimental	30	18.67	1.37	30	18.40	1.57
Control	30	18.50	1.80	30	17.40	3.06
Total	60	18.58	1.59	60	17.90	2.46

Table 6 presents pre and posttest data of experimental and control students in the abovementioned subdimension, and shows a decrease in the mean values of both groups.

ANOVA Results of Experimental and Control Groups in the Effort/Recognition for Reading Subdimension

Source of Variance	Sum of	df	Mean	f	p

	Squares		Square		
Between groups	320.49	59			
Group (Experimental/Control)	10.21	1	10.21	1.91	.172
Error	310.28	58	5.35		
Within groups	199.49	60			
Measurement (Pre-Posttest)	14.00	1	14.00	4.51	.038
Group*Measurement	**5.21**	**1**	**5.21**	**1.68**	**.201**
Error	180.28	58	3.11		
Total	519.98	119			

Table 7 shows that a statistically meaningful difference did not exist between the scores of the two groups in the subdimension specified ($F_{(1, 58)}$= 1.68, p.>.05).

Table 8.
Pre and Posttest Mean and Standard Deviation Values of Experimental and Control Groups in the Social Aspects of Reading Subdimension

Group	S.A.R. PRETEST			S.A.R. POSTTEST		
	N	$\bar{x}$	S	N	$\bar{x}$	S
Experimental	30	8.23	1.36	30	8.20	1.40
Control	30	8.00	1.66	30	7.40	1.73
Total	60	8.12	1.51	60	7.80	1.61

A decline in the mean values of both groups can be seen in the pre and posttest data of the Social Aspects of Reading subdimension given in Table 8.

ANOVA Results of Experimental and Control Groups in the Social Aspects of Reading Subdimension

Source of Variance	Sum of Squares	df	Mean Square	f	p
Between groups	185.28	59			
Group (Experimental/Control)	8.00	1	8.00	2.62	.111
Error	177.28	58	177.28		
Within groups	105.49	60			
Measurement (Pre-Posttest)	3.00	1	3.00	1.74	.192
Group*Measurement	**2.41**	**1**	**2.41**	**1.40**	**.242**
Error	100.08	58	1.73		
Total	290.77	119			

The findings in Table 9 show that a statistically meaningful difference did not exist between the two groups of students in this dimension ($F_{(1, 58)}$= 1.40, p.>.05).

Data from the subdimensions of the scale reveal no meaningful difference between the experimental and control students, and a decline in the mean values of each subdimension.

Table 10.
Pre and Posttest Mean and Standard Deviation Values of Experimental and Control Groups in the Reading Motivation Scale

Group	R.M. PRETEST			R.M. POSTTEST		
	N	$\bar{x}$	S	N	$\bar{x}$	S
Experimental	30	94.57	8.09	30	91.93	7.82
Control	30	91.70	9.48	30	86.03	12.91

Total	60	93.13	8.86	60	88.99	10.99

The pre and posttest data of the two groups given in Table 10 show a decline in the mean values of both groups. Two-factor ANOVA was used to identify whether the changes that occurred in the reading motivation of experimental and control students who read the same texts were statistically meaningful. The results are presented in Table 11.

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ANOVA Results of the Reading Motivation Levels of Experimental and Control Groups

Source of Variance	Sum of Squares	df	Mean Square	f	p
Between groups	9471.09	59			
Group (Experimental/Control)	576.41	1	576.41	3.76	.057
Error	8894.68	58	153.36		
Within groups	2801.5	60			
Measurement (O.M1/O.M2)	516.67	1	516.67	13.52	.001
Group*Measurement	**69.01**	**1**	**69.01**	**1.81**	**.184**
Error	2215.82	58	38.20		
Total	12272.59	119			

Two-factor ANOVA results given in Table 11 may be analyzed under three main headings. To begin with, measurements between groups should be compared. This shows how different experimental conditions affect students' reading motivation.

Secondly, the table offers a comparison of measurements within groups. Regardless of group, students' reading motivation is given here. The findings show that reading from the screen causes a decline in students' reading motivation.

Findings shown in the ANOVA Table reveal no statistically meaningful difference between the reading motivation of students in the two groups ($F_{(1, 58)}$= 1.81, p.>.05). Accordingly, it was concluded that reading from the screen did not have a meaningful effect on students' reading motivation.
Healthier data can be obtained by reconsidering findings obtained by using a graph. Figure 1 below shows the graph regarding the ANOVA test.

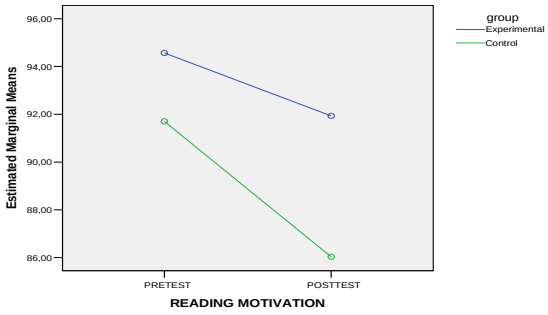

Figure 1. Reading Motivation Levels of Experimental and Control Groups

Figure 1 shows a decline in the reading motivation of experimental students, though not statistically meaningful. It may thus be argued that the training was not effective. Similarly, control students' reading motivation also seemed to decline. However, this decline was steeper than the one in the experimental group.

DISCUSSION AND CONCLUSION

The findings obtained from the exploration of the question "*Is there a difference between the reading motivation levels of experimental and control group students?*" reveal that reading from the screen adversely affects the reading motivation of experimental group students. However, when compared to the control group, the decline in the experimental group was less. Wigfield and Guthrie (1997) explored reading motivation under 3 main headings, the second of which is related to children's aims in reading and the value they attach to it. In other words, this dimension regards student interest in reading and the pleasure derived from it. Thus, lack of pleasure in reading may be attributed to low reading motivation among students. The findings of Grimshaw et al. (2007) also corroborate these findings. They argue that different presentation types did not significantly affect the pleasure that children derive from books. This may have been because this was the first time children experienced such an activity or texts were not animated. Guthrie and Wigfield attributed the decline in reading motivation to the unexpected changes in the reading experiences of students at school. These changes include isolating reading instruction from content, a significant lack of training in reading strategy, use of different materials, non-personal reaction-response expectations, limited student choice, students isolating themselves from teachers, advancing grade level, and alienation from reading due to real-life interactions.

Edmunds and Tancock (2003) studied the effects of incentives on the reading motivation of fourth grade students, and found no meaningful difference between the reading motivation of students who did and did not receive incentives. This finding is in accord with the findings of the current study. Motivation is not a single dimensional concept and the type of motivation used can affect individuals directly. As any change in motivation requires a process, incentives may not have caused a change in students' reading motivation in these studies. In addition, extrinsic elements have mostly been used to raise reading motivation. However, researchers state that intrinsic motivation is mostly accepted as the best type of motivation for learning (Ryan& Deci, 2000; Wigfield & Guthrie, 1997). At the same time, they also emphasize that extrinsic motivation is not as effective as intrinsic motivation in increasing the amount of reading that students do. Thus, it is important to reconsider what changes are to take place in reading instruction planning, ranging from rewarding students to developing intrinsic interest in students for reading. Marinak and Gambrell (2008) found in their study that carefully selected rewards can increase reading motivation. An inclination for rewards is an important factor in improving reading motivation. Thus, different results may have been obtained by giving computer-related rewards to students after reading from the screen. Also, student motivation may have been low because extrinsic motivation was used. The participants in this study were 5th graders who, according to Harmer, can only focus on the same subject for a limited amount of time, get bored when faced with activities that do not interest them, and lose their interest in 10 minutes. Therefore, an 8-week trial of reading from the screen may also have lowered students' reading motivation.

On the other hand, Greenlee-Moore and Smith (1996) found contrary findings to those above. They found that experimental students were more enthusiastic about their activity. This difference may have been due to the cd-rom and interactive texts used. Also, some authors claim that digital texts, particularly hypertexts, motivate students for individual and comprehensive reading (Coiro, 2003). E-books including stories, memoirs, tales, novels, poetry, magazines and newspapers at the children's level may also be used. These materials may be particularly beneficial as free reading and motivate students to read more. Previous research also suggests this (Nicholls, Cheung, Lauer & Patashnick, 1989). Following this study, quantitative and qualitative studies may be conducted to explore the reasons behind these findings. The study was limited to merely reading from the screen. Future studies may use sound effects, moving objects or other visual elements. The study was also limited to 60 fifth-graders. Future researchers may study other grade levels with different sample size. This study took eight weeks. This time frame may be shortened or lengthened by using different materials and purposes. The study used expository and narrative texts. Future studies may involve poetry or other genres.

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THE EXPLORATION OF INDICATORS OF IMAGINATION

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ABSTRACT
Although early studies in the fields of education and psychology appreciated the value of imagination, little work has been done pertaining to indicators of imagination. This study synthesized early works on imagination done between 1900 and 2011 to clarify its meaning and identify potential indicators. Then, two groups of samples were collected and validated through exploratory factor analysis and confirmatory factor analysis. There were two dimensions and ten indicators of imagination that emerged during this inquiry. The first dimension is "creative imagination," which includes the indicators of intuition, sensibility, productivity, exploration, and novelty. The second dimension is "reproductive imagination," which includes the indicators of focusing, effectiveness, transformation, crystallization, and dialectics. The two dimensions reveal not only distinct differences that characterize their uniqueness, but also certain shared features. Some suggestions for future studies are also proposed.
Keywords: confirmatory factor analysis, creative imagination, exploratory factor analysis, imagination, reproductive imagination

INTRODUCTION

Imagination is the basis for cultivating creative thinking, and thus the driving force of innovation. Creativity-related research has progressed for many years, but the understandings of imagination and its indicators still remain unclear. So far, few studies have clearly discussed how imagination manifests itself, let alone developed an evaluation tool for assessing imagination. Because of the potential applicability to the profession of educational technology and various fields, some general concepts of imagination must be explained before referring to them specifically with the indicators which might be observed or assessed.

IMAGINATION

The term imagination has its root in the Latin verb imaginary, meaning "to picture oneself". This root indicates that imagination belongs to an individual scope, and has a denotation of self-reflection, an examination of one's own feelings and thoughts. Imagination is thus viewed as "a creative faculty of the mind" or "a power of the mind" (Perdue, 2003).

Imagination enables people to go beyond actual experience and construct alternative possibilities in which a fragmented situation becomes a meaningful whole (Passmore, 1985). Finke (1990) claimed that individuals have the potential to make creative discoveries through their imagery. It is possible to demonstrate this experimentally for many types of creative discoveries. Reichling (1990) added that most of imagination is emotive content, with a meaning which is apprehended intuitively. Therefore, imagination can be viewed as the basis for cultivating creative thinking, and thus the driving force of innovation (Finke, 1996).

Vygotsky (2004) indicated that imagination is a function essential to human life as there are four ways that connect imagination with reality. First, imagination is derived from a person's experiences which, in turn, are based on reality. Second, the final product of an individual's imagination has a complex association with real phenomenon. The third type of association between the functioning of imagination and reality is related to emotion. Every emotion corresponds to specific images, and possesses a capacity to trigger impressions and thoughts at a particular moment. Finally, imagination that has been externally embodied into a tangible form

becomes an object existing in reality.

The definition of imagination in the Merriam-Webster Dictionary (2011) is as follows: "An act or power of forming a mental image of something not present to the senses or never before wholly perceived in reality; creative ability; fanciful or empty assumption." This concept of image synthesis is also mentioned in the definition of imagination in The Oxford Dictionary of Philosophy (2008): "Most directly, the faculty of reviving or especially creating images in the mind's eye. But more generally, the ability to create and rehearse possible situations, to combine knowledge in unusual ways, or to invent thought experiments." In this study, "imagination" thus refers to "the process of transforming the inner imagery of students when they face a given assignment." Such images are usually developed from an individual's memory of images and shaped into something new.

IMAGINATION INDICATOR

Betts (1916) contended that the activities of human imagination can be classified into two different categories: reproductive imagination and creative imagination. Reproductive imagination is the type of imagination people use to reproduce in their minds either images described by others or images from their own experience which lack the completeness and fidelity to make them true memories. In more advanced levels of development, creative imagination emphasizes the attributes of initiation and originality. Creative imagination is the function which is present in the great discoveries and achievements of humankind's scientific, artistic, literary and technological revolutions (Colello, 2007). From the related literature, nine indicators were compiled to assess human imagination. These indicators are transformation, crystallization, effectiveness, elaboration, exploration, intuition, novelty, productivity, and sensibility. The account of each indicator is presented as follows.

Transformation

Ribot (1906) held that the essential element of imagination in the intellectual sphere is the capacity of thinking through analogies. The core principle behind analogy is transformation. Analogies occur not from thinking about a singular object, but from connecting one object or one field to another. Vygotsky (1978) stressed that this transformation enables children to learn how to control a situation through the use of symbols, "In play, thought is separated from objects and action arises from ideas rather than from things: a piece of wood begins to be a doll and a stick becomes a horse…" (p. 97). Imagination assists people in transferring a function from one object to another that did not previously have such a function. This ability helps people in dealing with unpredictable problems by using existing experiences. In addition, Beaney (2005) indicated that imaginative individuals are usually those who make fruitful connections between apparently disparate ideas in different fields, and those who project themselves into unusual situations. These works suggest that *transformation* is an indicator of imagination which represents the ability to perform tasks by transforming knowledge across multiple fields of study.

Crystallization

According to Aristotle, imagination bridges "images" and "ideas," implying that rational thought takes place in the form of images, and are stored and combined in one's imagination (Perdue 2003). In Hegel's theory of mental activity, imagination connects "abstract properties" and "concrete universals" by law of association (DeVries, 1988). Ribot (1906) indicates that imagination can be reduced to three forms: sketched, fixed, and objectified. This demonstrates that no matter the form, imagination can facilitate people's abstract ideas into concrete subjects. Thomas (1997) discussed the theory of mental images and claimed that imagery arises from the interpretative aspect of perception ('seeing-as'). Vygotsky (2004) believed that imaginative activities are crystallized in culture. He asserted that all objects of common life appear as a crystallization of the imagination. In conclusion, *crystallization* emerges as another indicator of imagination which represents the ability of individuals to express abstract ideas by using concrete examples.

Effectiveness

Every invention results from a particular human need, acting within its own sphere and for its own special purpose. Under these circumstances, the aim of the invention is clear, and thus the imagination is influenced directly by the constitution of end products and confined within certain constraints (Ribot, 1906). Imagination thus could be examined by the inventions' effectiveness. Betts (1916) supported these theories and added that people are in danger of drifting into daydreams, unless their imagination is guided by some purpose. Reiner and Gilbert (2000) further confirmed that imagination is goal-oriented, based on prior experiential imagery. Folkmann (2010) also believed that a sharp focus in imagination will often be associated with a goal-oriented process that is close to the given requirements as stated by the client. Therefore, the third indicator of imagination is *effectiveness* which represents the ability of individuals to generate effective ideas to a desired goal.

Elaboration

During the beginning of imagination, an individual's attention is spontaneous, natural, and effortless. As the process continues, imagination becomes a long, detailed, and laborious personal moment. It is a time full of painful and intermittent resumptions, especially in the higher levels of imagination where people intentionally reunite images to make novel combinations (Ribot, 1906). Through acts of dissociation and association, an inventor's imaginative constructs are challenged, sorted out, broken up, corrected, narrowed, and united, until they are adapted to a social consciousness. Reiner and Gilbert (2000) also indicated that people can "zoom in and out" to inspect particular imaginary situations, transfer objects, and predict paths of imaginary objects. Valett (1983) contended that incubation is an important way to facilitate imagination. This is a time where internalization of acquired knowledge and experience occurs whereby the ends of imagination would gradually emerge and take shape. Similarly, Folkmann (2010) claimed that the process of focusing and defocusing is open to ongoing reformulation. Due to the process's functional position in the interface between the inner consciousness and outer world, it lies in an area between clear and rational discourse and inaccessible mental space. Thus, *elaboration* is the fourth indicator of imagination and is the ability of individuals to seek improvement by formalizing ideas.

Exploration

Valett (1983) indicated that the mental process of imagination can be described by five stages of growth: sensory exploration, egocentric speculation, personal experimentation, symbolic representation, and functional verification. Valett continually illustrated that children explore the world through play, and then satisfy themselves through exaggerations of their intuitive impressions. Thomas (1999) contended that the process of controlled perceptual exploration takes individuals from a vague appreciation to a detailed understanding of reality. Colello (2007) also asserted that imagination consists of the possibility of creation as a qualitative leap, which allows one to explore, dare, and challenge institutional order, and thus overcome limits. In addition, Folkmann (2010) claimed that imagination can be seen as a structure in consciousness that negotiates, exchanges, and explores between the known and unknown (judged by the amount of presupposed knowledge). *Exploration* is thus the fifth indicator of imagination and represents the ability of individuals to explore the unknown.

Intuition

Ribot (1906) held that in an individual's imagination, every intuition becomes concrete as a judgment and equivalent to a conclusion, which leads to a foresight of the future. Reichling (1990) contended that intuition could be defined as an immediate mode of knowing, knowledge gained directly as an insight, or a grasp of the whole. Reichling further elaborated that the insight may occur as a leap from the known to the unknown in the manner described by Dewey (1934): "When old and new jump together, like sparks when the poles are adjusted, there is intuition" (p. 266). Reiner & Gilbert (2000) supported that intuition leads people to test various thoughts, and possibly gain unexpected outcomes. Townsend (2003) anchored that the thrill of validation results in a more harmonious interaction between imagination and intuition. If people utilize more intuitive representations, then their imagination would last longer. All these works suggest that *intuition* is an important indicator of imagination which represents the ability of individuals to generate immediate associations to a target.

Novelty

The Platonic philosophy associates imagination with novelty, creativity, and irrationality. Betts (1916) held that imagination takes images from one's past experience or those gleaned from the work of others, and puts them together in new and original forms. Imagination is an inventive power which allows the ability to see old characteristics in new relations, and thus build new constructions out of old components. Vygotsky (2004) believed that although imagination builds using materials supplied by reality, but it would be productive from using combinations of concepts that are more removed from reality. Beaney (2005) contended that someone who is imaginative is good at creating new possibilities, and able to offer fresh perspectives on what is familiar. Note that any new ideas or acts derived from an individual's imagination should have positive social ends in order to promote well-being, enrich the act of consumption, or stimulate confidence in social cohesion (KEA European Affairs, 2009). Therefore, *novelty* can be perceived as another indicator of imagination which represents the ability of individuals to create uncommon ideas.

Productivity

Ribot (1906) indicated that imagination corresponds to four particular sets of conditions: quantity of images; quantity and intensity of images; quantity, intensity and duration of images; complete systematization. According to Ribot, mental images could teem, break apart, and associate in various ways, but could still be assessed in terms of quantity, intensity and duration. All these evolving conditions of imagination are related to physical dimensions of imaginative productivity, continuity and fluency. Therefore, someone described as

imaginative might be able to come up with original ways of seeing or doing things in a short period (Beaney, 2005). Folkmann (2010) claimed that imagination relates to the start of the design process as either an overall conception of the design as a whole, or a more experimental exploration for details. Both positions clearly state the success criteria for the design task in terms of productivity. *Productivity* is thus another indicator of imagination which represents the ability of individuals to generate numerous ideas.

Sensibility

All forms of creative imagination imply elements of feeling. Similarly, all emotional dispositions may influence the creative imagination (Ribot, 1906). Because inventors strive to achieve their goals and overcome problems, they will often experience painful struggles in thoughts, feelings, and emotions during creative activity. Ricoeur (1978) suggested that these feelings are not merely inner states, but are really "interiorized thoughts" (p. 156). Scheffler (1986) extends this notion and suggests that emotion without cognition is blind, while cognition without emotion is vacuous. Reichling (1990) also confirmed that feeling, in terms of imagination, is assigned a cognitive dimension. In addition, Vygotsky (2004) believed that the ability to control imagination comes with the maturation of emotion. Gajdamaschko (2005) also stated that even if the construct of the imagination does not correspond to reality, the feelings it evokes are real. *Sensibility* is thus concluded to be an indicator of imagination which represents the ability for individuals to arouse feeling during the creating process.

METHOD

Participants and Procedure

The participants in the study consisted of two samples ranging from freshman to graduate students majoring in Educational Technology from universities across different regions in Taiwan. Sample 1 (N=402) served as the calibration sample for testing the most appropriate structure of the imagination scale using exploratory factor analysis. Sample 2 (N=380) served as the validation sample using confirmatory factor analysis for testing the established structure from the sample 1. The descriptive data for the samples used in the study are reported in Table 1.

Table 1: Descriptive data of samples used in the study.

Profile	Sample 1 for EFA (n = 402)	Sample 2 for CFA (n = 380)
Gender		
Male	152 (37.8%)	94 (24.7%)
Female	250 (62.2%)	286 (75.3%)
Year		
Freshman	61 (15. 2%)	88 (23.2%)
Sophomore	116 (28.9%)	91 (24.0%)
Junior	89 (22.1%)	75 (19.7%)
Senior	19 (4.7%)	62 (16.3%)
Graduate	117 (29.1%)	64 (16.8%)

Note. EFA=Exploratory Factor Analysis; CFA=Confirmatory Factor Analysis

In order to ensure the quality of this study, the research team communicated the survey with instructors in the target universities first, and then arranged similar assignments. The investigation process delivered in each university followed the same procedure. Each participant received a cover page and questionnaire in a package. On the cover page, all participants were informed that their involvement was voluntary and they could withdraw from the study at any point in time without incurring any penalties. Students were guaranteed anonymity, confidentiality, and the right to review the results of their responses. In the questionnaire, students were asked to determine the level of agreement with each indicator of imagination. Data collection of each survey was conducted by trained graduate assistants who were accompanied by the class instructor.

Instrumentation

The research team searched the Ovid PsycINFO、ISI and EBESCO databases for works from 1900 to the present regarding the scales of imagination. Surprisingly, there were none available with established reliability and validity. Therefore, the team decided to develop a scale of imagination to serve as a research tool. Based on the literature review in the earlier section, nine indicators were summarized related to the construct of imagination: transformation, crystallization, effectiveness, elaboration, exploration, intuition, novelty, productivity, and sensibility. These nine indicators were then placed in the two general categories of creative and reproductive imagination.

The instrument scale of the present study is a nine-item questionnaire designed to evaluate one's indicators of imagination on a 5-point Liker-type scale (1=*strongly disagree* to 5=*strongly agree*). With regards to the construct validity, three experienced experts in the related fields were invited to provide feedback on this scale and also accepted content analysis offered by 10 acknowledged scholars. Moreover, the validity was assured by pre-testing this scale with college students from related fields to examine its readability and flow. In the final analysis, the values of internal consistency of creative and reproductive imagination were .777 and .659 respectively for sample 1 and .819 and .659 respectively for sample 2, showing that the developed scale had appropriate reliability estimates.

Data were analyzed using SPSS version 17.0 software. A number of data analysis procedures were conducted including descriptive statistics (demographic data), exploratory factor analysis, and confirmatory factor analysis with LISREL 8.80 with maximum likelihood methods. This study used the following indicators recommended by Hu and Bentler (1999), Jöreskog and Sörbom (1996), and Tabachnick and Fidell (2001) to assess goodness of model fit: Comparative Fit Index (CFI; .95 or above indicating excellent fit, .90-.95 indicating an acceptable fit), Root-Mean-Square Error of Approximation (RMSEA; .05 or below indicating excellent fit, .05-.08 indicating an acceptable fit), Standardized Root Mean Squared Residual (SRMR; .05 or below indicating excellent fit, .05-.08 indicating an acceptable fit), Tucker-Lewis Index (TLI; .95 or above indicating excellent fit, .90-.95 indicating an acceptable fit).

DATA ANALYSIS AND DISCUSSION

All nine indicators of imagination were examined for accuracy in data entry, missing values, normality of distributions, and multivariate outliners. The absolute values for skewness and kurtosis were in the appropriate range (below |2|), indicating a normal distribution of scores across all variables. Additionally, calculation of the Mahalanobis distance statistics at the $p < .01$ significance level (Tabachnick & Fidell, 1996) indicated that none of the cases were multivariate outliers. Furthermore, all the means located within 1.5 standard deviations, further confirming the normal distribution of the data.

Table 2: Descriptive statistics for the sample 1 and the sample 2.

Categories	Sample 1		Sample 2	
Indicators (Items)	*M*	*SD*	*M*	*SD*
Creative Imagination	3.58	.56	3.61	.61
Exploration (I like to explore the unknown)	3.92	.69	3.91	.72
Intuition (I often come up with new ideas through my intuition)	3.78	.76	3.72	.76
Sensibility (I often help myself imagine through feelings)	3.70	.73	3.69	.78
Productivity (I constantly have ideas toward my designs)	3.27	.80	3.38	.83
Novelty (I often have uncommon ideas compared to others)	3.21	.78	3.34	.81
Reproductive Imagination	3.52	.60	3.48	.60
Effectiveness (I often complete my tasks by focusing on effective ideas)	3.57	.71	3.54	.71
Transformation (I think flexibly and can transfer ideas to multiple fields of tasks)	3.55	.76	3.49	.75
Crystallization (I am good at expressing abstract ideas by using concrete examples)	3.50	.81	3.46	.79
Elaboration (I improve my thoughts by focusing on formalizing ideas)	3.44	.82	3.42	.83

Exploratory Factor Analysis

A principal component analysis (PCA) with promax rotation was conducted to determine the structure of the developed imagination scale. The number of factors to be extracted for this analysis was determined by using a number of criteria: eigenvalues above 1.0 (Kaiser, 1960), examination of Cattell's scree test (Cattell, 1966), communality values greater than .30, and the total variance accounted for by each factor. Initial examination of Cattell's scree plot strongly suggested the possibility of two factors with a marked eigenvalue slope change after two factors. The Kaiser-Meyer-Olkin measure of sampling adequacy was .84, indicating that the sample had a sufficient level of factorability.

Based on these criteria, the two-factor solutions (explained variables of 52.82%) with an oblique rotation provided the best factor structure both conceptually and statically. Factor 1 included items related to intuition, sensibility, productivity, exploration, and novelty, which explained 40.32% of the variance (eigenvalue 3.629), and was named creative imagination. Factor 2 included items related to elaboration, effectiveness, transformation, and crystallization, which explained 12.49% of the variance (eigenvalue 1.124), and was named reproductive imagination.

The results of this study also showed that the values of internal consistency of creative imagination (from .659 to .777) and reproductive imagination (from .659 to .819) were considered stable. The correlation coefficients among different items within the same category (from .66 to .79) were higher than those between the different

categories (from .24 to .53) which mean that the discriminate validity between the identified two categories was also acceptable (Brown, 2006).

Table 3: Results of exploratory factor analysis from sample 1.

Indicators	PCA			PCA with Rotation		
	Factor 1	Factor 2	Com.	Factor 1	Factor 2	Com.
Intuition	.84		.615	.80		.497
Sensibility	.75		.558	.72		.328
Productivity	.72		.609	.63		.530
Exploration	.64		.443	.51		.328
Novelty	.61		.428	.44		.318
Elaboration		.83	.602		.52	.228
Effectiveness		.73	.574		.73	.462
Transformation		.54	.573		.61	.535
Crystallization		.48	.352		.30	.219

Note. Com= Communality values

Confirmatory Factor Analysis

The research team next conducted a CFA to test the generalizability of that two factor solution using sample 2. The values of the goodness-of-fit indices were satisfactory, indicating a good fit of the two-factor structure for this sample. Moreover, in order to further test this structural model, a competing model strategy was used to compare the proposed two-factor model against a single-factor model (a baseline model, Kline, 1998). The superiority of the two-factor model over single-factor model was further evidenced by the significant chi-square difference, $\Delta\chi^2_{(1)} = 60.81$, $df = 1$, $p < .005$ (See Table 4). Factor loading from the results of confirmatory factor analysis of the sample 2 is reported in Figure 1.

Table 4: Results of confirmatory factor analysis from the sample 2

	χ^2	df	SRMR	RMSEA	TLI	CFI
Single-factor model	157.95	27	0.06	0.11	0.90	0.93
Two-factor model	97.14	26	0.05	0.08	0.95	0.96

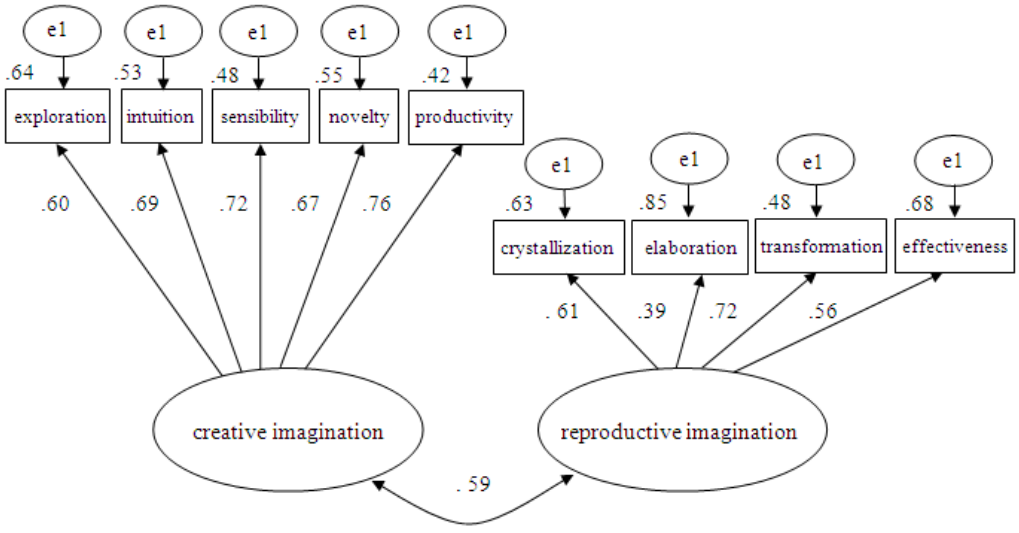

Figure 1: Factor loading from the results of confirmatory factor analysis of the sample 2.

Although the validated results of this study were theoretically acceptable, both values of internal consistency of reproductive imagination in two samples were below.7, and the explanation of the variance

of reproductive imagination was only 12.49%. Taking these potential drawbacks into account, the research team initiated follow-up inquiries.

Follow-up Inquiries

This follow-up study used a combination of document analysis and in-depth interviews with selected scholars. The document analysis focused on several well-known works regarding the principle of unity (Ribot, 1906), the theory of flow (Csíkszentmihályi, 1975), self-regulation theory (Vygotsky, 1978), processes of incubation and internalization (Valett, 1983), metaphorical and paradoxical imagination (Reichling, 1990), and the structure of focusing and defocusing (Folkmann, 2010).

In addition, a series of interviews with experts were conducted in October 2011. The team interviewed six distinguished scholars representing five different universities and research institutions. The experts selected in this follow-up study shared the common qualifications of having more than fifteen years of research in psychology-related fields, and were part of the first groups of imagination research supported by the Taiwan's government. The issues discussed included criticisms about the preliminary studies of reproductive imagination and additional insights regarding imagination indicators. The problems of "elaboration" indicator emerged in this stage.

Taking the results of document analysis and the low factor loading (.39) in the confirmatory factor analysis into account, the indicator of elaboration was further divided into two independent items: dialectics and focusing. A quick review of these newly emerged indicators of imagination is summarized below.

Dialectics ─ Any imagination, especially the reproductive one, starts from an unstable form. During this period, an individual's attention is spontaneous, natural, and without effort. As imaging proceeds, the individual experiences a laborious personal moment, a time in which imagination takes effort. Any inventor in that period struggles with miserable turns, as described by Ribot (1906). Valett (1983) contended that incubation is an important way to facilitate imagination. Incubation is a time where acquired knowledge and experience is internalized such that the ends of imagination can be gradually shaped. DeVries (1988) also asserted that imagination goes through a process of abstraction, analysis, and generalization. When discussing the final level of imagination, Reichling (1990) indicates that intuition leaps for the unknown, while reason is continually challenged to find an image that resolves the contradictions with which it is presented. Also, within their imagination, people can 'zoom in and out' to inspect particular imaginary situations, transfer objects, and predict paths of imaginary objects (Reiner & Gilbert, 2000). Therefore, *dialectics* can be viewed as an indicator of imagination which represents the ability of individuals to seek improvement through analyzing ideas.

Focusing ─ Development of self-control is related to the ability to create and sustain an imaginative scenario (Vygotsky, 1978). This may explain why many children enjoy role-playing games. According to Csíkszentmihályi (1975), people are happiest when they are in flow—"a state of concentration or complete absorption with the activity at hand and the situation". He believed that being in a flow implies focused attention, where people are completely immersed in what they are doing. Folkmann (2010) claimed that the process of focusing is open to ongoing reformulation. Due to its functional position in the interface between the inner consciousness and outer world, the focusing process lies in the span between clear and rational discourse and the inaccessible mental space. Thus, the discussion of the structure of focusing and defocusing explains how meaning is not just given but is developed as a result of the designer's mental setting, and underlines that this meaning contains definite as well as elusive elements. As a result, *focusing* is an additional indicator of imagination which represents the capability of individuals to formalize ideas through focus.

DISCUSSIONS

The current study collected two groups of samples majoring in Educational Technology, and validated this data with the methods of exploratory factor analysis and confirmatory factor analysis. The results showed that there were two dimensions and ten indicators of imagination that emerged during the research process. The first dimension is "creative imagination" which is composed of five indicators: intuition, sensibility, productivity, exploration, and novelty. The second dimension is "reproductive imagination" which comprises another five indicators: focusing, effectiveness, transformation, crystallization, and dialectics. In this study, the two dimensions reveal distinct validity, but still are co-related.

The indicators of imagination proposed by this study are characterized as follows:

1. Intuition: individuals are able to generate immediate associations to the target.
2. Sensibility: individuals are able to evoke feelings during the creation process.

3. Productivity: individuals are able to productively generate ideas.
4. Exploration: individuals are able to explore the unknown.
5. Novelty: individuals are able to create uncommon ideas.
6. Focusing: individuals are able to formalize ideas through focus.
7. Effectiveness: individuals are able to generate effective ideas about the target.
8. Transformation: individuals are able to perform tasks by transforming what they have known across multiple fields of knowledge.
9. Crystallization: individuals are able to express abstract ideas by using concrete examples.
10. Dialectics: individuals are able to seek improvement by logically analyzing ideas.

The authors' wish is to identify potential indicators to assess imagination. This wish cannot be achieved by only a couple of studies. In order to facilitate the wish to be reached, the authors invite all of the readers to test and validate the indicators proposed in this study, by using the following items in a variety of fields and in different circumstances.

- I often come up with new ideas through my intuition
- I often help myself imagine through personal emotions
- I constantly have ideas toward my designs
- I like to explore the unknown world
- I often have uncommon ideas compared to others
- I improve my thoughts by focusing on formalizing ideas
- I often complete my tasks by focusing on effective ideas
- I think flexibly and can transfer ideas to multiple fields of tasks
- I am good at expressing abstract ideas by using concrete examples
- I am good at seeking improvement by logically analyzing ideas

As educational technologists, we need imagination to construct activities, build system, and anticipate conversations and actions that will bring learners' inquiry to fulfillment, enabling their growth toward desirable skills and understandings. As Goodyear and Retalis (2010) described, technology-enhanced learning involves imagining how our learners learn, how they respond to a task, where they work, with whom, how, using what resources, under what circumstance, and over what timescale. In addition to the indicators, some issues for the future study are worthwhile for further exploration. The substance of creative and reproductive imagination can be clarified, but there are many questions that can be asked. Could the indicators be grouped in absolutely exclusive categories? What is the exact relationship between creative and reproductive imagination?

Though there have been an enormous number of studies done in the subject of creativity, more efforts need to be put into the study of imagination. What is the relationship between imagination and creativity? What environmental factors influence imagination stimulation? What psychological factors influence imagination stimulation? What kinds of personalities influence imagination stimulation? How are these factors enabled? How do these factors function? How do they function differently at the individual, team, and organizational levels?

In terms of talent development, what instructional methods and learning strategies should be proposed to cultivate imagination? What are the differences in imagination cultivation between schools and industries? Are there any differences among diverse fields? What is the relationship between imagination and professional knowledge in different fields? What are the differences in terms of gender, academic standing, major, institution, nationality, and culture? All of the issues raised above are meaningful not only for theoretical constructs, but for practical applications in the field of Educational Technology.

ACKNOWLEDGEMENTS

The current study is part of the research projects (NSC98-2511-S-155-005-MY2) supported by Taiwan's National Science Council. The authors would like to extend their gratitude to Dr. Hsu, Yu-Lin in Yuan Ze University for her valuable contributions. Furthermore, the authors also would like to acknowledge the insightful suggestions of anonymous TOJET reviewers.

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THE ROLE OF TECHNOLOGY: COMMUNITY BASED SERVICE-LEARNING PROJECTS ON ETHICAL DEVELOPMENT

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ABSTRACT
This study explores the utility of CBSL (community based service-learning) projects as a teaching method of ethics which this process supported by online communication tools in order to enhance progress of service learning and ethical development of undergraduate students and gather data during the research process. This study consists of an action research project and it employs case study method as it attempts to explore a unique phenomenon (CBSL projects) in Eastern Mediterranean University. Triangulation, which involves different methods to gather information, were preferred and the desired data were collected through pre-test, post-test, reflective papers and semi-structured interviews. This research identifies the critical question in the affective domain of learning such as the possibility of affecting students' ethical values in undergraduate years. The results of this study are noteworthy and clearly reflect that CBSL projects lead empowering and worthwhile experiences. Major findings are suggestive of a positive change basically in students' moral development, future awareness and empathy due to CBSL exposure.
Keywords: empathy, future awareness, moral development, technology.

1. INTRODUCTION

People do not born with a good moral character and to help them exhibit better moral values is not a fast food type fixed educational experience found in curriculum (Ekşi 2003). Unfortunately educators assume that their students are fully formed moral beings by the time they enter university. One of the major criticisms made for the modern education is focusing on latest trends in technology and ignoring to lead communities to a more humane future (Kenan, 2009) and the other one is the requirement of proffesionalization of teachers for moral education to be able to flourish students' moral sensitivities as well as the capacities (Taylor, 2008, Öztürk, 2010 and Ekşi, 2003). Althof and Berkowitz (2006) assert that 'societies need moral members' (p.496). Similarly, Marchand (2008) claims that few higher education students are able to reach advance stage of ethical development. For example, Ruso (2006) argues that the feeling of love and respect is started to be lost as youth started not to visit their elderly and relatives on special days like bairams, etc. This explains why it is important for domains of science and religion to enrich and complete each other (Kenan, 2009).

Stimulating the natural development of students' moral capacities is the goal of education based on the progressive philosophy of education (Boss, 1994). Educating responsible and productive citizens is a work of incredible depth that has the potential to become the standard reference volume for educators committed to moral and civic education. The period of youth, for moral development is very significant because, it is the fruit-bearing period like in the life of a tree. For all these reasons, moral development of students should not be disregarded or excluded by any profession (Salas-Diaz, 2009, Kenan 2009). It is a time ripe with possibilities, new directions and commitments, therefore providing the opportunity to bring moral and civic education from the margins of university life, are the job of the instructors. Teachers' own values and attitudes towards their profession also plays a crucial role in fulfilling these requirements (Durmusoglu, Yanık and Akkoyunlu, 2009).

In moral education, values and meaning come through communal and personal experiences, and this is always forced to justify its place in curriculum and the same problem is also observed in university curriculum (Kenan, 2009). Communication and social interaction are significant factors in knowledge construction (Arkün and Aşkar, 2010). Therefore, university students can become imbued with new virtues and new moral standards under relative guidance. In order to develop moral standards and virtues; online social interaction is also inevitable indicator to understand the values, virtues and standards based on peer support and guidance.

How to address the ethical, social values and virtues is the question challenging not only educators but everyone who is interested in the education of next generations (Kenan, 2009). It is widely accepted that instructors add a lot to the cognitive development of their students but besides this they can contribute to the affective development of their students as well, considering the assigned projects, environment, social factors, etc. while teaching quantitative knowledge, significant dimension of human experience which lead to qualities including value, goodness and meaning (Kenan, 2009). Similarly, Demirel (1995) who presents a teacher education curricula in Turkey, describes the input part of his model through determination of both cognitive and affective characteristics of teacher candidates to emphasize the significance of both domains. Teachers' instruction has impact on our students' character for better or worse, this is inevitable whether they intend it or not. Kenan

(2009) contends that 'Modern education itself leaves us puzzled and perplexed with how we are to fill the vacuum of spiritual and moral values' (p. 281).

Every course conveys some principles for a student life. Therefore, a good educational policy is the one which considers the moral development of the students intentionally and proactively similarly to the way they consider their students' academic education (Synder, 2005 and Berkowitz & Bier, 2005). Synder (2005) stresses that instructors influence students' moral development implicitly, so they should become more conscious of how they are doing this.

Further to this, impact of globalization and communication technologies change the way of understanding towards moral education, community based service learning. In this respect, there is intensified need to internalize the role of technology in moral education and how individuals perceive the role of communication technologies in moral education development.

Community Based Service Learning Projects

Besides universities' functions of research and education, after 1950's community service is added as a new function (Soran, Akkoyunlu and Kavak, 2006). Community based service-learning projects present a platform to discuss issues like social responsibility and real-world ethical considerations with the students as these concepts become tangible for students enrolled in such projects followed by reflective exercises and promote the moral development of students (Berman, 2006 and Kenworthy-U'Ren, 2003 and Strain, 2005). Promoting care, compassion, and responsibility in university students by integration of community service and academic curriculum is a worthwhile extension to ethics education. Students work together to achieve a common good and this develops their personal attitudes and personal values. Projects carried out for this study was organizing New Year parties for people living in the retirement house and homeless children living in North Cyprus. Students were supposed to plan, implement and evaluate the organizations they were responsible from the beginning to the end. They were responsible for every part of the project like finding sponsors, providing transportation, arranging a venue and all kind of other considerations.

Working on the projects together with classmates make students start to feel connectedness and commitment to the community (Pritchard and Whitehead, 2004 and Eyler and Giles, 1999, Ferrari and Chapman, 1999, Berman and McCarthy, 2003). Designing and implementing Cbsl Projects is also a good pedagogical practice which enhances the competencies necessary for consciousness raising of youth on certain issues orientating them more towards their community (Lovat and Clement, 2008, Morton and Troppe, 1996). Within that process, online communication platform become significant path to foster engagement, commitment between individuals to have good pedagogical practice, collaboration to complete tasks together.

Moreover, community based service learning expands students learning of the service ethic. Öztürk (2010) contends that one of the meanings encompassed by ethics is moral values. Community setting is significant in raising the morality of students as they share the same atmosphere with needy people and interact with them (Taylor, 2008). Influences like these are more potent and long lasting than reading books on moral education. The projects enhance students' social consciousness and social conscience. The majority of youth in these projects are Muslim and the Muslim youth are the same as other youth living in UK who need to be guided about their commitments and values to feel a sense of self-worth and personal identity (Campbell and Felderhof, 2007). Students experience a commitment of doing authentic and meaningful work and this empowers them as they believe that they have done something that needs to be done. They gain a sense of community as a result of providing help to others (Berman, 2006). Similarly, Ferrari and Chapman (1999) predict that "There is reason to believe that service learning can be a powerful tool in infusing or developing a carative spirit in our young people" (p.93). Similarly, a distinguished Turkish philosopher of education, Hasan Ali Yücel, claim that to balance material and moral values as the most critical task of humanity (Yücel, 1956).

2. METHOD

2.1 Research Design

This research employs case study method as it attempts to explore a unique phenomenon (raising more skilled and responsible tourism students, with the help of time and assigned activity of community based service-learning project) in Eastern Mediterranean University, School of Tourism and Hospitality Management. The study consists of the descriptive records of the research participants and statistical data. Tellis (1997) stresses the increasing usage of case studies in education which involves a system of action on a selected group of individuals. This case study is an exploratory one and makes use of interviews and documents like all other case studies. The major benefits of case studies are identified as the improvement of case and broadening of the students' horizons.

2.2 Subjects
The students of this study are from different nationalities such as Turkish, Turkish Cypriot, Nigerian and Iranian and their ages vary between 19-22. There are 80 students in 3 different classrooms who take this English course and involved in this project. These students are studying in the School of Tourism and Hospitality Management of Eastern Mediterranean University in North Cyprus.

2.3 Data Collection
In this case study, triangulation method of data collection is used. Data was collected using a variety of qualitative techniques including semi-structured interviews and reflective papers. Besides these, the pre-test and post-test provided quantitative results. Different data collection methods, qualitative or quantitative, possess different strength and weaknesses; therefore upon using multiple methods, the probability of creating a better picture out of the data is much higher (Daymon & Halloway, 2003; Bryman, 2004; Mason, 2002; Smith & Thorpe & Lowe, 1991).

2.4 Procedure
Pre-test is applied to 80 students at the beginning of the semester. Then, the students are introduced Cbsl projects and worked on the projects until the end of the semester. Reflective essays are written and semi-structured interviews are conducted at the end of the semester upon the completion of the projects. Finally post-test was applied to all the students.

Reflective Method: Asking students to write reflective essays was important to find out the ideas which the experiences have stimulated and focus on them. Several students' similar expressions on the same idea signified ideas' generability and therefore gave way to potentially wider acceptability. Reflective papers were assigned to elicit responses to open ended reflection questions indicating what they learned as well as how they thought, felt and processed their experiences during the project. Reflective thinking is seen as a crucial skill which in turn enhances skills such as critical thinking (Kızılkaya and Aşkar, 2009). Students were asked to write answers to the given question sheet (including questions like their responsibilities during project, their feelings, difficulties, favorite part, the role of technology in collaboration and social interaction) in private at their homes to express their thoughts about the project. In this way representative excerpts were reported to signify what students drew from their service experiences. Students were given 2 weeks time to answer the questions on the question sheet and to submit it to their teacher.

Semi-structured Interviews: To take further views on the similar issues, interviews are also carried out to allow students elaborate on more ideas during the dynamics of interviewing. Semi-structured interviews were conducted by the end of the course and individually with the students and was be designed to provide an additional means of reflection for the student participants and to allow for more in-depth discussion about the personal outcomes for each participant. Conducting the interviews permitted the students to think more about the experience. The interviews were held in the researcher's office one by one on appointment. Each interview lasted 10-15 minutes and all were recorded.

2.5 Data Analyses
Concerning the research, the qualitative analysis process of this study (the reflective essays and semi-structured interview) includes three sections; preparation for data analysis, familiarization and coding. Initial data analysis consists of coding and categorizing. Without coding, it was unlikely to organize mass of collected data. Each reflective essay and the semi-structured interview involve coding procedures in order to generate concepts from the collected data. With the help of coding, the data was transformed and reduced to build categories (Daymon & Holloway, 2003 and Moghaddam, 2006). Open coding, axial coding and selective coding were employed one after the other. Throughout the coding process, the researcher reviewed the data too many times for searching and re-searching emerging codes.

For the quantitative analysis, after the data collection, each questionnaire was entered and analyzed by SPSS (Statistical Package for the Social Sciences) 15.0. For the purpose of the study frequencies, descriptive analyses, reliability analyses, independent sample t-tests, paired sample t-tests, one way ANOVA, and correlation analyses were performed.

3. RESULTS
3.1 Findings of the Qualitative Data
Moral Development
Data derived from students' reflections within the Cbsl project context affect students' moral development. Therefore this research suggests a moral dimension. Most of them thanked God in their statements. Projects are

in a way self-reflexive tools which test the limits of the students encouraging them from time to time to new challenges asked by the project experiences (NSLC, 2009). Students understand the meaning of common good without thinking about discrimination. A typical elaboration is as follows:

'The usefulness of this activity was to reflect love to the orphanage kids and to give them a reason to smile, to show that no matter where we come from we are all one and created by one God'.

Cbsl project experiences make young people start to think about the consequences of their actions (Berman and McCarthy, 2003). Some students reflected as follows:

'This project taught me not shout at my mum and dad, not to make them sad'.

'We helped people and we got power and pray .it has so meaning. Old people prayed for us "my daughter my son, I hope u finish university". God may listen to them. It is hard to explain….'

Experiences encompass the recognition of the need to care for others and the responsibility is seen as a corresponding virtue. Eyler and Giles (1999) concede that when one contacts a person who experiences a totally different life, he/she questions his/her own world. Most of what project participants do in their daily ventures do not have meaning beyond immediate moment. Projects help students to move away from their personal, immediate situations and raise questions about the provision of care in our society (Keller et al. 2003). Criticizing themselves for ignoring the diversity in their community, they challenged their assumptions and then developed and understand of the ways they can include others to their lives (Carrington and Selva, 2010). One student, for example, commented as follows:

'In my decision I will use these opportunity to tell the society that God said in his holy book that love your brothers the way you love your self so that everything will be okay for you as well as the society can also contribute by helping the SOS youth in collaboration with the government'.

Representative excerpts signify that these projects are essential for the moral of individuals society desires. Students express compassion for others and for God. A typical response:

'Morally we appreciate God for making us grow up with parents when we compare ourselves with orphans'.

Contexts students experience result with greater gains in moral reasoning therefore the service provided can be accepted as an effective pedagogy for moral development (Morton and Throppe, 1996). Although some researchers report that a single semester implicit focus on moral development through enrollment of projects is not adequate to affect students' morality, the changes stated by the participants are seen as precursors to such developmental changes (Bernacki and Jaeger, 2008). At least, changes were noted in students' opinions. Change and learning are closely related with each other as change lies within the roots of education (Aşkar and Yurdugül, 2009)

As service involves a great deal of interaction between the self and the other, the comments from the participants appear to be in a great deal of repertoire. However it is obvious that the feelings expressed for Cbsl are generally positive. As Rhoads (1997) posit, 'because of the caring context of community service, students often get positive feelings reflected back to them that intuition tells us ought to have an effect on students' sense of self' (p.26). The data throughout the project repeatedly suggest that students found their interactions with homeless citizens to be some of the most enlightening encounters of their lives, many completed these cbsl projects with unique and heartfelt memories.

Moral education should not be left to chance. It requires vision, planning, preparedness and deep reflection. Morality is excluded from several schools' domain of knowledge which needs to be properly and sensitively integrated into the curriculum (Watson, 2009). Curriculum content should not only stimulate factual knowledge but focus on socio-moral and spiritual growth of students, as well (Skoe, 2010). Naturally, the teacher is seen as a crucial key to moral values learning (Taylor, 2008). As a result of societies questioning moral values, several approaches are put forward to socialize youth such as moral education, values clarification and character education (Althof and Berkowitz, 2006). As Berman and McCarthy (2003) affirm 'young people need to find their own moral center and learn how to manage moral conflicts' (p. 3). Moral education, rather than dealing with theories and abstractions, has to be lived and continued as a contact work in progress for creating better visions, values, beliefs, etc. (Taylor, 2008). Moral education has its roots from 1960's (Althof and Berkowitz, 2006).

There are noteworthy implications that Cbsl projects pushed students' preconceptions causing awareness on future.

Future Awareness

A common theme delineated by students was the fact that cbsl forced students to confront their future. Responses after meeting community service encounters make students think about their future. This is especially significant for those who are concerned only for today, never about tomorrow. Cbsl exposure prepares its participants for a more humane future and make them more sensitive and aware of the types of existing problems. Following are typical responses:

'I realized some different thing in myself . I tought , one day I will be elderly people and will soem people remember me in the future?'

'They were the most happy people when they saw us. Their glances made me think about my future. I wonder if my children will leave me too. They have still the names of their sons, daughters in their tongues; How on earth a human being can leave his/her parents helpless on the streets?'

'My family is nearly elder, 60-65 years old. I realized they will be the same one day. It was like training for me for the future'

In conclusion, the chief distinguishing mark of these excerpts is that students connected their current community experiences with the homeless citizens with the lives they projected for themselves in the future. Cbsl projects as well as treating schools as a component of community life, provide students with opportunities of awareness raising on several issues within the realm of experiential education. The more critically aware learners become, the more they are able to transform their reality. Students took actions to make homeless people happy and they realized their success in achieving this. If they do nothing in the future for these people, they may need guilty for their ignorance of these people. Youniss and Yates (1997) claim that 'Insofar as students incorporated this kind of agency into their emerging identity, any present noninvolvement or inactivity may evoke tension or guilt ant the soft promise to become involved again at some indefinite later date' (p.124).

Empathy

Findings derived from student reflections reveal that cbsl project experiences result in affecting students' feelings of empathy. Empathy is defined as the capacity for a person participating and sharing the other's feelings or interests (Chalves, 2000). We usually apply this word to situations describing the ability to take another's perspective or to care about what happens to someone else and imagine how one feels (Kristjan 2010). This word is generally not defined clearly or misused or underused. People generally do not identify the difference between the empathy and sympathy and use the words interchangeably. Kristjan (2010) endorses that empathy in a way refers to feel how the other person feels, therefore empathy and sympathy become conflated. However, sympathy is different than empathy as it causes burden for a person and emotionally tiring because person feels the suffer of the other person as if it is his/her suffer (Hardy, 2003). It is shortly the ability of understanding and sharing other people's experiences and feelings by being an observer. There are some researchers who argue that empathy results in sympathy (Skoe, 2010). Hardy, (2003) states that many experts claim that empathy is a teachable and learnable skill and he advocates the importance of exploring empathy and practicing empathetic communication. Similarly, Ekşi (2003) advocates the necessity of empathy skill in education. The aim in this research was empathy not sympathy because the researcher wanted the participants to understand the other peoples' feelings but not to take them as it is their own as it would cause suffers. Typical indications are as follows:

'Some families that could be bothered looking after their elderly parents put them in homes. This is cruel, why they do not realize that one day their children will do the same to them'.

'She was very little and so beautiful like an angel. She has got yellow hairs and blue eyes. Her eyes remind me a sea. I can't forget she. I want to go SOS (homeless children village) and see her again. I can't believe how can they left their children. This behavior is not humanity'.

'I understood many things that I couldn't study from the book, things I experienced.You have to live these' .

'I understood life without mother and father is very hard. If you have a father you learn a lot of things from him. You go home, your mum opens the door. But these children not'.

Indeed, research has shown that there has been an association between empathy and moral development (Skoe, 2010). This is because empathy conveys the message of 'value, care and concern' (Cooper, 2010, p.91). It is

important for students to enhance their ability to empathize with others (Thornberg 2008). Having the skill in empathy is critical for character development (Berman and McCarthy, 2003). Students feel more effective in social world as they can build connections with other people and easily reach them when they feel distress. Empathy is not a detached enterprise to be taught separately but is firmly embedded in the very nature of community experiences shared and stimulated. Empathy is one of the ways which helps students to know things better through experience (Watson, 2009). Empathic emotions oriented to the other, facilitate care-based moral development (Skoe, 2010) and to create a supportive environment for this, is the role of all teachers.

3.2 The role of technology in this Study

The role of technology is identified mainly in five major categories in this study: These are the use of tape recorder, the use of PPT, video, internet and msn as explained below.

Tape recorder

Each semi-structure interview which lasted 10-15 minutes was recorded by a voice recorder as a large amount of data was generated. It is a great advantage if the interview is tape recorded for later transcription (Mack et al. 2005). It becomes also possible to listen to the tape of the interview several times in order to better discover what sections are important enough to transcribe, which sections need to be summarized, and which sections should be ignored. Keeping the tape later in the research, one can find that what was not typed was indeed more important than one thought (Corsaro, 1981). Flick et al. (2004) argue that "From a technical point of view the emphasis on communication in qualitative research is accompanied and supported by the increasing use of audiovisual recording technologies, which is recorded tapes, casette recorders and –to an increasing extent- video equipment "(p. 355). For all these reasons, each interview was recorded in this study.

PPT

Before the students actually met the disadvantaged community members, they watched slide shows about these people and discussed with their teacher how to communicate them, what kind of conversation topics would be appropriate. Power point is a powerful technological tool for learning. It consists of electronic slides where a person can embed files such as texts, music, pictures, diagram, etc. The benefit is that teachers can engage students not just through words, but also through visuals. It should not be forgotten that some students learn better by hearing, but other students learn better by seeing. The PPT used in this study also provided several pictures.

Video

After specifying objectives which can be found in cognitive, affective or psychomotor domain, the teacher starts to think about the learning process. While designing events of instruction, technology helps teacher to become more creative and effective in his job. If we are to maximize the achievement of general curriculum standards, we must increase our efforts to differentiate instruction. Nowadays, the impact of globalization and communication technologies is felt in the education of all our students. Communication technologies change the way of understanding towards moral education. TV, video and audio visual techniques of conveying messages is an eloquent testimony of educational technology of recent times. Elias (1998) depicts that technology aids people of all colours to begin to get used to be closer with one another, although they may have different patterns or self-regulations.

For example, TV is a blessing and a precious gift of technology in the character formation of youth, therefore can be an integral part of education. It has the possibility of eclipsing man's dignity and moral (Nwankwor, 2010). TV programmes, radio programs and movies offer alternative formal and informal education for listeners and viewers. If teachers exploit technological devices like TV in an appropriate way, they access the power to influence life styles of their students' including their behavior and character. While watching TV, students not only become aware of other people but learn how to appropriately appreciate and evaluate them**.** For all these reasons, all the Cbsl organizations are recorded by EMU TV and students had the chance to watch all the details and discuss the happenings with their mates. Smaldino & Russell (2005) assert that "When there is an element of emotion or the desire for affective learning, video usually works well. Attitudes can be influenced by role models and dramatic messages on video. Because of their great potential for emotional impact, video and film can be useful in shaping personal and social attitudes." (p.292). The previously recorded Cbsl videos were also shown to the students to give them an idea of the people they were going to meet. Even while watching these videos, students started to feel different before their actual, physical meetings. Mejias (2004) depict that communication technologies are capable of facilitating empathic arousal by allowing one individual to experience the affective state of another who might not be physically present. This is possible through telepresence, the technologically-mediated illusion of being somewhere where our bodies are not. Video is a very good example of this.

Moreover, it has been discussed throughout this research that exposing students to Cbsl is a challenging way of ethical training however it requires great amount of energy and time. Video is an empowering tool in capturing students' attention to the realities of life showing the students different characters, life stories etc. like the case in Cbsl projects. You can teach your students important issues through Cbsl videos, as well. Watching the videos can arise students' feelings of doing similar things for their disadvantaged society members. Video helps students to understand the thought and feelings of different characters through empathy. Empathy is "the glue that makes social life possible… a biologically and affectively based, cognitively mediated and socialized predisposition to connect emotionally with others" (Gibbs, 2003, p. 79). Empathy promotes moral behavior by allowing an individual to identify with another's situation, instead of his or her own.

Students coherently analyze the situations and visualize these situations involving ethically tinged dilemmas. While reacting to the same dilemmas with the characters, students test their ethics by observing the decisions film characters make and their consequences on others. In this way, they find a chance to reformulate their values and modify their own behavior after watching certain negative consequences of film characters' decisions. Besides Cbsl films, there are several movies possessing multiple approaches to ethics related situations, opening multiple pathways to students in order to make them reach decisions including sensible perceptions and. Beyaz Melek, One flew over the Cuckoo's Nest and Fried Green Tomatoes are a few examples to these. While watching the movies, students ultimately can decide what is right and what is wrong and this causes pursuit of ethical training. These films have the potential to make students feel that they need to do something for their community and their culture. Smaldino & Russell (2005) assert that viewing videos depicting people from all parts of the globe enhances also cultural understanding.

Internet and Msn

Students in this research agree that online communication tools provide social interaction, collaboration between peers, enhance negotiation process through emails, web 2.0 technologies, etc. within course process. As Mejias (2004) points out by connecting people across space, the dispersed network becomes the generative site for moral standards. Online communication tools put students in touch with other peers and other people increasing communication. Levin and Wadmany (2005) with the access to technology, students' access communication over great distances increase instantaneously. Similarly, Sproull and Kiesler (1991) argue that communication technology cause people to have contact with other people and depend on one another differently.

Some students reflected during this study reveal that students were able to keep in touch with SOS students through online communication tools such as msn. For example:

"Ahmet was a very good mate. He gave me his msn and we chat each other. He asked me my religion last week. I invited him to come to Nigeria with me. I wish he could. But we need a big sponsor for this."

Without technology, it would be difficult for students to keep in touch for various reasons such as financial reasons. In other words, communication over web provides easy access to everyone. Electronic collaboration discussions through internet, using e-mail etc. promote cooperative endeavor among students (Taylor et al. 2004). Moreover, Kenney et al. (2005) claims that " the internet does provide more possibility for emotional involvement than some educators may acknowledge" (p.218).

Online technologies like msn, provide opportunities for students to develop cultural, global and moral awareness through making connections with others, comparing their life and ideas with those of their peers. Pierson (2001) allows people to reconsider how they find, exchange and think about things. Through chats with their teacher, project participant students told that they had invited new SOS friends to certain parties and birthdays in Magosa but they could not come due to transportation or financial problems. They said they empathized their situations. Like how Gibbs (2003) put forward, "For example, one may read a letter describing another's situation and affective state. Emphatic responding through language-mediated association entails the mental effort of semantic processing and decoding" (p. 83). In other words, as Hoffman (2002) advocates, responding to empathic distress does not require the victim to be present, and one can feel empathy towards subjects who are not close to them. Empathic individuals are those who are able to put themselves in other's people shoes, and act based on the kind of behavior they would like to see reciprocated by others. Empathy is primarily a social phenomenon; therefore it can be displayed in a techno-social system like the internet.

Finally, it should be underlined that it is through internet, where students and teachers can immediately share, promote and publicize their Cbsl project experiences (Kaye, 2004 and Pritchard and Whitehead, 2004). In this way, with the help of technology, project participants can receive feedback or initiate others to do similar activities. Besides this, when students decide to carry out projects like this, using a search engine like Google or

Yahoo and writing key words like community, service, projects, they will be able to find rich material on the variety of different project ideas (Berman, 2006).

3.3 Findings of the Quantitative Data

The descriptive breakdown of the survey instruments (pre and post) representing minimum, maximum, mean and standard deviations, the overall representation of the items demonstrates that there is a tendency to report higher after the pre-test evaluation of the students. This may indicate that service-learning participant profile study has improved the way students' acknowledge and perceive the importance of community based service learning. Results of the analysis strongly recommend that students showed an increase in their perceptions of living a more humane future. Changes in ratings from students' pre-test and post-test results seemed to show an positive effect on students' moral development, future awareness and empathy over the course of the semester.

4. CONCLUSION

Among the students attended this Cbsl project, significant differences were observed in their personal development. For example, community practices lived increase the capacity of project participants who initially may lack confidence in their abilities (Monaghan and Columbaro, 2009, Switzer et al., 1995, Osborne, Hammerich, and Hensley, 1998). Interactions made throughout the projects have the potential to increase self-efficacy of the students because as Akkoyunlu and Kurbanoğlu (2004) suggest, there is a close relationship between experience and students' improvement of self-efficacy. Moreover, Akkoyunlu and Kurbanoğlu (2004) contend that providing students experiences and motivating them to spend time, show effort enhances their beliefs in their self-efficacy.

Moreover, Cbsl projects indicate a pedagogical imperative for moral values education beyond boundaries of religion books' pages. Cooper (2010) believes that it is important for teachers to spend time with students, rather than providing shelves stacked high with unread documents. Telling students what is moral is not effective in helping them to behave ethical. Therefore, this research suggests that it is significant to create diverse community service activities which foster care-giving for the students to take part in and reflect on (Skoe, 2010). For an institution to be defined as excellent, personal development of the students should also be facilitated and this is possible through building better bridges to the world outside campus borders. Education is not limited by schools anymore (Akkoyunlu and Kurbanoğlu, 2004 and Soran et al. 2006).

This research concludes that service students have more efficacies to make the world better (Bernacki and Jaeger, 2008). After raising the question 'Can we fulfill our responsibilities and obligations while we are working?' (p. 393), Öztürk (2010) contends that it is important for all professions from different occupations to provide service. These vary from doctors to plumbers which all relate to people's needs and it should not be forgotten that one's very status as a professional requires the moral truth of social sensibility. It should not be forgotten that for an ideal comprehensive educational model, a sense of responsibility should be nourished not for the other people but for all kind of living organisms and 'educating a person only in terms of a cognitive mind and not in terms of values and morals is to create new sources of threats and danger to society' (Kenan, 2009, p. 292). Raising individuals who are sensitive to the problems of others is very significant issue in students' education (Serin et al. 2010). In other words, accumulation and change of experiences in students' lives formulate deeper dimension in students' feelings towards others. Moreover, it is important for teacher education programs to involve the characteristics of healthy personalities (Serin et al. 2010).

In conclusion, teachers should not afraid of trying new methodologies. Using new educational methods and creating a wholesome interaction with the students, requires pedagogical sufficiency at a higher level (Akkoyunlu and Gücüm, 1998). For example, Montessori (1942) believes that the solutions of all problems will be found when we find enough power in ourselves to find a higher plane and this will be possible when the child pushes humanity onto this new higher plane. These hopes will come with the new education. I think her impressive question "is anything unchangeable?" reveals that it is worth trying Cbsl projects in our schools. I certify that Cbsl project is something everybody should get involved in doing. It may not be practiced the same by every person in every place. Some might conclude that the individual statements in this research are discursive and do not prove any definite success about Cbsl projects success on moral development of students'. Some might argue that this is a very meager contribution to the students and express their fears in wasting their valuable teaching time. May be there is no way to prove whether the excerpts cited in this research are going to initiate a building block for lifelong development of community service and the work done will be remembered as a waste of time. However, I feel differently and believe in the potential benefits of being involved in Cbsl projects for the students.

Suppose all the criticizers are right. The Cbsl projects will not change anything for the students and it did not stimulate and affect any kind of identity development. Still, I am very happy to carry out this research because at least me and my students made too many people live very happy hours and enjoyable moments they will never forget during their lives. This is something at least. Isn't it?????

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THE USAGE OF INFORMATION TECHNOLOGIES IN CLASSROOM ENVIRONMENT AMONG PRIMARY SCHOOL TEACHERS AND THEIR PERCEPTION ON IN-SERVICE TRAINING PROGRAMS ON IT (SAMPLE OF SAKARYA)

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ABSTRACT
In this research, the opinions of teachers, who have received in-service trainings on the subject of information technologies, on their levels of use of information technologies in classes are investigated. A total of 164 teachers, who were working in the city of Sakarya in the 2007-2008 Academic Year, have participated in the research. A questionnaire has been administered to all of these teachers in order for them to evaluate the in-service trainings they had participated, and semi-structured interviews have been conducted with 45 of them. After the research, it has been observed that those teachers who have received in-service trainings on information technologies use information technologies in their classes, the levels of use of information technologies are higher among those teachers who are satisfied with the in-service trainings than those who are not, the problems that teachers encounter while using information technologies mostly stem from equipments, and schools that do not have any problems in terms of equipment lack internet connection and educational software.
Keywords: in-service training, use of information technologies

INTRODUCTION

Technology has influenced the educational process in line with its own development. Educational technologies have influenced all learning-teaching theories, teaching methods and issues such as media design and teacher training. In this respect, given the fact that the educational technology is an important discipline that has emerged to improve the quality and quantity of learning; for teachers, who are the directors of learning-teaching activities, to actively use educational technologies is a significant necessity. According to Taiwo (2009) in-service courses (or holiday courses) should be based in the College of Education and the Faculties of Education in Universities where experts can be assembled. Also according to Koc and Bakir (2010) pre-service teachers' technology adoption can be grouped into three main categories. The first group of work has focused on pre-service teachers' technology proficiency and experiences during their undergraduate education. Secondly, a number of studies have examined student and their readiness to use technology. Lastly, research has dealt with possible barriers influencing pre-service teachers' learning about educational technologies.

The Ministry of National Education (MNE) has initiated various projects for teachers to use information technologies in classes. Some of them are Temel Eğitime Destek (Support to Basic Education), Bilgisayar Formatör Öğretmen Eğitim Programı (Computer Computer Coordinator Training Program), Gelecek İçin Eğitim (Education for Future) and Uzaktan Öğretmen Eğitimi (Distant Teacher Training) Projects. Other than these projects implemented by MNE at the national level, in-service training courses have been organized by province and town directorates of national education in order to increase teachers' levels of use of information technologies. Integration of computer technologies in classroom still bears some problems. Financial and technical problems are certainly beyond what teachers can handle in their own classrooms, yet those problems related to affect, that is self-efficacy beliefs, values and judgments, can be solved through support and education and it should start with pre-service teacher education (Topkaya, 2010).

All these projects and in-service trainings aims at enabling teachers to use information technologies in their classes and preparation phases for classes as materials supportive to teaching. This research has investigated the opinions of teachers, who have received in-service trainings on the subject of information technologies, on their levels of use of information technologies in classes.

The aim of this research is to determine the extents elementary teachers working in schools affiliated with the Ministry of National Education use information technologies in their classes, and their levels of satisfaction with the in-service trainings provided on the subject of information technologies. For this general purpose, answers to the following questions will be sought.

1. Which information technologies are used by teachers in classes and how often they use them?

2. Which information technologies are considered by teachers to be beneficial to use in classes?
3. Does the information technologies computer coordinator assist teachers on information technologies?
4. For what purposes teachers benefit from information technology classrooms in schools?
5. To what extent teachers are supported by school managers in benefiting from information technologies in classes?
6. What are the problems that teachers encounter when they want to use information technologies in their classes?

METHOD

The survey model was used for this research, which aimed at assessing teachers' levels of use of computer technologies in classes. The data collection technique that was used in the study in order to determine the current situation is interviews. Interviews have been conducted with teachers in order to determine their levels of use of computer technologies in classes. The interviews have been conducted by the researcher using the interview guides distributed.

In the research, semi-structured interviews have been conducted with 45 voluntary teachers. For this purpose, a Teacher Interview Guide has been prepared. There were three different interviewing approaches in the interview method; informal conversational interview, general interview guide approach and standardized open-ended interview (Patton, 1987, quoted by: Yıldırım and Şimşek, 2004). Among these approaches, the interview guide is prepared in order to obtain similar kinds of information from different people by orienting towards similar topics. Thus, the researcher can ask not only previously-prepared questions during the interview, but also additional questions to obtain more detailed information, and he/she can alter the order of the questions. The interview guide is a method developed in order to ensure the scope of all dimensions and questions connected to the research problem (Yıldırım and Şimşek, 2004).

During the process of the development of the Teacher Interview Guide, firstly, the information technology use behaviors that teachers must acquire in the in-service trainings on Information Technologies have been determined by benefiting from experts' opinions and the reports prepared by MNE. In this framework, interview questions, aimed at determining teachers' satisfactions with the in-service trainings they had received and whether they use the Information Technologies use levels that they had learned in these trainings, have been prepared.

The working group of the research was made up of teachers working in a total of ten elementary schools located in the city center of Sakarya and in the District of Hendek in the 2007-2008 Academic Year. In the research, 164 teachers have participated in the questionnaires and interviews have been conducted with 45 of them.

In the analysis of the data obtained through semi-structured interviews in this research, the descriptive analysis method was used. The reason this method was chosen is that the main dimensions of the theoretical framework have been formed in the research.

FINDINGS

1. Of the teachers participated in the interviews, 17 were females and 28 were males. Of the total of 45 teachers interviewed; 30 were elementary school teachers, 4 were math teachers, 2 were teachers of religious culture and moral knowledge, 2 were foreign language teachers, 2 were physical education teachers, 1 was teacher of guidance and psychological counseling, 1 was painting and 1 was Turkish language teacher.
2. Of the teachers, 37.77% (17) have reported that they use TV-VCD, 35.33% (15) use computer and projector, 17.77% (8) use the internet, 4.44% (2) use educational software in their classes.

When the opinions of those teachers who use computer technologies in their classes are analyzed, they reported that classes are more productive, their students participate in the class, and they direct attention to the class. A classroom teacher reported that "*she uses computer, projector and CDs in her classes, and addressing students with more resources ensures faster and more permanent learning*". Another classroom teacher's opinions are as follows:

> *"I use only computer, projector, internet and educational CDs in classes. I use them two hours per week. Such technologies are not available in all of our classrooms. I use the Computer Technology classroom when necessary. I only make presentation in this classroom. Sometimes, students use computers, too. My students' interests in and curiosities*

3. 62,22% (28) of 45 teachers participated in the research reported that they use CT in their classes, while 38,78% (17) of them reported that they do not.

When the reasons of those teachers who do not use CT in their classes not to use CT are examined, it became evident that the schools they work lack CT and they do not feel the necessity to use CT. A classroom teacher reported that he/she cannot use CT since the CT facilities in his/her school are limited. A Math teacher stated "*I do not use CT in classes and I do not feel the necessity to use. Why? Because there are no materials related to the Math course*".

4. Of the participant teachers, 37.78% (17) reported that they never use CT, 21.44% (11) reported that they sometimes use CT, and 35,56% (16) reported that they use CT in their classes frequently.

It was determined that it is easier for those teachers who use CT in their classes to get prepared and present the lessons, students in their classes more actively participate in the class, and their classes are more productive. It was also determined that those teachers who do not use CT in their classes do not use CT because their schools lack CT facilities, they do not feel the necessity and they do not have the required educational software.

5. Of the participant teachers, 44.44% (20) reported that having computer and projector, 15.55% (7) internet, 11.11% (5) educational software and 11.11% (5) reported that having digital camera, camera and printer in the classroom will be beneficial for them.

All of the teachers who cannot use CT due to the lack of CT facilities in classrooms think that having CT facilities in classrooms will be beneficial for their classes.

Specialty area teachers think that having the CT facilities, which are present in some classrooms, in all classrooms will be beneficial, and teachers who actively use CT in their classes think that the presence of the internet and educational software in classrooms will be beneficial in lessons.

11.11%, (5) of the participant elementary school teachers think that having video cameras and printers will be useful to record student activities and to take printouts when necessary.

A elementary school teacher reported that they do not have educational software and the MNE has neither sent to them the educational software CDs indicated in guide books, nor informed them about the ways to get them, for two years by stating: "T*he guide books sent to us by the Ministry order 'Show this CD', but such a CD does not exist. They do not send them"*.

Teachers' CT needs differ according to the CTs present in schools. While those teachers whose schools do not have any CT facility think that the CT facilities will be useful in the ways the lessons are taught, those teachers whose schools possess all kinds of CT facilities reported that using internet and educational software in classes will be more useful.

A majority of the teachers use the CTs present in their schools. Teachers need educational software since the MNE has not delivered the educational software indicated in its guide books to schools. If the CT deficiencies in schools are removed, it can be said that teachers will integrate CT to their classes.

6. Of 45 participant teachers, 60% (27) reported that the information technologies coordinator assisted them whenever they need 24.44% (11) reported that they had never been in need of assistance and 15.55% (7) reported that there was not a information technologies coordinator in their schools.

When the opinions of those teachers who stated that they are assisted by information technologies computer coordinators are analyzed, it became evident that information technologies computer coordinators assist them in every sense on CT but they sometimes cannot assist due to their high workloads. A classroom teacher explained this situation as follows: "*The information technologies computer coordinator assists us when we need, but he generally does not have free time since his workload is too high*".

Those teachers who do not feel the necessity for such assistance reported that they are capable of coping with problems and they are more knowledgeable about CT issues more than information technologies computer coordinators are.

It was determined that, in schools where information technologies computer coordinators are present, teachers can get assistance from computer coordinators but some troubles might be experienced due to high workloads of information technologies computer coordinators.

7. Of the participant teachers, 28.89% (13) reported that they use the CT classroom, and 71.11% (32) reported that they do not.

7. 1. Of the participant teachers 84. 61% (11) reported that they use the CT classroom for presentation, and 15.38% (2) reported that they use it for educational software.

7.2. When the opinions of those teachers who reported that they do not use the CT classroom are examined, it became evident that 37,04% (10) of them reported that the CT classroom is always occupied, 29,83% (8) of them stated that they do not need the CT classroom, 18,52% (5) of them stated that their classes are too crowded and 14,80% (4) of them reported that the software they need are not available in the CT classroom.

While 37% of the teachers who do not use CT classrooms do not use them willingly, while 63% of them do not use them due to lacks, crowdedness or deficiencies of software.

It is concluded through the findings obtained from this question that teachers benefit from CT classrooms in order to present the lesson with rich educational materials, that the current situations of the CT classrooms in schools do not enable teachers to use these classrooms and that teachers will use CT classrooms more when the quantity and quality of CT classrooms are increased.

8. 75.56% (34) of the participant teachers reported that they receive support from their managers in using CT in classes, 13,33% (6) of them reported that they do not need any support and 11,11% (5) of them reported that they do not receive any support from their managers.

When the opinions of those teachers who reported that they receive support from their managers are analyzed, the prominent opinions are that managers send teachers to in-service training courses, they provide support in terms of purchasing CT facilities to the school, and they arrange programs for the use of the CT classroom. A classroom teacher underlined the support they receive from managers by stating "*Our managers provide us with any kinds of support in terms of the use of CTs. They enable us to receive trainings when necessary, and they purchase the facilities required for the classes*".

When the opinions of those teachers who reported that they do not need to receive support from their managers are analyzed, it was observed that they are unwilling to use CT in their classes, and managers do not impose any sanctions on them. A Math teacher expressed his unwillingness to receive support from managers by stating "*We do not want any support from our managers, after all they do not force us about what to use and not*".

When the reasons of those teachers who reported that they do not receive any support from their managers are analyzed, it was concluded that either managers are uninterested in or they do not have adequate knowledge about the issue of CT. A classroom teacher stated

> *"In a meeting, we talked about the necessity of establishing a wireless network in the school, and the fact that everybody has portable computer. Our managers found this idea favorable at first, but they changed their minds after a colleague told that wireless networks are unhealthy". Another classroom teacher mentioned about the disinterestedness of the managers in CT by stating "Our managers only remind us our responsibilities, but they do not take any steps that might support us while using CTs".*

It was determined that managers generally support teachers in terms of using CT in classes, and that those managers who have inadequate knowledge about CT do not have any negative attitude towards the use CT in classes.

9. 38,78% (17) of the participant teachers reported that they do not use CT in their classes, while 62,22% (28) of them reported that they do.

1.9.1 73,53% (25) of the teachers reported poor CT facilities, 11.76% (4) of them reported the lack of course materials, 8,82% (3) of them reported the difficulty of classroom management and 5,88% (2) of them reported the breakdown of the CTs they use as the big problems they encountered.

1.9.2 When the opinions of those teachers who reported that the CT facilities in their schools are poor are analyzed, 52% (13) of them reported that the classrooms do not have any CT facilities at all, 20% (5) of them reported that speed of the internet connection in classroom is slow, 16% (4) of them

reported that the CT facilities in classrooms are inadequate and 12% (3) of them reported that the CT facilities already present in classroom are old.

The problems encountered by teachers while using CT are mostly based on hardware, and this is followed by the lack of educational software and the difficulty of classroom management. It was also concluded that the problem in the schools with no hardware problem are the lack of internet connection and educational software.

10. All of the participant teachers (45) reported that they had attended to basic educational courses. Of these teachers, 40% (18) also attended to Intel education for the future course, 13.33% (3) also attended to web design course, 6.67% (3) also attended to Publisher Course and 2.22% (1) also attended to formatter teaching course.

11. Of the 45 participant teachers, 46.67% (21) reported that the in-service trainings satisfied their expectations, while 53.33% (24) of them reported that they did not.

Those teachers who reported that their expectations have been satisfied stated that they started to use computers better, they started to use computers more actively in classes and they started to use the computer certificates they received in efficient teaching.

Those teachers who reported that their expectations have not been satisfied justified this by mostly pointing out the oldness of computer facilities, the idea that their opportunities to put what they had learned in practice were low and that the attendance was compulsory. A classroom teacher explained his dissatisfaction with the course by stating "*It did not satisfy my expectations, because we attended to the course compulsorily. How can you expect from a course that you attend compulsorily to satisfy your expectations? I would have learned if I had attended willingly*".

It is observed that those teachers who learned to use computer better and who adapted this into classes are prominent among those who reported that the courses satisfied their expectations.

On the other hand, those teachers who proposed the ideas that the facilities were old and non-operational, that they could not have the opportunity to implement what they learned, and that they attended to these courses compulsorily are prominent among those teachers who reported that the courses did not satisfy their expectation.

12. While 44.44% (20) of the participant teachers reported that the in-service trainings on CT they received became useful for them to use CT in classes, 55.56% (25) of them reported that they did not.

When the interviews conducted with those teachers who reported that the in-service trainings they received became useful for them to use CT in classes are analyzed, it is observed that the in-service trainings they received increased the CT use in classes, that they use CT more, and that their students' motivations and achievements increased, thanks to the increased CT use in classes. One of elementary school teacher stated,

> *"Yes I use CT in classes. It is useful after using computer in classes, while getting prepared for the class and during the lecture. Erstwhile, preparation for the class used to take too much time, this duration has decreased thanks to the course. Besides, students' interests In the class have increased when I lecture using computer or projector. I observe that students are more motivated when I use computer in the class. Moreover, I can say that I observed an increase in their achievements".*

When the interviews conducted with those teachers who reported that the in-service trainings they received did not become useful for them to use CT in classes are analyzed, the most popular reasons they proposed are the inadequacy of courses, the few number of computers in the classrooms where the courses took place, and the crowdedness of classrooms when they felt the necessity to use CT. A classroom teacher stated that "*he cannot use CT since classrooms lack computer, projector and screen"* . Another classroom teacher said:

> *"Classrooms lack computer, screen, projector etc. I cannot use them in classes. Not only me, but also the whole secondary stage teachers in this school cannot. I use computers for collecting lecture notes and creating materials at home".*

The teachers who do not use CT since they do not feel the necessity proposed the inadequacy of educational materials as the reason for this. A Math teacher stated:

> *"In-service trainings have not been useful; I already knew what they taught. After all, I already use computer at home. I do not use it at school. Why? Because I do not need it. Besides, there*

are no materials related to mathematics. I consider the computer use in classes to be unnecessary".

It was determined that the in-service trainings have been useful for those teachers who use CT in their classes; and for those who do not use, CT and physical infrastructures are inadequate in schools.

CONCLUSIONS

It is evident that it is easier for those teachers who use CT in their classes to get prepared for the class and to lecture, their students participate in the class more actively, and their classes are more productive. It was also determined that those teachers who reported that they do not use CT do not use it since their schools lack of CT facilities, they break down frequently, they are old, they do not need to use CT and their schools lack the required educational software.

While those teachers whose schools do not have any CT facility think that the CT facilities will be useful in the ways the lessons are taught, those teachers whose schools possess all kinds of CT facilities reported that using internet and educational software in classes will be more useful. Teachers need educational software since the MNE has not delivered the educational software indicated in its guide books to schools.

It was determined that, in schools where information technologies computer coordinator s are present, teachers can get assistance from computer coordinators but some troubles might be experienced due to high workloads of computer coordinator. It was also concluded that the teachers in schools that do not have any information technologies computer coordinator cannot get assistance in the issues of information technologies. Those teachers who do not feel the necessity for such assistance reported that they are capable of coping with problems and they are more knowledgeable about CT issues more than information technologies computer coordinators are.

It is observed that teachers benefit from CT classrooms in order to present the lessons with rich educational materials. It was also observed that the current situations of the CT classrooms in schools do not enable teachers to use these classrooms and that teachers will use CT classrooms more when the quantity and quality of CT classrooms are increased.

It was concluded that managers assist teachers in the use of CT in classes, and some managers allocate class hours for courses other than the Information Technologies course while determining the schedule of the CT classroom. It was also concluded that those managers who have inadequate knowledge about CT do not have any impact on teachers in terms of the use of CT in classes.

The problems encountered by teachers while using CT are mostly based on hardware, and this is followed by the lack of educational software and the difficulty of classroom management. It was also concluded that the problem in the schools with no hardware problem are the lack of internet connection and educational software.

The findings related to the teachers' satisfactions with the in-service trainings were presented under the headings of the satisfaction of expectations from the in-service trainings, the influence of the in-service trainings on the CT use in classes, the influence of the satisfaction levels with the in-service trainings on the frequency of CT use, the opinions about course teachers, methods and techniques, training materials and course duration.

The teachers who are satisfied with the in-service trainings they received are able to use the computer better and adapt it to the class. On the other hand, those teachers who reported that the courses did not satisfy their expectations proposed the ideas that the facilities were old and non-operational, that they could not have the opportunity to implement what they learned, and that they attended to these courses compulsorily.

It was determined that the in-service trainings have been useful for those teachers who use CT in their classes; and those who do not use CT in their classes do not use it not because of the inadequacy of the courses but because of the fact that CT and physical infrastructures are inadequate in their schools.

It was concluded that the half of those teachers who are satisfied with the in-service trainings always use CT in their classes, and the half of the teachers who are not satisfied with the in-service trainings never use CT in their classes.

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VIRTUAL ENVIRONMENT INTERPERSONAL TRUST SCALE VALIDITY AND RELIABILITY STUDY

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ABSTRACT
The purpose of this study is in the process of interpersonal communication in virtual environments is available from the trust problem is to develop a measurement tool. Trust in the process of distance education today, and has been a factor to be investigated. People, who take distance education course, they could may remain within the process communicate with different people and different problems in different ways. In this context, this scale (VEITS) developed for the accurate detection of these problems and has been developed. İt is also can be used for measuring how much the individuals can reflect their real personalities in the virtual environments.
Keywords: virtual environments, interpersonal trust, social networks, validity, reliability

INTRODUCTION

The Internet represents the final point the technology of the modern world reached in terms of communication. Contribution of the Internet to globalization and their joint effect on the social structure brought along concepts such as cyber area and virtual reality (Erenay & Hashemipour, 2003; Ruzgar, 2005; Bostan, 2007; Murray & Waller, 2007). It is possible to assert that in today's complex and dynamic nature, there no longer is a considerable difference between the virtual and the real in terms of the flow of the daily life and life habits (Messinger et al., 2009). People routinely carry out their business-related and personal affairs synchronously both in the real and virtual environments (Riva & Galimberti, 1998; Bartle, 2003). This situation, which we can consider as the natural consequence of the interaction introduced by the Internet and developed depending upon the communication channels in the Internet, also brought along fundamental changes in the lives of people and their behaviors (Cheung & Lee, 2010; Lohse, 1998).

It is known that, in the traditional formal communication environments the source and the receiver are in an exchange of messages and the characteristics of these persons as the source and the receiver are defined and clear (Peters, 1999; Yalın, 2011). In other words, the answers of the questions such as what was learned, from whom it was learned, how was it learned, how much was it learned and what effect it had are clear. However, in virtual environments answers of these questions have mainly informal, or in other words, anonymous characteristics. It is possible to state that the virtual world, and particularly the social networking sites, is an informal world in itself, and it is not really possible to clearly answer the questions what an individual learns, from whom it learns, how much and how it learns in this virtual world (Bartle, 2003; Giard &Guitton, 2010).

The aspect that renders virtual environments, as a new communication channel in interpersonal communication, different from the traditional formal communication is the type of interaction they manifest (Moore, 1989). Interaction is naturally included also in formal communication. However, its type in the virtual environment can be defined as a dynamic simulation that is not only dependent to the technology, but also has an appearance similar to the real world (Bostan, 2007; Gunewardena ve McIsaac, 2004; Reeves, Malone, & O'Driscoll, 2008; Ergul,2005). According to Fiske (1990), communication is the social interaction that occurs by means of messages. In interaction, the important point is to know who provides the information and who controls the distribution in terms of timing and context (Jensen, 1999; Romiszowski ve Mason, 1996; Usta, 2011).

Examining how an individual perceives and interprets the outer world brings forward two apparently similar, but different concepts, namely sense and perception (Cuceoglu, 1997). While sense is defined as the neurotic process that occurs when sense organs are stimulated with the physical energy coming from the outer world, the process of giving meaning to the outer world in the human mind by interpreting sensory data is called perception (Cuceloğlu, 1997). In this process, way of living and the past experiences are important. As a consequence of globalization, which gathered speed with the Internet, the meanings of these two concepts changed, and as it changed the clothes and finery, entertainment, music and game preferences, particularly of the youngsters, it also caused difference in the way they communicate. These differences evolved into a new identity for those and a new informal concept as "virtual world identity" emerged (Li, Chau, & Van Slyke, 2010; Shin, 2008; Mazer, Murphy & Simonds, 2007).

Considering that internet users are the members of a virtual society, the individual stuck in between the virtual reality and the real reality is both the creator and the receiver of the message in virtual environments. In this

sense, as the individual has the possibility to make itself visible and step forth as it actually is, it can also conceal itself and always remain virtual (Kir, 2008). The ambiguous, anonymous and informal environment originated by the Internet made the individuals come up with the idea that they can fabricate new identities and enter into new environments with these identities. This may cause insubstantial or contrary to truth situations. For instance, it is known that individuals freed from all external pressures of the face-to-face communication tend to avoid the reality during their existence in the virtual world and in the process of creating identity, either due to their desire to use their imagination or due to personal security and preferences (Altun, 2008; Dunne, Lawlor, &Rowley, 2010). The most significant nature of this area, which is very different from the real life in terms of individual socialization, is that it does not have the various limitations of the real life (such as financial, social and physical limitations) and it can ignore the differences in social statuses. In this sense, the individual adopts an identity it imagines and can create his virtual personality as it is in its mind (Maczewski, 2002; Yee et al, 2007).

Individuals' ability to create their identities as they wish in the virtual platform, as explained above, brings into mind the issue of trust within this communication process. It is doubtless that, for the communication to be healthy, the source and the receiver have to be ready to communicate. However, the case where the receiver does not trust the source is considered as a noise in the communication process (Ergin, 1998). It is possible to state that, in the sense of utilizing internet sources more effectively, it is quite important to reveal how much the individuals trust to internet sources. However, at the end of the literature review carried out, no scale, the validity and reliability of which were demonstrated, for measuring individuals' attitude concerning their trust to each other in interpersonal communication particularly in the virtual environments could be found. The purpose of this study is to develop an attitude scale with the aim of determining individuals' trust-related attitudes in the virtual environments by filling this gap in the literature. Considering that the scale will be the first in its kind, it is believed that it can provide important contributions to the field. The fact that the interaction and fast communication made possible by the virtual environments bring along many problems is a social matter of fact (Pew Internet and American Life Project, 2010; Hinduja & Patchin, 2008). It is believed that the measuring tool to be developed at the end of this study will be useful in terms of manifesting the perception of the new concepts concerning the daily life, new manners of discussion and discourse, new kinds of friendships and new ways of understanding and perceiving, as well as the effects of virtual environments on the individuals' real identities and on the sense of trust in interpersonal communication.

In conclusion, this study is considered important in the way it aims to develop a tool for measuring how much individuals can reflect their own personalities in virtual environments. Within this frame, the purpose of the study is to develop the "Virtual Environment Interpersonal Trust Scale" (VEITS).

METHOD

Study Group

The study group consisted of 343 adult individuals using social networking sites, as 165 women and 178 men, from different cities and age groups. Age and gender related distribution of the study group is summarized in Table 1.

Table 1. Age and gender related distribution of the study group

Age Groups	Female	Male	**Total**
Between 17-19	39	13	**52**
Between 20-29	118	146	**264**
Above 30	8	19	**27**
Total	**165**	**178**	**343**

Scale Development Process

Within the development process, at first a literature review (Murray & Waller, 2007; Marcella, 1999; Belsey, 2005; Jung & Kang, 2010; Nowak & Biocca, 2003; Kim,2006; Lee, 2005; Gross et al., 2002; Taylor, 2002; Meadows, 2007) was carried out. Also five experts of the field were asked to write down the possible items that will be suitable to be included in the scale. 68 students were asked to answer open-ended questions regarding the topic and by analyzing the answers a pool of 36 items was created. Next to each of the items five choices were placed. These choices were arranged and scored as "(1) never", "(2) rarely", "(3) sometimes", "(4) usually" and "(5) always".

The draft items were examined by a linguistics expert, a psychological counseling and guidance expert and two educational technology experts, all having doctoral degrees in their respective fields, in terms of content, expression and wording and spelling and punctuation. After carrying out the necessary adjustments in line with the received criticism, the 36-item draft scale was established.

The draft scale was applied online to a randomly selected study group consisted of persons having profiles in social networking sites such as Facebook and Twitter. Collected data were then entered into the SPSS 15.00 software in order to carry out the validity and reliability analysis of the scale through statistical ways.

As part of the statistical analyses, first KMO and Bartlett test analyses were carried out on the collected data in order to determine whether factor analysis was to be conducted or not. Based on the obtained values, exploratory factor analyses were conducted on the data, the decomposition of the scale was determined by means of principal components analysis, and factor loads were examined via the Varimax rotation technique. After eliminating the items with less than 30 factor load analyses were repeated. Item discrimination power and item-total correlations of the 20 items that remained after removing the eliminated ones were tested with Pearson's r test and the validity of the scale was determined. In order to determine the reliability of the scale, stability tests were carried out with the internal consistency coefficients. In order to determine the level of internal consistency Cronbach alpha reliability coefficient, correlation between two equal halves, Spearman-Brown formula and Guttmann split-half reliability formula were utilized. Stability level of the scale was calculated by determining the correlation of the results of two applications of the scale, the second one made four weeks after the first one.

FINDINGS

The procedures followed and the findings obtained as part of the validity and reliability analyses of the scale are presented herein below.

Findings Concerning the Validity of the Scale

Within the scope of the validity analyses of the Virtual Environment Personality Description Scale (VEITS), primarily construct validity and item-total correlations were calculated. Findings are submitted below:

Construct Validity

In order to test the construct validity of the VEITS, fist Kaiser-Meyer-Oklin (KMO) and Bartlett test analyses were conducted on the data and KMO was determined as = 0,798 and Bartlett test value as x^2= 4111,30; sd=210 (p=0,000). From these values, it was understood that factor analysis can be made on the 36-item scale. Factor analysis is used in order to determine whether the items of scale can be put into a fewer number of factors that exclude each other (Balci, 2009). On the other hand, in consequence of the Principal Components Analysis and the Varimax Rotation technique made in line with this, the items with less than 0,30 factor load and the items that do not have at least 0,100 between their loads on two factors were excluded from the analysis (Buyukozturk, 2002).

In this respect, at first the principal components analysis was carried out in order to determine whether the scale is one-dimensional. In order to determine whether the scale is divided into factors that are unrelated with each other, Varimax rotation technique was implemented and the factor loads were examined. After the 16 items that had less than 0,30 factor load were removed accordingly, factor analysis was carried out on the remaining 20 items. The key criterion in evaluating the results of factor analysis is the factor loads included in the scale and that can be considered as the correlation between the factors (Balci, 2009; Gorsuch, 1983). Having high factor loads is considered as an indication that the variable can be included within the particular factor (Buyukozturk, 2002).

After these procedures, it was determined that the total 20 remaining items in the scale are gathered under three factors. It was determined that the KMO value of the 20-item final state of the scale is 0,810, while the values obtained from Bartlett Test werex^2=2513,707; sd=210; p<0,001. It was determined that the unrotated factor loads of the remaining 20 items were between the values of 0,348 and 0,769, while the rotated loads obtained after the Varimax rotation technique were between 0,485 and 0,876. On the other hand, it was determined that the items and factors included within the scope of the scale explain 48,763% of the total variance. As it is known, having no factor load less than 0,30 and having 40% of the variance explained in terms of behavioral sciences is considered sufficient (Buyukozturk, 2002; Eroglu, 2008). On the other hand, 20 items were gathered under three factors. Factor names were determined by examining the items included in the factors. While 9 items were gathered under the factor designated as "Virtual Honesty", there were 7 items under the factor designated as "Virtual Negativity" and 4 items under the factor designated as "Virtual Distrust".

This is shown in Figure 1, plotted according to the eigenvalues. It can be seen from Figure 1 that the first three factors feature rapid falls and consequently have significant contribution to the variance, yet the falls of the other factors start to become horizontal and therefore the contributions of their factors are close to each other (Buyukozturk, 2002; Eroglu, 2008).

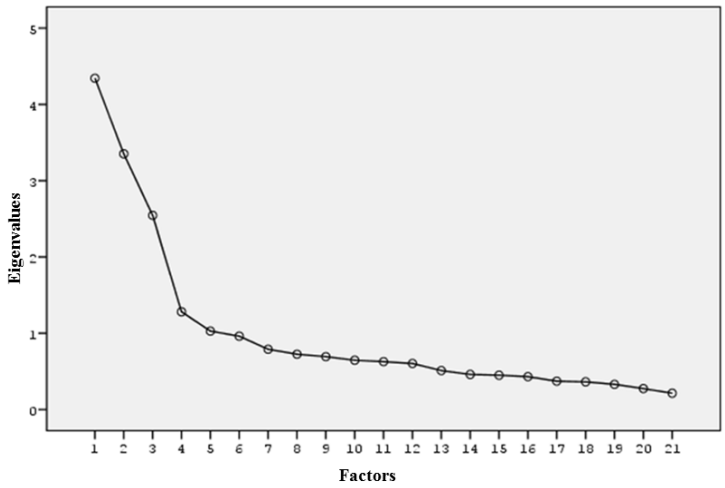

Figure 1. Eigenvalues as per the Factors

In consequence of these procedures findings regarding factor related item loads of the remaining 20 items, the eigenvalues of the factors and their rates in explaining the variance are presented in Table 2.

Table 2. Results of the Factor Analysis of the Scale

		Items	F1	F2	F3
Virtual Honesty	I1	In virtual environments I express my own world views (religious, political, ideological).	,743		
	I2	In virtual environments, I become member of the groups that reflect my world view.	,730		
	I3	In virtual environments, I share the contents that reflect my own world view (photo, music, article, etc).	,718		
	I4	In virtual environments, I discuss my own world view within groups.	,680		
	I5	The personality I put forth in the virtual environments is identical to my real personality.	,679		
	I6	I do not abstain from defending my political opinion in the virtual environment.	,677		
	I7	In virtual environments, I can easily express and share what I think.	,608		
	I8	In virtual environments, I give my real name, gender, address and age information.	,540		
	I9	My opinions and thoughts in the virtual environments are identical to those I have in real life.	,485		
Virtual Negativity	I10	In virtual environments, I share the photos of my friends without asking for their permission.		,702	
	I11	I curse and use slang in virtual environments.		,687	
	I12	I trust my virtual friends more.		,639	
	I13	I am often misunderstood in virtual environments.		,611	
	I14	I have difficulty in expressing myself in virtual environments.		,559	
	I15	I do not answer others' questions truthfully in virtual environments.		,547	
	I16	I am not interested in who someone I know from the virtual environment is in reality.		,537	
Virtual Distrust	I17	I do not trust to my virtual friends.			,876
	I18	I doubt my virtual friends.			,853
	I19	Virtual friendship is not my thing.			,769
	I20	I consider friendships in the virtual world as fake.			,705
		Eigen value	4,033	3,357	2,850
		Explained Variance	19,206	15,985	13,571

As it is seen from Table 2, the "Virtual Honesty" factor of the scale covers 9 items and factor loads vary between the values of 0,743 and 0,485. While the eigenvalue of this factor within the general scale is 4,033, the contribution it makes to the general variance is 19,206%. The factor “Virtual Negativity” covers 7 items. Factor loads of the items vary between 0,702 and 0,537. While the eigenvalue of this factor within the general scale is 3,357, the contribution it makes to the general variance is 15,985%. The factor “Virtual Distrust" includes 4 items. Factor loads of these items vary between the values of 0,876 and 0,705. While the eigenvalue of this factor within the general scale is 2,850, the contribution it makes to the general variance is 13,571%.

Item Discrimination

In this part item discrimination level was tested by calculating the correlations between the scores obtained from the factors and the scores obtained from each item in the factors according to the item total correlation method, or in other words, the level each item serves the general purpose was determined. The item-factor correlation values obtained for each item are presented in Table 3.

Table 3. Item-Factor Scores Correlation Analysis

F1 (Virtual Honesty)		**F2 (Virtual Negativity)**		**F3 (Virtual Distrust)**	
M. No	**R**	**M. No**	**R**	**M. No**	**r**
M1	,733(**)	**M10**	,683(**)	**M17**	,883(**)
M2	,696(**)	**M11**	,670(**)	**M18**	,846(**)
M3	,724(**)	**M12**	,638(**)	**M19**	,781(**)
M4	,628(**)	**M13**	,648(**)	**M20**	,737(**)
M5	,720(**)	**M14**	,613(**)		
M6	,657(**)	**M15**	,607(**)		
M7	,608(**)	**M16**	,555(**)		
M8	,593(**)				
M9	,563(**)				

N=343; **=p<, 000

As it can be seen from Table 3, item-factor correlation coefficients for the first factor vary between the values of 0,733 and 0,563, between 0,683 and 0,555 for the second factor and between 0,883 and 0,737 for the third factor. It is determined that each factor is significant and is in a positive relation with the general scale (p<0,000). These coefficients are the validity coefficients of each item separately and indicate the related item's consistency with the whole of the scale, or in other words, their level of serving for the general purpose of the scale (Carminesi, Zeller, 1982).

With the same purpose, also the corrected correlations between the score of each item and the total score of the factor minus the score of the given item, were calculated and presented in Table 4.

Table 4. Item-Factor Scores Corrected Correlation Analysis

F1 (Virtual Honesty)		**F2 (Virtual Negativity)**		**F3 (Virtual Distrust)**	
M. No	**r**	**M. No**	**R**	**M. No**	**r**
M1	,630	**M10**	,552	**M17**	,770
M2	,600	**M11**	,511	**M18**	,718
M3	,629	**M12**	,474	**M19**	,597
M4	,509	**M13**	,479	**M20**	,540
M5	,622	**M14**	,440		
M6	,535	**M15**	,417		
M7	,492	**M16**	,357		
M8	,465				
M9	,426				

N=343

As it can be seen from Table 4, corrected correlation coefficients between of each items in the scale and the factors they belong to vary between the values of 0,770 and 0,357. It is known that having a corrected correlation coefficient higher than 0,20 indicates that the item significantly serves the purpose of the related factor (Tavsancil, 2010). According to this, all of the items included in the scale serve the purpose of the factor they belong to.

Findings Concerning the Validity of the Scale

For the purpose of calculating the reliability of the scale, internal consistency and stability analyses were carried out on the data. Followed procedures and obtained findings are presented below:

Internal Consistency Level

Factor-based and in general reliability analysis of the scale that consists of 20 items and 3 factors, were calculated by utilizing Cronbach alpha reliability coefficient, correlation between two equal halves, Spearman-Brown formula and Guttmann split-half reliability formula. Reliability analysis values of each factor and the scale in general are summarized in Table 5.

Table 5. Results of Reliability Analysis Concerning the Scale in General and its Factors

Factors	Number of Items	Two Equal Halves Correlations	Spearman Brown	Guttmann Split-Half	Cronbach Alpha
Virtual Honesty	9	,676	,807	,786	,836
Virtual Negativity	7	,541	,702	,705	,744
Virtual Distrust	4	,667	,800	,800	,828

As it can be seen from Table 5, two equal halves correlations of the scale consisting of 3 sub-factors and total 20 items vary between the values of ,541 and ,676, Spearman Brown reliability coefficients between ,702 and ,807, Guttmann Split-Half values between ,705 and ,800 and Cronbach Alpha reliability coefficients vary between ,744 and ,836. According to this, it is possible to assert that the consistency levels of all three factors are high.

Stability Level

Stability level of the scale was determined with the use of test-retest method. As it is known, a reliable measuring tool has to make stable measurements (Balci, 2009). The final 20-item form of the scale was reapplied to the 73 students to whom the initial application was made. The relation between the scores obtained at the end of the both applications was examined at both separate item level and general scale level. In this way the capability of making stable measurements of the separate items and of the scale itself was tested. Findings are summarized in Table 6.

Table 6. Test-Retest Results of the Items of the Scale

M. No	*r*	M. No	*R*	M. No	*R*
M1	,897(**)	**M8**	,922(**)	**M15**	,860(**)
M2	,885(**)	**M9**	,917(**)	**M16**	,932(**)
M3	,901(**)	**M10**	,892(**)	**M17**	,951(**)
M4	,876(**)	**M11**	,876(**)	**M18**	,910(**)
M5	,855(**)	**M12**	,918(**)	**M19**	,948(**)
M6	,855(**)	**M13**	,652(**)	**M20**	,903(**)
M7	,873(**)	**M14**	,908(**)		

N: 73; **=p<0,000

From Table 6 it can be seen that the correlation coefficients of each of the items forming the scale, obtained by means of test-retest method, vary between the values of 0,932 and 0,652, and that each correlation is significant and positive (p<0,000). As it is known, reliability is related with the stability, consistency and sensitivity levels

of the scale. Due to this reason, these values determined as stability coefficients are considered as the evidence of the reliability of the scale (Hovardaoglu, 2000). According to this, it is possible to assert that the scale is capable of making stable measurements. The findings exhibiting the test-retest values of the factors of the scale are summarized in Table 7:

Table 7. Test-Retest Results of the Factors of the Scale

			Second Application		
			F1	**F2**	**F3**
Initial Application	**F1: Virtual Honesty**	**F1**	,872(**)		
	F2: Virtual Negativity	**F2**		,864(**)	
	F3: Virtual Distrust	**F3**			,876(**)

N: 73; **=p<0,000

It is seen from Table 7 that the correlation coefficients of the factors, obtained by means of test-retest method vary between the values of 0,864 and 0,876, and that each correlation is significant and positive (p<,000). According to this, it is possible to state that also the factors in the scale are capable of making stable measurements. According to the values obtained within the scope of reliability analysis, it is possible to consider that the VEITS is a reliable scale in terms of its capability of making consistent and stable measurements.

CONCLUSION

In this study a measuring tool that will determine to what extent individuals reflect their real personalities in virtual environments was developed. Being a five point likert-type scale, the VEITS consists of 20 items gathered under three factors. Each of the items included under the factors have choices as Never (1), Rarely (2), Sometimes (3), Usually (4) and Never (5).

Validity of the scale was tested through two different methods. The methods employed to test validity were (1) factor analysis and (2) item discrimination. According to exploratory factor analysis results, the scale consists of three factors. Considering the factor loads included in the factors, eigenvalues of the factors and the rates of explained variance, it is possible to assert that the scale has construct validity. Besides, having factor loads higher than 0,30 and having at least 40% of the variance explained is considered sufficient in terms of behavioral sciences (Kline, 1994; Scherer at al., 1988) .

Item-factor correlations on the data were calculated in order to determine the extent with which each of the items in the scale can measure the attributes that the related factors try to measure. Calculation of the correlation between the scores obtained from each of the items and the score obtained from the related factor, is used as a criterion in order to determine the level of each item in serving the general purpose of the factor (Balci, 2009). Accordingly it was determined that the correlation values between the scores obtained from singular items and the factors they are included in vary between the values of 0,357 and 0,770. Considering this, it is possible to assert that all items and all factors included in the scale serve to the purpose of the scale for measuring a particular attribute in a significant way and that all items are as discriminative as required.

Internal consistency coefficients of the scale were calculated by utilizing Cronbach Alpha, Spearman-Brown formula and Guttmann split-half reliability formula. It was determined that the two equal halves correlations of the scale vary between the values of ,541 and ,676, while Spearman Brown reliability coefficients are between ,702 and ,807, Guttman Split-Half values are between ,705 and ,800 and Cronbach alpha reliability coefficients vary between the values of ,744 and ,836. Pursuant to these values, it is possible to state that the scale is capable of making reliable measurements in terms of both its factors and in itself. As a matter of fact, having a reliability coefficient higher that ,70 is considered as an indication of the reliability of the scale (Buyukozturk, 2002; Gorsuch, 1983).

In order to determine the time-dependent stability level of the items of the scale, test-retest method was employed by using the data collected in two separate applications carried out with an interval of four weeks. The test-retest method was utilized both for the separate items and the sub-factors of the scale. It was determined that the test-retest correlation coefficients found for the separate items vary between the values of 0,652 and 0,932. As for the test-retest correlation coefficients calculated in terms of factors, they were determined to be varying between the values of 0,864 and 0,876. All of these correlations are positive and significant at the level of p<0,001. The reliability coefficient, which exhibits consistency level, increases as it gets closer to 1,00 and

decreases as it gets closer to 0,00 (Gorsuch, 1983). As it is known, while a correlation coefficient between the values of 0,00 and 0,30 generally indicates the presence of a low correlation, a value between 0,30 and 0,70 indicates a medium and an amount between 0,70 and 1,00 indicates high level of correlation (Buyukozturk, 2002). According to this, all of the items included in the scale are in a high level of correlation. Similarly, also the factors are determined to be in high correlation. Therefore, each item and each factor included in the scale are capable of making stable measurements in terms of time-dependent invariance.

In conclusion it is possible to state that the VEITS is a reliable and valid scale that can be used for measuring how much the individuals can reflect their real personalities in the virtual environments.

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