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Message from the Editor-in-Chief

Dear Colleagues,

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

Educators are increasingly using technology in all aspects of their profession (e.g., creating curricula, classroom instruction, and work assignments). This trend can be enhanced by educating the educator about cultural and cognitive aspects of technology and technikos, as well as the associated advantages and disadvantages related to educational and human development goals. Since the Renaissance, modern everyday attitudes tend to freely accept and use new technologies. Technology is usually comprehended in terms of hardware and the end experiences it produces (good or bad) or its material benefits (profitable or unprofitable), rather than understanding deeper relationships between technology, human nature, and culture. What produces technology—cultural organization, human values, research and development, and so on—is less obvious and less interesting than experiencing it's products and benefits.

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. Kim, Sung-Wan - Graduate School of Education, Ajou University, South Korea; Prof. Dr. Petek ASKAR - TED University – Turkey; Assoc. Prof. Dr. Sun-Young PARK - South Korea. 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 and University of Malaya-Malaysia will organize the 13th International Educational Technology Conference (IETC 2013) between May 13-15, 2013 at University of Malaya in Kuala Lumpur, Malaysia. The web page of IETC is “www.iet-c.net”.

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.

October 01, 2012

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

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Articles Presented in IETC 2012

A CEFR-BASED COMPUTERIZED ADAPTIVE TESTING SYSTEM FOR CHINESE PROFICIENCY

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ABSTRACT
In the era of globalization, the trend towards learning Chinese as a foreign language (CFL) has become increasingly popular worldwide. The increasing demand in learning CFL has raised the profile of the Chinese proficiency test (CPT). This study will analyze in depth the inadequacy of current CPT's utilizing the common European framework of reference (CEFR) for language learning, teaching, and assessment to develop a set of reliability and validity standards for a computerized adaptive testing (CAT) CPT system. Actual performance of computerized tests will simulate the empirical data via the CAT system process and assess the efficacy of this system.
Keywords: Chinese Proficiency Test, Common European Framework of Reference, Computerized Adaptive Testing

INTRODUCTION
With the growing demand of learning Chinese as a foreign language (CFL), the development and utility of the proficiency test for "non-native Chinese" learners is essential, particularly, countries that are in the preliminary stage of promoting CFL courses in the educational institutions and organizations. For example, United Kingdom language school has included CFL in its foreign language learning curriculum. National Security Language Initiative (NSLI) of the United States has identified Chinese language an important national security strategic language, and is planning on including Chinese in the foreign language learning curriculum in schools and workplaces (U.S. Department of State, 2006). All these programs show that learning CFL is becoming an important issue due to the large demand of Chinese language proficiency. Currently, Test of Chinese as a Foreign Language (TOCFL), Hanyu Shuiping Kaoshi (HSK), Test of Practical Chinese (C. Test), Scholastic Assessment Test (SAT) subject test in Chinese with listening, and Advanced Placement (AP) Chinese language and culture are often used to assess Chinese proficiency (SC-TOP, 2011; HSK, 2011; C. Test, 2011; College Board, 2011a; College Board, 2011b). However, the majority of these tests are administered by the traditional paper and pencil tests (PPT) format. Although there are many studies about developing the tools for learning CFL (Wong, Gao, Chai, & Chin, 2011; Zhao, Wang, Wu, & He, 2011; Shieh, 2011), the construction of computerized test for CFL is hard to find on the literatures. The aims of the present study are: adopting the Common European Framework of Reference (CEFR) for item development; providing a framework by using item response theory (IRT) as the scoring method; constructing computerized adaptive testing (CAT) system.

Currently the frameworks of reference are inconsistent among CPTs which results in various classification levels of proficiency and makes it difficult to classify learners' language levels consistently. With a international recognized common reference framework that describe learner language skills in detail, it will make it easier to identify learner's status of Chinese learning. In addition, this framework will allow learners to continue their Chinese language learning in any countries without extraneous evaluation of level assessment. By providing a common basis for the explicit description of objectives, content and methods, the CEFR will enhance the transparency of courses, syllabuses and qualifications, thus promoting international co-operation in the field of modern languages. The provision of objective criteria for describing language proficiency will facilitate the mutual recognition of qualifications in different learning contexts and settings, and accordingly will promote the mobility of learning CFL. Currently, proficiency tests that adopt CEFR as the framework reference are: Test of English for International Communication (TOEIC), Test of English as a Foreign Language (TOEFL), Cambridge Main Suite, Business Language Testing Service (BULATS), Test Deutsch als Fremdsprache (Test Daf), Japanese-Language Proficiency Test (JLPT), DiplômeD'Etudes en Langue Française (DELF), and HSK etc. (Kecker & Eckes, 2007; Tannenbaum & Wylie, 2005).

The majority of these CPTs analyze examinee's proficiency level based on the classical test theory (CTT), which use the total of observed scores (raw score) to classify examinees CFL proficiency scales (SC-TOP, 2011; HSK, 2011; C. Test, 2011; NCACLS, 2010). Using raw score to represent proficiency scale of test violates the following assumptions: meaningful measurement, unidimensionality, and linearity of data characteristics (Lord, 1980; Wright, 1999). In addition, when an examinee participates in different proficiency tests, the total raw score of each test will not be able to reflect truthfully his/her language skills since the difficulty of test items are undefined and uninformed. However, the psychometric basis of tests has changed dramatically, even though CTT has been used for several decades, the application of IRT increases rapidly and become the mainstream of measurement theory. Recently, more standardized tests are developed by using IRT because of its theoretical measurement principles. IRT consists of mathematical models designed to describe the performance of examinees on test items. IRT not only selects the most appropriate items for examinees, it also equates scores across different subsets of items. For example, the Scholastic Assessment Test (SAT) and the Graduate Record Examination (GRE) both use IRT for ability estimation.

Using computers to deliver standards-based assessments is becoming common among education departments, legislators, and policy makers. Computer-based testing (CBT) has become one of most common forms of testing since 1990s. CBT has been developing quickly since then as new question formats, alternative models of measurement, improvements in test administration, immediate feedback to test takers, more efficient information gathering (Akdemir & Oguz, 2008; Mills, 2002; Wise & Plake, 1990), and development of new methods of assessment such as simple adaptations of multiple-choice items to more innovative item types (Jodoin, 2003). Through the use of multimedia technology, CBT is able to apply more diverse and developed items which are closer to real situations. CAT combines the multimedia characters of computerized testing and the efficiency of adaptive testing. With computerization, color, sound, animation, interaction, and performance could be integrated in a test. This will definitely improve the validity of the test. Thus, although the majority of these CPTs are administered by the traditional PPT, College Board is conducting an important project in developing CBT (College Board, 2011a). Although there are CPTs, which were developed based on CBT, yet, CAT was not used. With CAT, precision of abilities can be obtained as non-adaptive test with only half of the items administered, and at the same time, appropriate items can be selected by the system to measure participant's potential abilities. Therefore, different items will be delivered to different participants in a more time efficient manner.

The data will be analyzed by applying IRT three-parameter logistic (3PL) model. One thousand five hundred and seventy-six participants recruited from Grace Christian Collage in Philippine were administered with Chinese listening and reading tests via CBT in September, 2010. In addition, the effectiveness of applying CAT among the three estimating methods, namely maximum likelihood estimation (MLE), expected a posteriori (EAP), and maximum a posteriori (MAP) will be investigated.

THE COMMON EUROPEAN FRAMEWORK OF REFERENCE, CEFR

CEFR was developed by the Council of Europe (CE) and its members as a framework and guideline for foreign language learning, teaching, and assessment. It was developed as a standard reference and guideline to provide language learning, communication dimension, teaching materials development, and language assessment (Joël Bellassen & Zhang, 2008). CEFR is also a set of language proficiency measurements adapted by different countries to maintain the consistency of mutual authentication between their education systems. The main content of CEFR describes the background of language use, the level of language proficiency, learner acquisition, knowledge, and skills that the language user or learner need to develop (Council of Europe, 2001). CEFR classifies language proficiency and divides proficiency into three categories with a total of six levels (A1, A2, B1, B2, C1, C2). It applies Can-do sentence types and positive presentation types to describe the performance of the various levels of language users and learners' behaviors. Language proficiency as described in CEFR emphasizes the language user and learner's usage of target language in completing certain levels of communication tasks. In order to complete communication tasks, the learner must use their previous experience or competence. Teachers must also understand the ability of the language user and learner in order to support his or her developing ability.

CEFR is an action-oriented approach. It treats language user and learner as part of the community who is able to achieve communication tasks under certain conditions and special circumstances, or some specific behavior aspects (Council of Europe, 2001). Since the 2001 CE recommendation to adopt CEFR, wide spread promotion and application has contributed to the growth of CEFR and has influenced education system in more than 40 countries. Other than CU members countries, countries outside Europe, like Japan, Canada, and New Zealand have referred to CEFR as a framework reference for their foreign language learning, teaching and assessment. Therefore, CEFR is becoming the international language framework reference for language proficiency. Many studies suggest that the most recognized aspect of CEFR is that CEFR has brought positive impact on teaching, curriculum development, and assessment. In the APEC economies research, a survey also showed that CEFR is the best model or reference (Duff, 2008). Therefore, CEFR is a language learning framework that provides clear guidelines for various levels of language learners (Council of Europe, 2001).

Recent Development of Chinese Proficiency Computerized Test

With the popularity of computer devices and the development of information technology, computerized tests have become a current trend in testing. So far, only AP Chinese Language and Culture and TOCFL have developed their own Chinese language computerized assessment systems (College Board, 2011a). AP exams are used for placement purposes to determine college students current language level in the United States. In 2003, the College Board launched an AP Chinese Language and Culture course and exam based on the national standards for foreign language teaching and examination formulated by the American Council on the Teaching of Foreign Languages (ACTFL). The purpose of the exam is to evaluate learners Chinese language communication skills in the real life (College Board, 2011a). TOCFL, on the other hand, is a proficiency test developed for learning CFL by Steering Committee for the Test of Proficiency (SC-TOP) in Taiwan (SC-TOP, 2011). The characteristics of AP Chinese Language and Culture and TOCFL are:

1. There are four kinds of tests in the Chinese language computerized assessment systems, including listening, reading, speaking, and writing tests. The listening and reading tests consist of multiple choice items; the speaking and writing tests comprise free response items.
2. AP Chinese Language exam uses English only for instructions, test content, and computer interface, however, TOCFL uses eight different languages, namely English, Japanese, Korean, French, Spanish, German, Thai, and Vietnamese for instructions, test content, and interface for the Beginner Level, and Chinese for advanced learners.
3. Both test items are presented in simplified or traditional characters. Test takes can choose either Han-Yu-Pin-Yin or Zhu-Yin-Fu-Hao to input their answers.
4. Multiple choice items are scored automatically by the computer system, whereas writing and oral answers are rated manually by Chinese language teachers.

Numerous computerized assessment systems were developed for various language proficiency tests; such as Business Language Testing Service (BULATS) by Cambridge ESOL and Test of English as a Foreign Language (TOEFL), Graduate Record Examination (GRE), and Graduate Management Admission Test (GMAT) by Educational Testing Service (ETS). Among these tests, BULATS and TOEFL were computerized by using CAT (BULATS, 2011; ETS, 2011). Therefore, for Chinese language proficiency tests CAT should be developed and implemented. With the proper use of computer technology, efficiency and accuracy of testing administration could be met by creating more tests with multimedia applications and allowing more flexible testing time.

The Development of the CEFR-based Chinese Proficiency Test System

Chinese language proficiency indicators proposed by Tsai (2009) have been adopted in this study and items for the A1 and A2 level of the listening and reading tests have been developed on a web-based test system. In this section, we will introduce the interfaces of the test system, data collection process and the process of developing adaptive testing.

The User Interfaces of Test System

In this system, there are four types of interfaces, test selection, questionnaire, listening test and reading test. These user interfaces are introduced in the following.

Test Selection Interface. Figure 1 indicates the test selection interface. Each examinee has an account number and password which enable them to enter into the system and start the test. Each examinee is required to preselect the section for testing after entering into the system.

Figure 1. Test Interface

Questionaire Interface. Figure 2 indicates the questionnaire interface. Each examinee have to fill in the basic information questionnaire before the exam starts. The questionnaire is presented in both English and Chinese.

Figure 2. Questionnaire Interface

The listening test includes listening comprehension and visual-listening comprehension items. In each item, examinees will hear a phrase or a conversation followed by a set of four options to select. Examinees have to click the box that best fits the option on the computer screen. The response time for each item is limited. When the time is up, the system will automatically go to next item.

Listening Comprehension Item: In Figure 3, the examinees will hear, "Walking is too slow! Let us take a taxi to the market. Question: How do they get to the market?" followed with (A), (B), (C), and (D) options The examinees are requested to choose one correct answer. Each item will be read twice and there is a five second break between them.

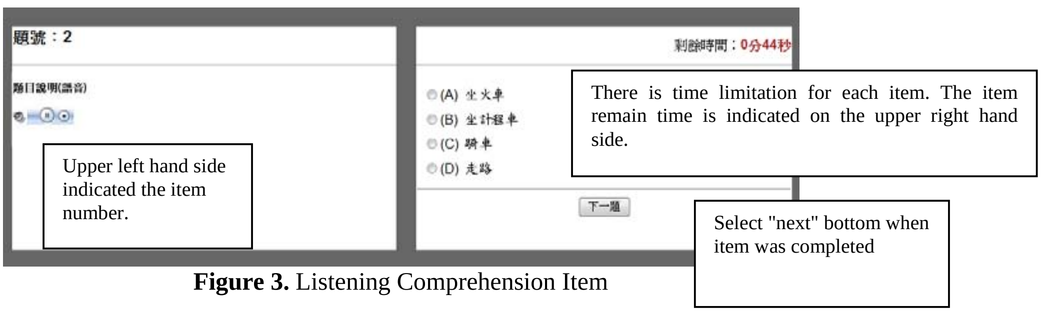

Figure 3. Listening Comprehension Item

Visual-Listening Comprehension Item: In Figure 4, the examinees will hear "Please help me buy eggs from the market." and the computer screen will display four options, (A), (B), (C), and (D) on the right hand side.

According to this sentence the examinees have to select an appropriate picture from (A), (B), (C), and (D) which matches the item most. Similarly each item will be read twice.

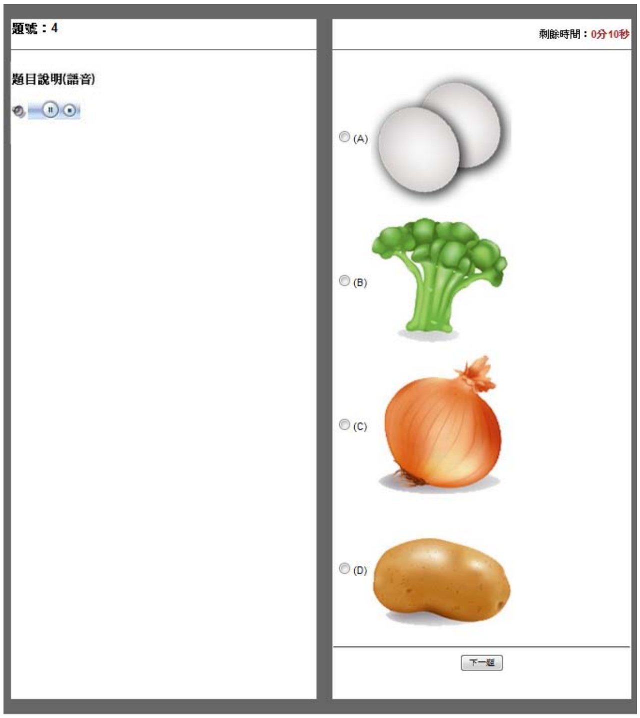

Figure 4. Visual-Listening Comprehension Item

The reading test includes vocabulary and grammar items, and visual comprehension, and reading comprehension items. There is no time limitation on each item in reading test but the whole test has to be completed in 30 minutes.

Vocabulary and Grammar Item: In Figure 5, each item has an incomplete sentence with four options and each option contains a “word” or "vocabulary". Based on this sentence the examinees have to select an appropriate answer which fits the sentence most.

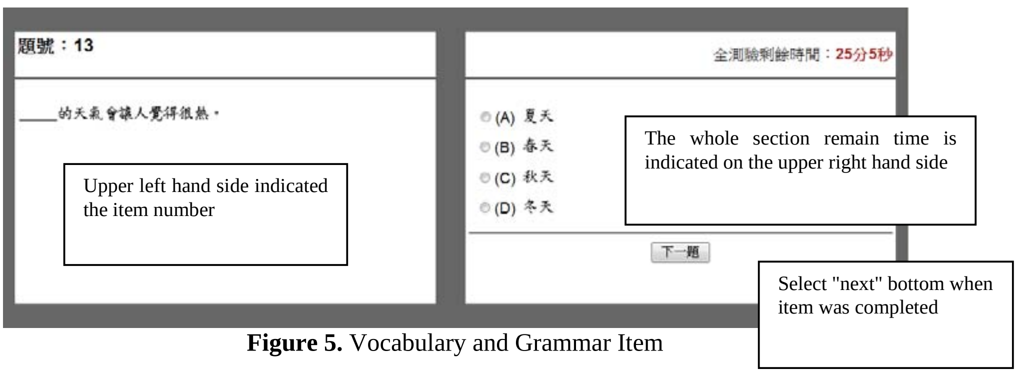

Figure 5. Vocabulary and Grammar Item

Visual Comprehension Item: In Figure 6, the examinees will see a brief sentence, and four options. Based on this sentence the examinees have to select an appropriate picture which matches the item most.

Figure 6. Visual Comprehension Item

Reading Comprehension Item: In Figure 7, the item will include some materials, such as: a picture, flyers, letters, and four options. Based on this information the examinees have to select an appropriate answer from options.

Figure 7. Reading Comprehension Item

Data Collection Process

This study conducted computer-based tests with a listening and reading section for A1 and A2 level exams in the Grace Christian Chinese School in the Philippines. The participants were grades five to ten students. The test level was assigned according to the amount of time the examinee spent learning Chinese. The 5th to 7th grade examinees were assigned to participate in the A1 level CPT. The 5th to 7th grade examinees were assigned to participate in the A2 level. Each examinee must take both listening and reading sections in either the A1 or A2 level. The test time of each test in each level is 30 minutes with a test length of 35. The examinee needs to participate two tests in the same level. Therefore, the total test time for each examinee is 60 minutes.

There were a total of 830 examinees participated in the A1 level and a total of 746 examinees participated in the A2 level. The invalid data were removed including no responses or single responses to the entire set of test items, responses in a guessing manner such as AAABBBCCCDDD for the entire test, response in a very short period time such as responding to each item within 3 seconds, etc.

The Processes of Parameter Estimation and Developing Adaptive Testing

Many CPTs are still using the raw score to categorize proficiency level. For example, HSK transfers the exam's raw score as the test result (HSK, 2011). The score report in the SAT Chinese test includes the raw score, composite total score, and percentile range (NCACLS, 2010). The score calculation in TOCFL is based on one point for each correct item and there is no penalty for wrong answers (SC-TOP, 2011). Wright (1999) shows that if using raw score to represent proficiency, the test is not able to become a meaningful measurement because of the lack of virtue in basic requirements such as unidimensionality. Lord (1980) pointed out that IRT had improved those shortcomings in CTT such as the assumption of using a single standard of error measurement, sample dependent parameter estimation, parallel tests assumptions. Therefore, this study applies a 3PL IRT model for item and ability parameter estimation. The resulting 3PL model (Baker, 1992; Baker & Kim, 2004; Zimowski, Muraki, Mislevy, & Bock, 2003) is

$$P(x_j = 1 \mid \theta_k, a_j, b_j, c_j) = c_j + \frac{(1-c_j)}{1+\exp^{-D^* a_j(\theta_k - b_j)}} \equiv P_{j1}(\theta_k) \qquad (1)$$

where $P_{j1}(\theta_k)$ is the probability that an examinee with ability θ_k answers item j correctly; a_j is the item discrimination for item j; b_j is the item difficulty for item j and b_j represents the point on the ability scale at which a candidate has a 50% probability of answering item j correctly; c_j is the item guessing for item j; D is a scaling factor and is applied the default value, 1.7.

The marginal maximum likelihood (MMLE) formulation with an expectation-maximization (EM) algorithm is applied to calibrate the item and ability parameters (Zimowski, Muraki, Mislevy, & Bock, 2003). An item bank was established after obtaining the item parameters. One of the goals of this study is to develop a computerized adaptive test for the CPT.

Figure 8 shows the structure of an adaptive test as a flowchart in this study. The three major steps (starting, continuing, and stopping) were followed the flowchart. The steps were (Wainer, 2000):

Starting: The general principle of selecting the next item based on previous response is not helpful, of course, when there are no previous responses. Although an examinee's proficiency cannot be estimated from responses to previously administered items when testing begins, the mean of the population of examinees is a reasonable initial guess. After a few response, examinees lead themselves to items that are more informative near their own particular.

Continuing: The two strategies currently most widely used for selecting an examinee's next item, given a provisional estimate of ability based on preceding responses, are methods providing "maximum information" and "maximum expected precision". In this study item selection strategy is based on the maximum information method. The item selection procedure is the process of selecting an item from the item pool to be administered to the examinee, and that information will be provided as a guideline in the CAT system to indicate which items should or should not be chosen during a test.

Stopping: After each item is administered and scored, an interim estimate of the examinee's ability is calculated and used by the item selection procedure to select the next item. Three commonly used ability estimation procedure are MAP, MLE, and EAP (Lord, 1980). An adaptive test can be terminated when a target measurement precision has been attained, when a preselected number of items has been given, or when a predetermined amount of time has elapsed. Any of these rules may be used in its pure form, or a mixture of them can be used.

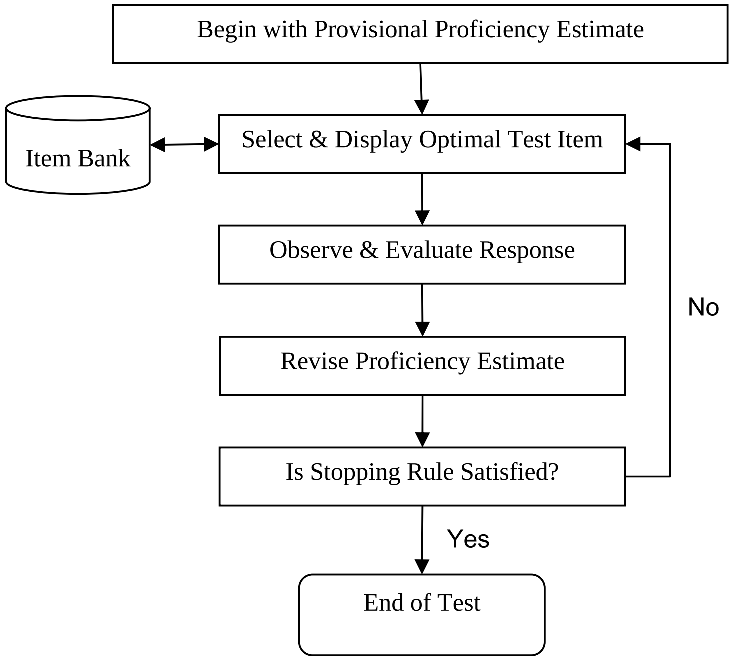

Figure 8. The Procedure of Computerized Adaptive Testing

RESULTS

The Reliability and Item Parameters of Chinese Proficiency Test

Table 1 shows the reliability (Cronbach's α) of the Chinese proficiency test. The reliability in each section of the test ranged from 0.842 to 0.899 reflect a reasonable degree of reliability. In general, an alpha value of around 0.8 is an acceptable value for Chinese proficiency test. (Shen, 2005), this means that these Chinese proficiency tests are reliable.

Table 1. **The Test Reliability**

Section	Test Length	Effective Sample Size	Cronbach's α
A1 listening	35	798	0.842
A1 reading	35	797	0.897
A2 listening	35	712	0.899
A2 reading	35	706	0.869

The averages of item parameters for each section presented in Table 2 show that the average of item discrimination in the listening and reading sections were higher than 1.2. This indicated a very high degree of item discrimination had developed in each section. In addition, according to the IRT model, the average correct rates are 68.44%, 69.51%, 69.38%, and 58.26% for A1 listening, A1 reading, A2 listing, and A2 reading section respectively.

Table 2. **Averages of Item Parameters in Each Section**

Section	a	b	c	P(Θ)
A1 listening	1.2223	-0.4742	0.2075	0.6844
A1 reading	1.2425	-0.4473	0.2048	0.6951
A2 listening	1.3145	-0.4637	0.1998	0.6938
A2 reading	1.2125	-0.0214	0.2085	0.5826

The Chinese Proficiencies of Total, Male and Female Groups

Table 3 shows the sample sizes of the total group and the gender subgroups for each of the 4 forms of the CPT. Over the various test forms, the male group comprised 47% to 48% of the total group, and the female group comprised 52% to 53% of the total group. The average number-correct scores and standard deviations for groups taking different forms of the CPT are summarized in Table 4. It shows that the female group had higher mean scores than the male group. The average raw scores across various test forms were similar to one another, both for the total group and for each of the gender subgroups. This provided evidence of random assignment of test forms to candidates (i.e., the groups taking different forms were fairly equivalent). Overall, Table 4 shows that the test forms were designed to be fairly similar to one another.

Table 3. **Sample Sizes of Total and Gender Subgroups on CPT**

Section	Total Group (n)	Male Group		Female Group	
		n_m	$\frac{n_m}{n}$	n_f	$\frac{n_f}{n}$
A1 listening	798	381	0.48	417	0.52
A1 reading	797	379	0.48	418	0.52
A2 listening	712	337	0.47	375	0.53
A2 reading	706	333	0.47	373	0.53

Note. n The sample sizes of the total group.
n_m The sample sizes of the male group.
n_f The sample sizes of the female group.

Table 4. **Average Raw Scores of Total Group and Gender Subgroups on CPT**

Section	N	Total Group		Male Group		Female Group	
		M	SD	M	SD	M	SD
A1 listening	798	23.93	6.31	22.50	6.61	25.25	5.72
A1 reading	797	24.27	7.07	22.21	7.46	26.13[a]	6.12
A2 listening	712	24.23	6.96	22.62	7.52	25.67	6.07
A2 reading	706	20.47	6.83	19.19	7.20	21.62[b]	6.28

Note. a. The maximum of means.
b. The minimum of means.

The Effectiveness of CAT System for CPT

In this study, a complete computerized test without adaptive process was applied to collect participants' responses. And these responses were used to estimate the items parameters and evaluate the performances of different ability estimation methods in CAT process. The evaluation method is applied the collected data into CAT process mentioned in Figure 8 to simulate CAT process. At each iteration, CAT assumes one item is draw from item bank and administered to the participant. We can obtain the response of this item in the collected data.

For evaluating the performances of CAT algorithms based on different ability estimation methods, MLE, MAP and EAP, the root mean squared difference (RMSD) between the estimated abilities by CAT and by complete test was applied. The definition of RMSD is stated in following

$$RMSD\ (\hat{\theta}_i^{(k)}) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(\hat{\theta}_i^{(k)} - \tilde{\theta}_i)^2} \qquad (2)$$

where $\tilde{\theta}_i$ represents the i^{th} participant's ability estimated by using all administrated items. $\hat{\theta}_i^{(k)}$ represent the i^{th} participant's temporarily ability estimate after k items had been responded (in Kth iteration); N represents the total number of participants.

In Figure 9, the vertical axis indicates the RMSDs of EAP, MAP, and MLE and the horizontal axis represents the number of administered items. Figure 9 shows that there is a significant difference in RMSD decline as the accumulation of items examinees participated in increased. Referring to the estimated result from Figure 9a; it indicated that, using MLE, the RMSDs are greater than 1 when exam items completed number less than 15 and the RMSDs are less than 0.4 when the exam items completed reached 31. In addition, when using MAP, the RMSDs are greater than 1 when exam items completed number less than 5 and the RMSDs are less than 0.4 when the exam items completed reached 19. However, when using EAP, the RMSDs are always less than 1 and the RMSDs are less than 0.4 when the exam items completed reached 6. The other three sections also showed the same result regarding these three estimation methods. This result indicated that under above three estimation methods, the EAP estimation method resulted in an overall lower RMSD compared with MLE and MAP. This result is similar to the study conducted by Chen (2006), Wang and Vispoel (1998). Therefore, the EAP parameter estimation method was adopted in the proposed CAT system.

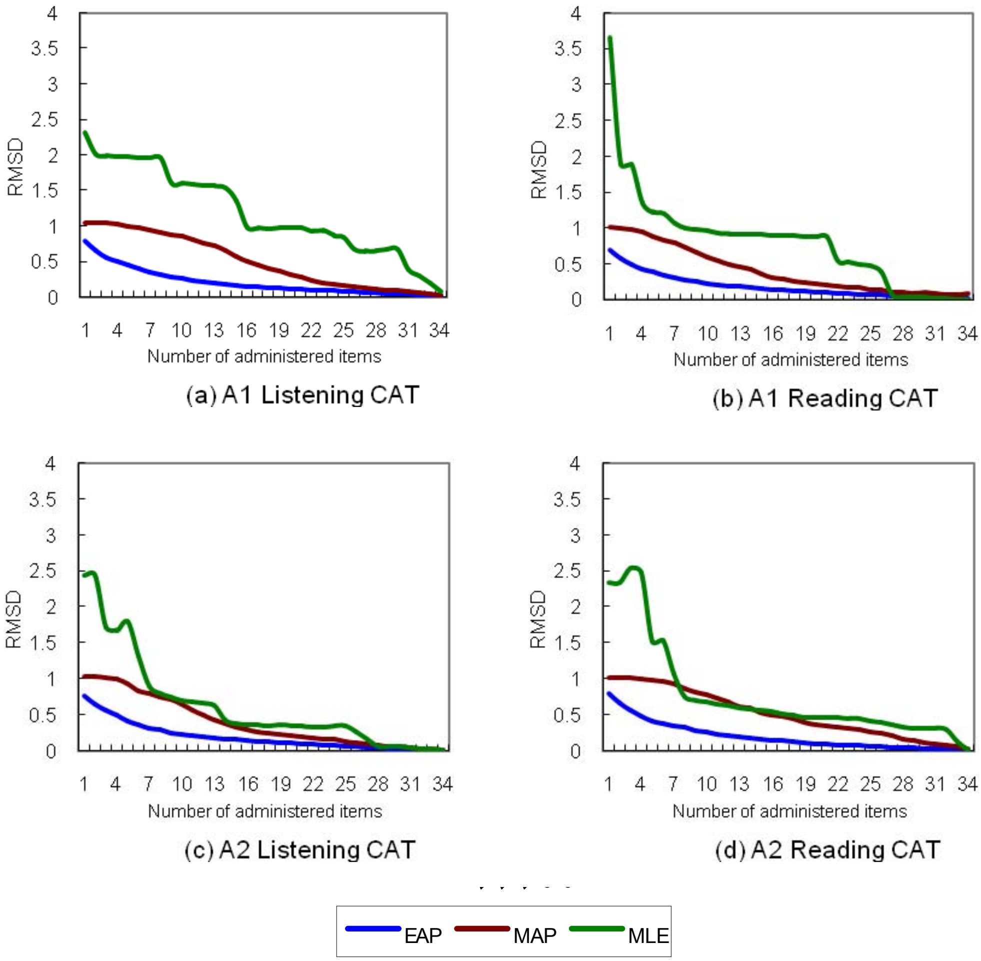

Figure 9. The Performances of EAP, MAP, and MLE in CAT

DISCUSSION

This study based on CEFR and Tsai (2009) developed A1 and A2 level items for a CPT in both listening and reading sections. The computerized CPT was performed onsite at the Grace Christian Chinese School in the Philippines. The examinees were 5th to 10th grade CFL learners. The development of the CPT in this study refers to the PISA 2006 test development process (OECD, 2009). The data analysis showed that the computerized CPT possess good reliability and validity. The examinee's item correct response rate in different tests is close to 70% except for the A2 level reading section which is closer to 60%. The results also indicated that females performed better than males.

The CAT system developed in this study included a testing interface and a management interface. For the testing interface, examinees participated in testing according to their proficiency level after login to the interface. The result will also be presented to the examinee as soon as the items are competed. The management interface contains the function of item bank editing. This function also includes test assignment, item bank creation or modification, and item editing in the item bank. In addition, there are different features in the CAT system that are available to the user in accordance to his or her requirement. For example, the user can select different testing formats and different parameter estimation methods. In response to international demand, the CAT system for CPT developed in this study used computer facilities to analyze and calibrate the test and score. This will shorten the data collection time. When performing the CAT simulation through different parameter estimation methods, this study discovered that the RMSD is best performed under the EAP estimation method. Therefore, this study recommends EAP as the prefered parameter estimation method.

During research, valuable experience was acquired during the system implementation process and the actual conduct of the test. This valuable experience can be used as directions in future research and subsequent recommendations are as follows:

1. This CAT system was developed for multiple-choice items. However, in order to fully utilize computers in the test, this CAT system can be amended to fit more diverse and comprehensive items and to make the exam closer to real scenarios.
2. The extension of this study is to develop the B level or even the C level of the CPT and focus on new item format development in the near future, not only to enrich and enliven the content of the CPT but also to be able to implement proficiency test according to the examinee's ability in productive activities and strategies, receptive activities and strategies, interactive activities and strategies, and mediating activities and strategies.
3. Considering the examinee's proficiency and acceptability, future studies can focus more on conducting the test or grading online with a CAT system for the writing and speaking section to make it more common and easy to carry out the assessment.
4. The CAT system was developed based on traditional Chinese. In consideration of the majority of the users and learners in different countries, a simple Chinese version can also be implemented rendering the test limitless cross the world.
5. This study can also focus on adding new functions to the CAT system such as the an initial item setup method, item selection strategy, and exposure rate control, in the near future.

ACKNOWLEDGEMENTS
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A CROSS-TEXT ANNOTATION SHARING MECHANISM FOR ENHANCING STUDENTS' COMPREHENSION OF POETRY

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ABSTRACT
Poems are usually expressed with elaborate rhetoric techniques, which make them hard to be understood. In this study, a cross-text annotation sharing mechanism is proposed to help students comprehend poetry by creating and sharing individual annotations. Furthermore, relevant annotations among various texts can be retrieved to stimulate and help students make connections while reading. A quasi-experiment has been conducted to evaluate the effectiveness of the proposed approach. The experimental results show that a cross-text annotation sharing approach is significantly more helpful to the students for poetry comprehension than a conventional annotation sharing approach in terms of learning achievements; moreover, the students highly accepted the developed learning system in terms of "ease of use" and "usefulness."
Keywords: Annotations, Poetry, Cross-text, Taxonomy

INTRODUCTION
Poetry often draws on poets' inspiration and experiences and may be expressed with different kinds of poetic techniques or figurative languages. Undoubtedly, it becomes hard for students to comprehend such literary works in any kind of poetic forms (Cai, 2008; Eva-Wood, 2008). To help students learn poems, researchers have suggested various approaches such as situated learning (Su, 2007), multimedia learning (Lo, Zhang, Lin, Tseng, & Chen, 1999; Sun & Cheng, 2007), think-aloud (Eva-Wood, 2008), and annotation sharing (Shih, Tseng, Yang, Weng, & Liang, 2008). In this paper, a cross-text annotation sharing mechanism is proposed to enhance students' comprehension of poetry.

Nowadays, with the vigorous development of the Internet, a pedagogical approach called Computer-Supported Collaborative Learning (CSCL) is a promising method for improving teaching and learning with the help of modern information and communication (Chen & Chen, 2012; Lin, Chan, & Hsiao, 2011; Wang, 2009). In CSCL environments, annotations can be very useful for knowledge sharing (Glover, Xu, & Hardaker, 2007; Hwang & Hsu, 2011; Nokelainen, Miettinen, Kurhila, Floreen, & Tirri, 2005; Robert, 2009; Su, Yang, Hwang, & Zhang, 2010; Yeh & Lo, 2009). Researchers have also shown that annotation offers a useful tool to increase deep reading of textual materials (Marshall, 1997, 1998).

Researchers indicated that appropriate recognition of rhetoric devices and feelings expressed in poems could be helpful for poetry comprehension (Chen, 2001; Eva-Wood, 2008; Wang, 2010). However, any arbitrary annotations with free-form terms may result in the Out-Of-Vocabulary problem (Chechik, Ie, Rehn, Bengio, & Lyon, 2008). This makes the system unable to retrieve relevant stored annotation information among various texts for users to further understand poems. To increase interoperability, researchers suggested using a standardized ontology for annotations (Glover et al., 2007). Yeh and Lo (2009) showed the benefit of adequate scaffolding for learners to annotate by using a taxonomy. Therefore, a taxonomy-based annotation is demanded so that users can annotate objects easily and annotation sharing can be realized among various texts. This may help learners to develop new insights into the learning materials with which they are working and help reinforce existing knowledge by accessing different materials. Hence, a Cross-text Annotation Sharing System (CASS) has been built with the motivation to resolve the above mentioned issues so that sharing poetic knowledge with a friendly annotation becomes easier for students.

This study investigates how CASS helps students annotate poems and share their annotations in a supported collaborative learning environment. A quasi-experiment was conducted with two classes of 8th graders. According to the experiment results, most of students in the experimental group were satisfied with the use of CASS and thought the system to be particularly useful. Furthermore, the analytical results show that the use of CASS can increase learning achievements.

RELATED WORK

Chinese poetry learning

It is hard for novices to understand the deeper meanings of Chinese poems since poetry often packages language in forms that are both concise and precise (Cai, 2008). Recently, due to the rapid growth of information technology, many researchers have integrated information technology into Chinese language processing such as style identification (He, Liang, Li, & Tian, 2007; Yi, He, Li, & Yu, 2004; Yi, He, Li, Yu, & Yi, 2005), and Chinese language teaching methods such as writing (Tseng, Yang, Weng, & Liang, 2009; Wang, Tseng, Yang, & Su, 2005), and learning (Cai, 2003; Cao, Klamma, Gao, Lauz, & Jarke, 2009; Lo et al., 1999; Shih et al., 2008; Sun & Cheng, 2007; Weng, Tseng, Su, & Wang, 2008; Yao & Zhang, 2010; Zhao, Wang, Wu, & He, 2011). These studies reveal the need to use information technology to promote Chinese poetry learning. Since annotations can be useful to increase deep reading of textual materials (Marshall, 1997, 1998), this study uses annotations as a tool to assist students in comprehending or studying poems.

Annotation and annotation systems

The Web application technology (Web 2.0) facilitates interactive information sharing on the World Wide Web. Users use tags to categorize the online content, which has been proved to be useful in many Web applications such as the delicious (http://delicious.com), Flickr (http://www.flickr.com) or YouTube (http://www.youtube.com).

In fact, collaborative annotation provides an opportunity to make individual knowledge public, and has been proved to be effective in students' studies (Marshall & Brush, 2004). According to (Nokelainen et al., 2005), appropriate annotation systems can bring about students' learning motivation. Moreover, a personalized annotation management system is justified to enhance knowledge sharing and students' learning efficiency (Hwang & Hsu, 2011; Robert, 2009; Su et al., 2010; Yang, Chen, & Shao, 2004). So a well-designed management system to support a rich set of annotations in a consistent and systematic way is certainly demanded.

To manage and enhance semantic annotation elements, some researchers try to link the relations by tags (Auer, Dietzold, & Riechert, 2006; Bateman, Brooks, & McCalla, 2006; Tsui, Wang, Cheung, & Lau, 2010). Through the relation construction, annotation sharing can be realized among various texts. Therefore, an annotation sharing mechanism in a collaborative learning environment is constructed so that relevant and useful annotations could be retrieved for learning.

Prior knowledge

The main purposes of this research were to explore the usage of the cross-text annotation sharing tool and to investigate its influence on online learning. Cross-text annotation sharing refers to annotation sharing among various texts. The prior knowledge used in this study is defined below.

Annotation sharing

An annotation (AN) is expressed as a 5-tuple relationship, which denotes an annotated information (AI) made by a user on an annotated object (AO).

Definition 3-1. AN is expressed as a 5-tuple (uid, pid, AO, AI, plus)

- The uid is the user identification.
- The pid is the poem identification.
- AO could be a word, a sentence, a paragraph, or entire poem.
- AI = (type, sub-type, item)
  Type, sub-type, and item are the categories used in the proposed taxonomy "Content-rich Dictionary".
- A user can click +1 button on any annotation they like, thus sharing it.

To enhance students' comprehension of poetry, the annotation retrieval is presented to allow users to review or browse annotations made by themselves or others as shown in Figure 1. Users can use AN_i to retrieve AN_l, AN_m, AN_n, etc. with the same $user_i$, $text_i$, AO_i or AI_i. With the aid of annotation retrieval, users may benefit from others' annotations (Hwang & Hsu, 2011; Robert, 2009; Su et al., 2010).

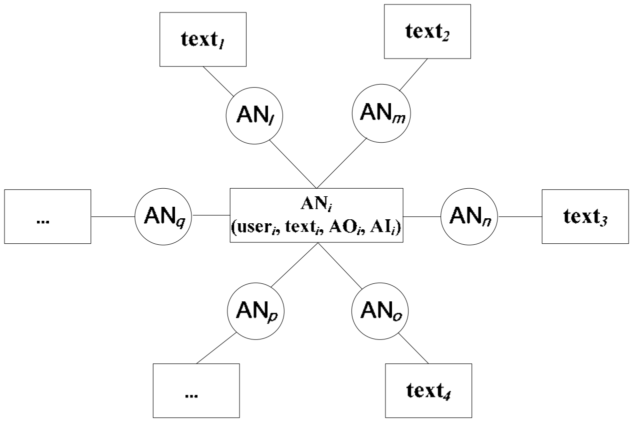

Figure 1. Annotation retrieval.

Content-rich Dictionary (CDict)

The kernel part of the system contains a Content-rich Dictionary (CDict) as our taxonomy. While annotating, learners can achieve personalized annotation with the aid of CDict. Since appropriate recognition of rhetoric devices and feelings expressed in poems could be helpful for poetry comprehension (Chen, 2001; Eva-Wood, 2008; Wang, 2010), CDict (a three-level dictionary) contains the type of rhetoric device and the type of common feeling as shown in Table 1. The difference between rhetoric type and common feeling type are the ways to collect each set of items. The set of items in rhetoric type are predefined, while the set of items in common feelings are incrementally acquired from users.

Rhetoric devices are classified into three sub-types, namely, lexical stylistic devices, syntactical stylistic devices, and phonetic stylistic devices (Chen, 1996; Chen, 2001; Wang, 2010; Zeng, 2007). Each sub-type contains several items and each item has its own explanation and model essay. The explanations and model essays are the providing scaffolds for students to become independent. Then, these supports can bridge the gap between what students can do on their own and what they can do with guidance from others (Vygotsky, 1978).

Previous studies show that model essays are good paradigms for students to imitate or learn language (Cumming, 1995; Wang, 2010). Cumming (1995) demonstrates the significance of rhetorical aspects of texts in model essays. For example, the model essay of metaphor could be “merry larks are ploughmen’s clocks (William Shakespeare)”. Hence CASS supports student users with friendly rhetoric annotation as well as a model essay for each type of rhetoric device. Through the assistance of a model essay, students can understand the usage of rhetoric devices which are common in poems and annotate them in a similar way.

As to the type of the common feeling, we treat it as an assistance option. This is because it may be difficult for some students to express their feelings with precise words. Feelings for a poem can be categorized into style, originality, and sentiment (Chen, 2001; Wang, 2010). To assist students in annotating their feelings for a poem accurately, two heuristics are offered for them. One is a matched common feeling selection in which previous accumulated annotations about feelings in reading poems are listed if the annotated terms occurrence frequencies are higher than a predefined threshold. The other is a synonym-based feeling suggestion in which synonyms are recommended from a Chinese synonym dictionary “Tongyici Cilin (TYCCL)” (Mei, Zhu, Gao, & Yin, 1984). Through folksonomy annotations, the number of words listed in common feelings of CDict increases as more users annotate.

Table 1. Content-rich dictionary.

Type	Sub-type	Item
Rhetoric device	Syntactical stylistic device	parallelism, antithesis, repetition, rhetorical question, inversion, climax, anticlimax, catchword repetition, zeugma, aposiopesis, ellipsis, quotation, apostrophe
	Lexical stylistic device	simile, metaphor, metonymy, synecdoche, allegory, personification, euphemism, irony, hyperbole, pun, oxymoron, imitation, transferred epithet, parody
	Phonetic stylistic device	alliteration, end rhyme

Common feeling	Style	homesick, farewell, …
	Originality	unique, novel, …
	Sentiment	yearning, affecting, …

Cross-text Annotation Sharing System for supporting poetry comprehension (CASS)
CASS is built with the aim of enhancing students' comprehension of poetry by using two kinds of collaborative annotation. One is rhetoric annotation; the other is personal feeling annotation. Other functions should be taken into account like annotation retrieval. Figure 2 illustrates the presented CASS, which includes a poetry editor, annotation creation, annotation retrieval, and databases. All the addressed processing modules are incorporated with a poem database, an annotation information database, a content-rich dictionary and TYCCL.

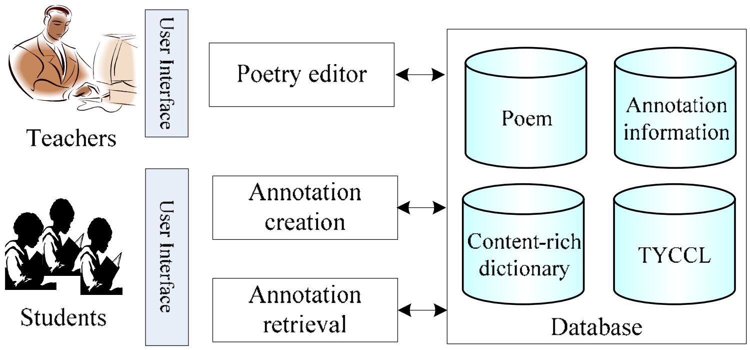

Figure 2. System architecture.

Poetry editor
Figure 3 illustrates the poetry editor, which is a kind of WYSIWYG (What You See Is What You Get) editor. The content displayed at editing is similar to the final outputs. A teacher can use this editor to add, edit, or delete a poem. Furthermore, s/he can use this editor to upload a file or picture to enrich the poem's content. To add a poem, a teacher may input its title and author and compose it online by typing it directly in the text box or using a copy-and-paste function. The system will convert it into an HTML document and save it in the poem database.

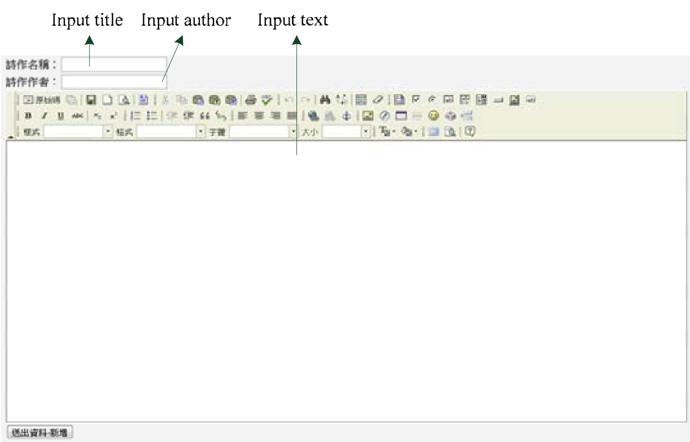

Figure 3. Poetry editor.

Annotation creation
In the beginning of annotations, students can choose an arbitrary poem. Then, CASS guides users to annotate poems by using the hierarchical structure in CDict. A user can choose his/her intentions by following the sequence: type, sub-type, and item. For example, when annotating personification used in a poem, a user can click rhetoric device, click lexical stylistic device, click personification, and then mark an object which uses the rhetoric device. After annotating, the created annotations are stored in the annotation information database.

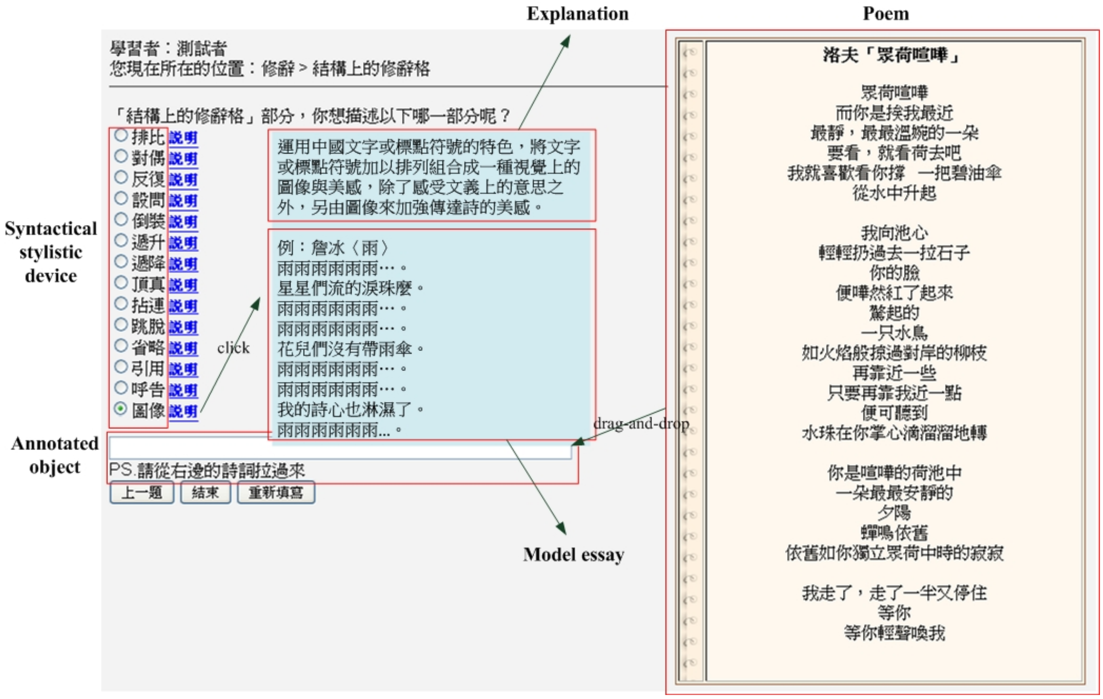

Figure 4. A screenshot of rhetoric device annotation.

Rhetoric device annotation. Figure 4 shows a screenshot of rhetoric device annotation. An annotated poem is allocated in the right of the figure. The illustrated poem is "眾荷喧嘩 (zhong he xuan hua)" written by a poet "洛夫 (Luo Fu)". The left of the figure lists syntactical stylistic devices for selection. Users can click "說明 (instruction)" right behind each rhetoric device to read an explanation and model essay when they need the scaffolding. The bottom left of the figure shows that a user marks an object (AO) by typing it directly in the text box, using a copy-and-paste function, or using a drag-and-drop pasting function. The rhetoric annotation procedure is described as follows:

Step 1: A user chooses one option from three sub-types in CDict.
Step 2: Upon receiving the user's option, the system will list related items in CDict for the user.
Step 3: A pop-up window will come up to display an explanation and model essay when the user clicks the instruction of a rhetoric device.
Step 4: The user chooses one option (AI_j) from the items and marks an object (AO_i).

Personal feeling annotation. Students may use vague words or basic words like "not bad" or "OK" when annotating their feelings about a poem. To help students use appropriate annotation words, we built both a matched common feeling selection and a synonym-based feeling suggestion in CASS.

The matched common feeling selection allows users to express their feelings with a set of the items listed in the common feelings of CDict. These items are collected from users' annotations for the same poem if their frequencies are more than a predefined threshold (i.e. common feeling). The number of items in the common feelings of CDict increases as more users annotate.

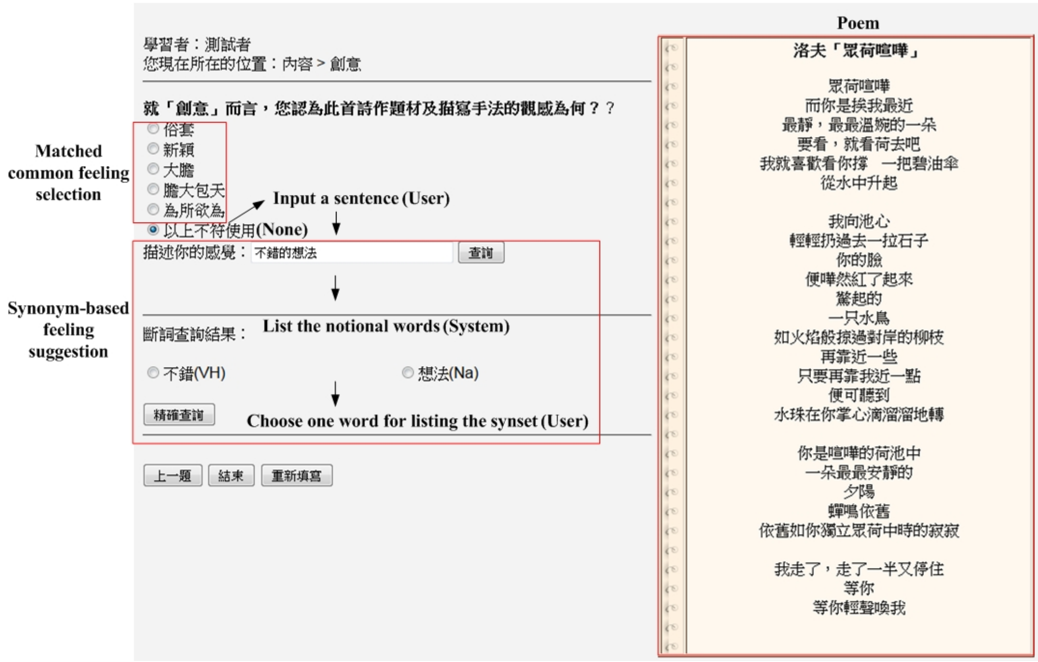

Figure 5. A screenshot of personal feeling annotation.

To give synonym suggestions, we employ a Chinese vocabulary-indexing thesaurus TYCCL which is a four-level thesaurus that collects allusions, idioms, common words, etc. The semantic meaning of a word in a higher level is more abstract than those in a lower level. According to their semantics, Chinese words are categorized into different classes. Owing to the characteristics, words in the same class (synonyms) are provided for reference based on students' words.

The synonym-based feeling suggestion provides annotators with a TYCCL's synset with respect to annotators' inputs. If the input is a sentence, then it will be firstly processed by a CKIP segmentation tool (http://ckipsvr.iis.sinica.edu.tw) and its notional words will be extracted. The notional words are the major elements in a sentence and they denote a person, a thing, an act, or a quality referred to in a sentence. In the latter, a notional word is identified and its synset will be promptly returned to annotators for their annotation.

Figure 5 is a screenshot of personal feeling annotation. An annotated poem is listed in the right of the figure. The matched common feeling selection and the synonym-based feeling suggestion are respectively provided in the bottom left and the upper left of the figure. The procedure of personal feeling annotation is described as follows:

Step 1: A user chooses one option from three sub-types in CDict.
Step 2: Upon receiving the user's option, the system will list related items in CDict for the user (the feeling annotations for this poem and their frequencies are larger than a predefined threshold).
Step 3: If the user does not satisfy the listed options, s/he can input a word/sentence in the text box.
Step 4: The system segments the word/sentence by using the CKIP segmentation tool and lists notional words.
Step 5: The user chooses a word from the notional words list.
Step 6: A synset based on the notional word is listed for selection.
Step 7: The user chooses a synonym (AI_j) from the synset and marks an object (AO_i).

Annotation retrieval

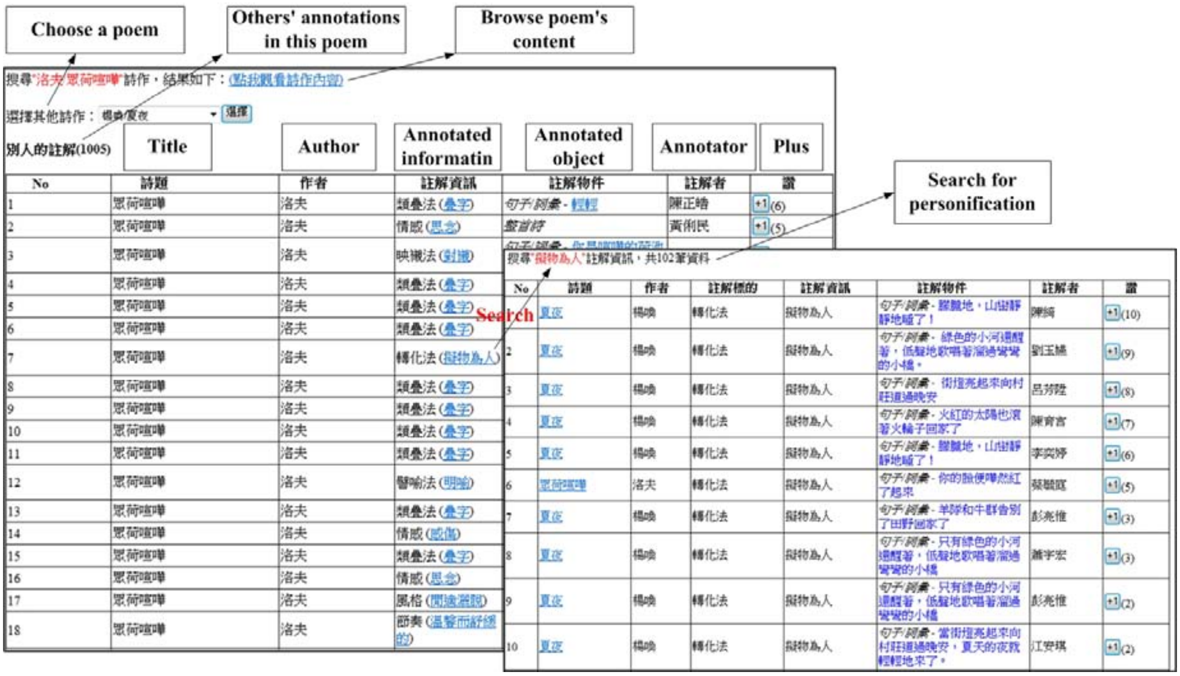

Figure 6. A screenshot of annotation retrieval.

With the aid of annotation retrieval, users can retrieve useful and valuable annotations based on username, poem name, annotated object, or annotation. Figure 6 illustrates the retrieved annotations. In Figure 6 (top-left), users can choose any poem they want. There are 1,005 annotations on this poem “眾荷喧嘩 (zhong he xuan hua)”. During browsing, users can recommend others annotations by clicking the button “+1”. Then the highest recommendation will be at the top of the annotations, which may help novice users. To further assist users in comprehending poems, users can click any annotated information or any annotated objects to search the relevant stored information. In the right of Figure 6, the user clicks personification to search the created annotations and a pop-up window will come up to display the search results, which contains 102 annotations; the highest recommendation being at the top of the list.

THE EXPERIMENTS

Participants

There were fifty native Chinese speaking eighth grade students participating in this research. The students were from two classes and taught by the same instructor under the same conditions. They had previously taken computer courses and possessed basic computer skills. The two participating classes were randomly divided into experimental group (N=24) and control group (N=26). The students in the experimental group were instructed and guided to participate in the annotation-based learning activity with the cross-text annotation sharing, while those in the control group were instructed and guided to participate in annotation-based learning activity without the cross-text annotation sharing (conventional approach). Note that all participants received the same treatment such as instruction, learning materials, and environment.

Experimental procedure

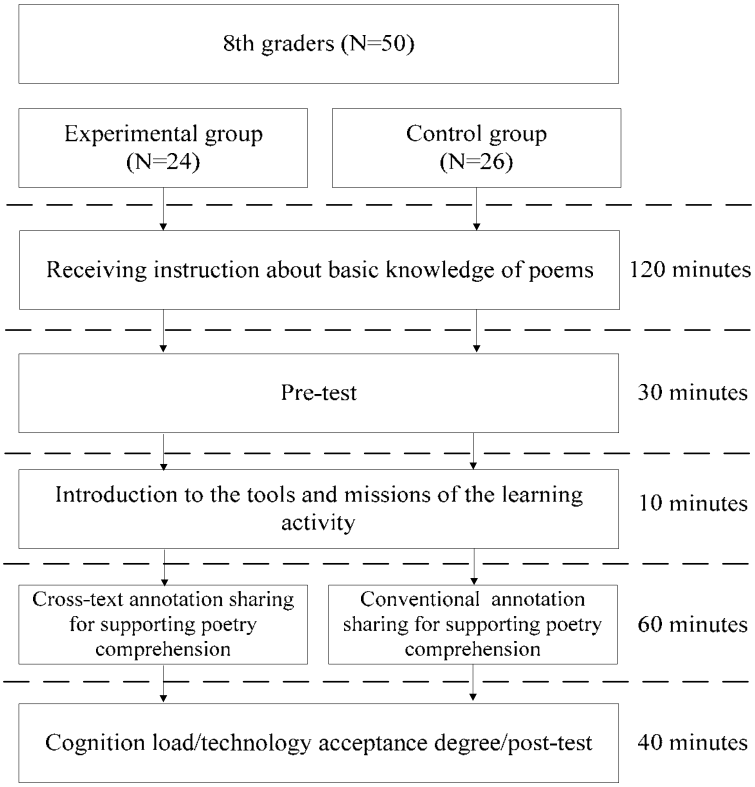

Figure 7. Experiment design.

Figure 7 shows the experiment design of this study. Before conducting the learning activity, the two groups of students received basic instruction about poems; moreover, a pretest was conducted to analyze the students' knowledge toward poems. Then, the students in two groups were instructed with the tools and missions of the learning activity.

Following the instruction, a 60-minute learning activity was conducted. During the learning activity, the students in both groups were guided to annotate the poems with the aid of the learning assistance of annotation creation. The students in the experimental group could review annotations created by their colleagues by using a flexible viewing mechanism which retrieves relevant annotations based on users' requirements. The annotations were ordered by the number of +1. Moreover, students who were industrious and generated more annotations were listed. Thus, students could be encouraged to achieve a higher position by making more annotations. On the other hand, the students in the control group could only review others' annotations by choosing the intended poem without cross-text annotation sharing. In the final stage, the students took a cognitive load questionnaire, a technology acceptance model questionnaire, and the post-test.

Measuring tools

The pre-test was conducted to evaluate the students' prior knowledge before annotating the poems. It consisted of twenty multiple-choice questions with a total score of 100. The post-test aimed to evaluate the learning achievements of the students after annotating the poems. It consisted of twenty multiple-choice questions with a total score of 100.

The questionnaires concerning cognitive load and technology acceptance were presented with a 7-point Likert scale, where '7' represented 'strongly agree' and '1' represented 'strongly disagree'.

The questionnaire of cognitive load was developed based on the cognitive load measure proposed by Sweller et al., (1998). It contained four questionnaire items. The greater the cognitive burden, the lower the users' satisfaction (Segall, Doolen, & Porter, 2005). The Cronbach's alpha value of the questionnaire was 0.726, showing adequate internal consistency in evaluating the cognitive load of students.

The questionnaire for technology acceptance was modified from the questionnaire items developed by Davis (1989). It was used to explore how students came to accept and use CASS while annotating the poems. The questionnaire included two subscales: four items for "usefulness of CASS" and three items for "ease of use". The Cronbach's alpha value of the questionnaire was 0.851. The result implies that the reliability of the questionnaire is sufficiently high. The students in the experimental group were asked to complete this questionnaire after the learning activity.

RESULTS

Learning achievements

Before participating in this learning activity, students from both the experimental and control group took a pre-test to evaluate their basic knowledge. Table 2 shows the means and standard deviations of the pre-test scores, which were 61.88 and 13.74 for the experimental group, and 66.92 and 11.67 for the control group. Internal consistency reliability was assessed using Kuder Richardson 20 (KR-20). The KR-20 coefficient of pre-test was 0.662, showing adequate internal consistency in evaluating the students' prior knowledge. A t-test performed on the result of the pre-test scores showed no significant difference between the pre-test results for the two groups with $t=1.404$ ($p>.05$), implying that the two groups of students had an equivalent base knowledge in Chinese poems before participating in this learning activity.

The scores of the students in the pre- and post- tests were analyzed to compare the learning achievement of the students in the two groups. A one-way independent-samples Analysis of Covariance (ANCOVA) was adopted for the analyses, in which the post-test scores were the dependent variable, the pre-test scores were the covariate, and the treatment for different groups was the fixed factor.

Before applying ANCOVA, the homogeneity of the regression coefficient was tested, which revealed that interaction $F(1, 46)$ between the covariance was 7.122 ($p>0.05$). This confirms the hypothesis of homogeneity of the regression coefficient.

Table 3 shows the ANCOVA result of the post-test scores of the two groups, the means and standard deviations of the post-test scores, which were 67.76 and 17.92 for the experimental group, 67.50 and 13.95 for the control group. The KR-20 coefficient of post-test was 0.753, showing adequate internal consistency in evaluating the learning achievements of students. It was found that the post-test scores of two groups were significantly different, with $F=7.122$ ($p<.01$); implying that the CASS was more helpful to the students in terms of improving their learning achievement; moreover, the adjusted mean of the experimental group's post-test scores (69.38) was higher than that of the control group (66.01). Consequently, it is concluded that cross-text annotation sharing was more helpful to the students in terms of improving their learning achievement.

Table 2. t-test result of learning achievements on the pre-test scores of the two groups.

Group	N	Mean	S.D.	*t*
Experimental Group	24	61.88	13.74	1.404
Control Group	26	66.92	11.67	

Table 3. ANCOVA result of learning achievements on the post-test scores of the two groups.

Group	N	Mean	S.D.	Adjusted Mean	Std. Error.	*F value*
Experimental Group	24	67.76	17.92	69.38	2.905	7.122^{**}
Control Group	26	67.50	13.95	66.01	2.788	

$^{*}p<.05$, $^{**}p<.01$

Cognitive load

A cognitive load questionnaire was given after the learning activity to investigate the cognitive loads of the two groups of students. The results are presented in Table 4. The mean and standard deviation are 3.48 and 1.10 for the experimental group and 3.41 and 1.17 for the control group. The t-test result showed no significant difference between the two groups with $t=-.205$ ($p>.05$), implying that the two groups of students had an equivalent level of cognitive load after the learning activity. Moreover, the average cognitive loads of the two groups were not high, implying that the annotation sharing approach provided an easy and comfortable way for the students (Paas, Tuovinen, Tabbers, & Gerven, 2003).

Table 4. t-test result of cognitive load on the two groups.

Group	N	Mean	S.D.	*t*
Experimental Group	24	3.48	1.10	-.205
Control Group	26	3.41	1.17	

Technology acceptance

As Table 5 shows, the result show that most students felt satisfied with the proposed system. The average of the answers for all questions is above 5. Question 7 is especially high (6.08), implying that using this system to share annotations is easy. However, for question 5, the deviation of user satisfaction is slightly larger than other items. The reason is that the scaffolding offered in this research may not provide enough support to students.

Table 5. The result of technology acceptance on the experimental group (N=24).

#	Questions	Mean	S.D.
Usefulness			
1.	I think annotation types of CASS (e.g., rhetoric, feeling) were useful for sharing individual thoughts toward poetry.	5.71	.81
2.	I think CASS was useful for organizing individual knowledge.	5.67	.96
3.	I think CASS was useful for sharing individual thoughts.	5.54	.98
4.	I think CASS was useful.	5.46	.93
Easiness			
5.	I think the learning content of the learning activity was clear and easy to understand.	5.37	.92
6.	I think it was easy for me to learn how to use CASS.	5.79	1.06
7.	I think the GUI of CASS was easy to use.	6.08	.88

DISCUSSIONS AND CONCLUSIONS

In this study, CASS was implemented with the aim of helping students to create and share annotations toward poetry in a collaborative learning environment. In terms of annotation creation, the system provides well-defined rhetoric device annotation so that students can annotate poems with appropriate rhetoric annotation either using the offered scaffolding or not. CASS offers two kinds of personal feelings annotations, namely, matched common feeling selection and synonym-based feeling suggestion. The more frequently CASS is used, the larger will be the amount of items in the common feeling type of CDict and users' feelings for a specific poem may reach a consensus. In terms of annotation retrieval, with the proposed system, students are enthusiastic about viewing colleagues' annotations and thus generate more annotations.

The experimental results show that the cross-text annotation sharing approach had significantly better effectiveness in improving students' learning achievements than the conventional annotation sharing approach. Meanwhile, the analysis of the questionnaire results showed that the proposed learning approach did not increase the cognitive burden of students; moreover, most of the students held positive opinions on the "ease of use" and "usefulness" with the proposed system.

Students used to understand poems by using various reading strategies such as looking for hidden meanings and themes, addressing figurative language, and referring to other texts to understand what is being read (Eva-Wood, 2008). Oatley (2002) pointed out that when a reader reflects on an emotion through reading, "The reader may reach an insight and build a new piece of his or her model of the self and its relations". Based on the findings, CASS was proposed to assist students in understanding poems.

In addition, students can benefit from the function of annotation retrieval. Such a finding conforms to what has been reported by previous studies (Glover et al., 2007; Hwang & Hsu, 2011; Nokelainen et al., 2005; Robert, 2009; Su et al., 2010; Yeh & Lo, 2009). Furthermore, students could understand and comprehend text more effectively by making connections with background knowledge: text-to-self, text-to-text, and text-to-world (Vacca, Vacca, & Mraz, 2011). With the cross-text annotation sharing mechanism, this kind of connection could be achieved. As a result, the proposed system assists students in enhancing their comprehension of poetry.

Although the experimental results have shown the benefits of using CASS, there are some limitations in the present study. For example, students need to have the ability to use analogy strategy to annotate the rhetoric techniques used in a poem. If they do not have this ability, the scaffolding given by this system will not be helpful to them.

A future work will be directed to the automation of annotation analysis. That is, students can get feedback automatically when they complete their annotations. Hence appropriate semantic similarity measurement, like ontology-based distance measurement, should be incorporated to achieve such annotation automation. So far, the proposed mechanism focused on poetry comprehension. Therefore, other future work will extend this study to other subjects to further evaluate the effectiveness of this approach.

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A DIFFERENT APPROACH TO HAVE SCIENCE AND TECHNOLOGY STUDENT-TEACHERS GAIN VARIED METHODS IN LABORATORY APPLICATIONS: A SAMPLE OF COMPUTER ASSISTED POE APPLICATION

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ABSTRACT
The purpose of this study is to develop a new approach and assess the application for the science and technology student-teachers to gain varied laboratory methods in science and technology teaching. It is also aimed to describe the computer-assisted POE application in the subject of “Photosynthesis-Light” developed in the context of this approach choosing the most appropriate design software called “Flash Player 10.1. The study was applied during the fall semester in the 2009-2010 and 2010-2011 academic year with 188 science and technology student-teachers who attended the course of Science and Technology Laboratuvar Applications-I at the Karadeniz Technical University Fatih Faculty of Education based on action research methodology. The survey’s data was analyzed with SPSS 16.00 using descriptive statistics based on mean and standard deviation. The interviewing data was analyzed according to common views. In this study, the implementation process of a developed approach was explained and an example of the computer-assisted POE application in the subject of “Photosynthesis-Light”was described. It was concluded that the developed approach introduces the science and technology student-teachers to an efficient and reflective process to gain varied methods in laboratory applications.
Keywords: Varied Laboratory Methods in Science and Technology Teaching, Science and Technology Student-teacher, Science and Technology Laboratory Application, Computer-Assisted POE Application

INTRODUCTION

The developments achieved in science and technology education within the last twenty years ha ve contributed to science and technology teaching being treated as a new field of knowledge and research (Akpınar & Bayramoğlu, 2008; Cavaş, Cavaş, Karaoğlan & Kısla, 2009; Jenkins, 2000). However, the Turkish National Education System aims at raising individuals with developed critical and creative thinking skills (Ozmen, 2004). In this process, with the agency of educational institutions, the teachers should take an active role in instructing the individuals who put forward the original, useful, new ideas and findings, and prioritize the creativeness in all areas (Cakır Ilhan, 2003; Celikten, Sanal & Yeni, 2005). Teacher efficacy is enhanced through pre-service and in-service teacher education (Stein & Wang, 1988). On the other hand, teachers’ professional development cannot be described as a linear continual formulation and a defined stable process to constitute a professional perspective (Ovens, 1999; Solomon & Tresman, 1999).

It is stressed that teachers should have an approach adopting the principle of continual development during the teaching process. During effective science and technology education, the laboratory approaches that teachers apply during the teaching process require the teacher to be a guide facilitating the students to reach the knowledge rather than the presenter of the knowledge (Holt-Reynolds, 2000). However, student-teachers clarify that they do not implement profoundly the application activities because of the limitations of the process, especially regarding time (Saka, 2001). Therefore, having more practice teaching during pre-service teacher education has crucial importance to improve student-teachers’ skills in relation to application of the varied laboratory methods. On the other hand, the idea of reflection and the reflective practitioner has crucial importance on raising interest in relation to elaborate practice teaching in laboratory classrooms to emerge an interactional profitable climate (Shaw, 1995). Therefore, student-teachers should be oriented to understand science and technology laboratory methods during their pre-service teacher education process.

Within the scope of science and technology laboratory applications, the aim is to develop students’ skills of the scientific process by making the abstract science concepts understandable (Karamustafaoğlu, Aydın & Özmen, 2005). It is already known that this method has several positive impacts, notably: developing reasoning, critical thinking, scientific perspective, and problem solving skills in students (Feyzioğlu, Demirdağ, Ateş, Cobanoğlu & Altun, 2011; Hofstein & Naaman, 2007; Morgil, Ozyalçın Oskay, Yavuz & Arda, 2003; Usun, 2006; Yenice, 2003). Hence, laboratory applications constitute the focal point of science and technology teaching (Taşdelen, 2004). Considering this fact, student-teachers are required to make science and technology applications at the expected level in practicing their professions. Therefore, the aim is to develop activity design and application skills toward the goals of the curriculum in the implementation of the courses that the student-teachers have taken during pre-service education process. However, although new curriculums have been developed in science and technology teaching, the disabilities in the application varied laboratory methods during teaching process can not be resolved (Saka, 2005).

The students are said to find lab activities more enjoyable and useful (Cerini, Murray & Reiss, 2003). The attention is drawn to the necessity of setting rich learning environments by the use of laboratory activities (Arı & Bayram, 2011). Although the laboratory activities in science and technology teaching have become more prominent in recent years (Thair & Treagust, 1999; Tsai, 2003; Skoumios & Passalis, 2010; Watson, Prieto & Dillon, 1995), the laboratory applications for science and technology teaching are not conducted at the desired level (Saka, 2002; Teo, 2009). The following factors are underlined as leading causes in this situation: lack of devotion and planning for laboratory applications (Backus, 2005; Booth, 2001; Hackling, Goodrum, & Rennie, 2001); teachers' negative attitudes and low-level of interest toward laboratory applications (Brown, Abell, Demir & Schmidt, 2006; Cheung, 2007); lack of efficient and sufficient course materials (Abraham, Craolice, Graves, Palmer, Aldhamash & Kihega, 1997; Lawson, 2000); overcrowded classrooms (Bayrak, Kanlı & Ingeç Kandil, 2007; Bintaş & Barut, 2008; Cheung, 2008; Hofstein, Levi-Nahum, & Shore, 2001; Kipnis & Hofstein, 2007; Prades & Espinar, 2010); students' low readiness level (Hardy, 2003); the problems related to classroom management (Jones, Gott & Jarman, 2000); lack of safety measurement in laboratories (Staer, Goodrum & Hackling, 1998); not taking students' laboratory application achievements into consideration in their assessment (Hofstein, Shore & Kipnis, 2004); and teachers' lack of sufficient knowledge and skills concerning laboratory application approaches (Furtak, 2006; Lubben & Ramsden, 1998; Roehrig & Luft, 2004; Singer, Hilton & Schweingruber, 2005). Thus, no matter how efficient a science and technology teaching curriculum is developed,or how knowledgable the teachers as the practitioners of the curriculum and as the people who will take charge in the process, the student-teachers' unawareness of their roles and responsibilities in the implementation process of the developed curriculum, and their inabilities in efficiently developing their skills of fulfilling these roles and responsibilities cause the deadlock of the encountered problems. It also necessitates the science and technology student-teachers in the pre-service education process to improve their skills by carrying out the practices enabling them to acquire knowledge about their aforesaid roles and responsibilities, and fulfill these roles and responsibilities as they are expected to do (Saka, 2007).

Teachers' inability to conduct science and technology teaching applications efficiently is explained by their inadequacy in developing their laboratory application skills (Bencze & Hodson, 1999). It will be possible for the teachers who have sufficient levels of knowledge and skills for the substantial laboratory approaches such as induction, deduction, inquiry-based approach, and constructivist approach, to choose relevant methods and techniques (Koyunlu Unlu & Dökme, 2011). Thus they will be able make the best of their time through effective planning. Then following the recovery of the commonly-encountered problems in relation with classroom management, the negative attitudes towards laboratory application will be changed. In describing teachers' competency, the ability to apply different field specific teaching methods and techniques is accepted to be one of the most important skills in terms of field teaching knowledge. However, when the sub-aspects of this skill are examined, it can be stated that teachers' skills to apply different laboratory approaches, methods, and teachniques at the desired level are materialized in three stages. At the first stage, they need to have sufficient level of knowledge about the fundamentals and principles of applying different laboratory approaches, methods, and teachniques. Secondly, they have to choose the most efficient laboratory approach, method, and teachnique specific to every subject; and next to have developed the skills to apply laboratory approach, method, and teachnique, decided to be the most effective option, at a desired level by considering the application fundamentals and principles (Bedweel, Hunt, Touzel & Wisaman, 1991). It is stressed that the teachers should carry out teaching process by using alternative laboratory approaches, methods, and teachniques complying with the students' learning styles at the upper level (Diesterhaft & Jaus, 1997).

Student-centered laboratory approaches, methods, and techniques are stated to be used at a low level or never used by the teachers in science and technology teaching (Kocaküllah & Kocaküllah, 2001; Saka, 2004a). Senior teachers, as well, do not use laboratory approaches, methods, and techniques at a desired level. Therefore, it is thought that the students' active participation is not ensured sufficiently, and the materials are not put into to their applications in science and technology teaching (Dindar and Yaman, 2002). To overcome this deficiency, the student-teachers must be trained with a perspective having them gain insight about different laboratory approaches, methods, and techniques, and put their knowledge into practice, thereby, eliminate the misconceptions. Therefore, to have the student-teachers acquire a wide range of methods, it becomes a necessity to develop and evaluate the new approaches by practicing them in order to achieve the desired efficiency in the applications being carried out (Lunenberg & Korthagen, 2003; Saka, 2004b; Springer, Stanne & Danovan, 1999; Trumbul & Kerr, 1993).

Within the scope of the study being held, the student-teachers are provided with the alternative activity development and application opportunities thanks to employing different laboratory applications towards the same gain based on the laboratory approaches, methods, and techniques. In this context, the aim is to develop a different approach intended for promoting laboratory application skills towards science and technology teaching in the pre-service teacher education. For this reason, the student-teachers are intended to develop their skills of choosing the best laboratory approach, method, and technique for a specific subject, and obtain a wide range of methods in laboratory applications. Besides a detailed sample implementation for the computer-assisted POE application in the subject of 'Photosynthesis-Light' is presented by the student-teachers in the context of this study.

Conceptual Framework

When science and technology student-teachers interact with their peers during laboratory applications, they get experiences through collaboration for preparing their practice. Practice of collaboration could be applied by working with peers to gain varied methods in laboratory applications as a group. When the science and technology student-teachers work in groups, the method tutor's role is to orientate their interaction and intervene when necessary to contribute or support their laboratory application skills (Johnson & Johnson, 1994). In this process, working together within group and also between groups exceedingly contributes to their professional skills development by sharing their ideas, assumptions and ensuring mutual support observing each others' practice and having best relationship with peers (Talvitie, Peltokallio & Mannisto, 2000; Veenman, Bentum, Bootsma, Dieren & Kemp, 2002). It is believed that this approach is useful in constructing the framework of science and technology student-teachers' image. Because, constructing reasonable change on framework of teacher development emerges from the teacher's own practice by adaptation of others' "experimental learning" regarding agreeable features (Ovens, 1999).

Science and technology student-teachers could have an opportunity to assess their own laboratory applications' effectiveness, feeling more confident about themselves as a developing teacher and exploring new laboratory application methods. This process could have a meaningful contribution to the science and technology student-teachers regarding cooperative learning and classwide peer tutoring. It involves proactive collaborative relationships among the student-teachers which can result not only in more agreeable implementations during reflective practice of their laboratory applications in science and technology teaching, but also more beneficial examples of implemantation of student-centered laboratory application in science and technology education. Therefore, it is indicated that when student-teachers get engaged in a reflective practice with their peers, they might gain remarkable facility in the improvement of their laboratory methods in science and technology teaching (Goldstein & Lake, 2000). Observing peers' video records provides an effective reflective interaction to help and support student-teachers in relation to their implementations in laboratory applications in science and technology teaching. This interactive process has positive impact on their own laboratory applications and their skills as a team member in terms of self-esteem, encouragement and reasonable solutions.

The approach explained in this study is based on the reflections that indicate the different patterns of science and technology student-teachers' preparation for laboratory applications in the extent of supportive interaction. This approach ensures the practitioners various kinds of opportunities through reflection of specific responses, regarding learner participation, learner relationships and laboratory applications based on different approaches, methods and techniques. By this, we can prepare science and technology student-teachers for any kind of conditions especially with respect to applications for different laboratory methods. Therefore, this process gives inspiration to science and technology student-teachers for providing multiple opportunities for science and technology student-teachers to gain varied methods in science laboratory implementations.

PURPOSE OF THE STUDY

The purpose of this research is to develop and assess a new approach to the application for science and technology student-teachers to gain varied laboratory methods in science and technology teaching. It is also aimed at describing the computer-assisted POE application developed on the subject of the "Photosynthesis-Light" in the context of this approach.

METHODOLOGY

This study is implemented based on action research methodology. Since it has the characteristics concerning the development of application, the approach employed in the scope of the study requires the implementation of a "practice oriented-action research" (Holter & Schwartz-Barcott, 1993). In this process, survey and questionnaire techniques are used. In the execution of the research, a survey and structured interview form was utilized as data collection means.

Participants

The sample consists of 188 third grade science and technology student-teachers who attended the course of Science and Technology Laboratory Application-I educated in the 2009-2010 and 2010-2011 fall education term at the Karadeniz Technical University Fatih Faculty of Education Science and Technology Teaching Programme.

Development of Measurement Tool

Before the implementation process of the approach is executed, the student-teachers were asked to state their expectations by taking the objectives of the course into account. During the execution process of the approach the student-teachers were asked to prepare a log of experience gained with the behaviors of professional skills. The items are formed with the expressions of expectations before the application and learned behaviors about the implementation process are arranged by the frequency of expression of public opinions. The developed survey was applied to 45 student-teachers in the scope of the pilot study and reliability analysis were implemented in SPSS 16.00 program. In this analysis, 95% confidence interval, taken, and discriminant validity of the survey consists of 19 items by subtracting non-distinctive 4 items was calculated as Cronbach's alpha value of 0.93. The alpha value which is greater than 0.70 shows the reliability of survey (Tavsancıl, 2002). A likert style 5-rating measurement was used in the developed survey (totally: 5, greatly: 4, partly: 3, few: 2, any: 1). This survey was used as a measurement tool to determine the level of skills acquired before the application and professional skills acquired in the process of teaching of the course based on the approach applied in Science and Technology Laboratory Application-I course. However, student-teachers in the sample assessed the processed application in terms of the level of impacts of the different laboratory approaches, methods and techniques on the development of application skills. In this process, on one hand, within the scope of the approach a laboratory scale approach, methods and techniques used by the student-teachers were put in an order and on the other hand, before and after application of the likert style 5-rated measure of opinions about the level of implementation (complete: 5, to a large extent: 4, partly: 3, very little: 2, any: 1) was used.

Data Analysis

Obtained survey data was analyzed on the basis of the mean and standard deviation with descriptive statistical methods using SPSS 16.00 package program. Interview data was analyzed on the basis of the student-teachers' common opinions about the application being implemented on the processes before and after the application of the developed approach.

Developed Approach and Implementation Process

Within the scope of the approach developed in the study, student-teachers were grouped and they carried out various applications based on different laboratory aproaches, methods and tecqniques considering that they have the same gains. The efficiency and applicability level of the applications in this process was observed and it was aimed that the students teachers skills in terms of various laboratory methods should be developed. Science and technology student-teachers in this process, have designed approaches, demonstration methods, 5E model, the POE method, worksheets, simple teaching tools and computer-assisted experiment activities on the basis of induction, deduction, and research. Thus, it is argued that science and technology student-teachers would gain a wealth of method and techniques in science and technology laboratory applications.

In the first phase of the study, a survey developed to determine their views about the level of effectiveness of the approach, was applied to 188 student-teachers in the sample during the processes, before, and after the Science and Technology Laboratory Application-I course. In the second stage, before and after the application of the developed approach, the student-teachers were asked to mark the chart prepared by considering the levels of the student-teachers' ability to apply the methods of laboratory applications related to science and technology teaching. In the third phase, student-teachers were asked to state their opinions in written format about the approach applied to the extend of "positive aspects", "negative aspects" and "suggestions for better application".

The following steps were followed in the process of implementation of this approach:

- The instructor conducting the course used the first 4 weeks of the theoretical and practical part of the course in order to make the necessary explanations about the laboratory methods to develop the student-teachers' skills to gain a wealth of methods in laboratory applications.
- In this process, the principles of application of laboratory methods, advantages and weaknesses were pointed out.

- After the required disclosures were completed in theoretical and practical courses in the first four weeks of the period, all the lessons were used as the application process.
- In the application part of Science and Technology Laboratory Aplication-I course; gains in Science and Technology Curriculum (2-3 gain) were given to the student-teachers in the extend of grade level-unit-subject-gain with 3 members in groups consecutively.
- Each of the group members made an application in the classroom in 20-25 minute periods by selecting different laboratory methods appropriate to the same gains. Student-teachers carried out their applications according to their detailed activity plans they prepared.
- Each of the group members presented the principles of laboratory methods and the reasons for choosing this method in the first 5 minutes of the incipient process of applications in the laboratory.
- Student-teachers in their presentations in this process used overhead projectors or projection devices by preparing a one-page word document in the computer environment and transferring this into acetate.
- The student-teachers watched the video recordings of the sample applications they made intending to the application of laboratory methods and techniques in attempt to increase the quality level of the applications. were attempted to increased by having.
- Sample plans were shown on the screen by a projection device transferred from the computer in order to ensure the preparation of the activity plans for the application of laboratory methods and techniques.
- After the application of each group, the application level and effectiveness of the chosen method, the observer position in the laboratory before the group elements and their peers were evaluated by the instructor.
- In the assessment, the group's gains and the laboratory method chosen by each group member were discussed in terms of "gains-method compliance". Thus, after the application of each group, the most effective laboratory method for the group gains were selected on the basis of the discussions held.
- Student-teachers were informed about the criteria used to assess the applications carried out by the student-teachers by the instructor. This observation scale was created by integrating the principles of the approach with the criteria in Teaching Practice Assessment Form, (Appendix Table 1). In the use of this form, the criteria contained in Teaching Practice Assessment Form (YÖK,1998) were considered as; Deficient (D=2 point), Acceptable (A=3 point), Well-trained (W=5 point).
- In this form of the assessment, the size of the presentation was considered 60% of the level, and the size of the plan was considered 40% of the level.
- Activity plans prepared by the student-teachers of their choice and application of the principles of the method steps of the laboratory were asked to indicate in the box to italic. Principles stated in this case contribute to increase the consistency level of the chosen method with the activity plans the student-teachers prepared.
- The course instructor in the position of the researcher, informed the student-teachers during the process of the application in order to ensure they reflected the different aspects of the teaching skills in a detailed and consistent way. At this stage, care was taken to ensure the active participation of students. In this process, the researcher often assumed a leading role.

Development Stages of the Computer-Assisted POE Application

To use the software included in the study design, the "Flash Player 10.1" software was preferred because of features such as standardized file structure, the fast, small footprint files, interaction functions and ease of use.

In the process of developing Application in Computer-Assisted POE, the following steps were conducted by the student-teachers;

- By researching literature about computer-assisted education, POE method and laboratory applications on science and technology teaching, current studies, and developed teaching materials.
- A variety of textbooks appropriate to the curriculum were used in the process of the development of activities by considering the gains as a result of the groupings made in the process of the application of the course.
- Features of an appropriate and effective interface in terms of visual design were determined.
- As an animation and design program for the objective of the research "Flash Player 10.1" were selected and the required animations, steps, texts, images and shapes were designed for the packet program to be prepared.
- Interface was prepared on "Flash Player 10.1" program and texts were placed into the interface.
- The colors shown in the material were matched.
- To ensure the widespread use of these materials academic support was provided to the student-teacher by the researcher. In this process, developed materials, available in different languages (English and Turkish) were prepared. In order to increase the level of common impact of the materials presented within this research, the form prepared in the English language was given (Appendix Figure 1-9).
- Buttons required to ensure the interactive use of the execution process of the activity were prepared and the action commands were prepared and activated;

To reflect the execution process of the activity - *Play* (►),

To stop the execution process of activity - *Pause* (II)

To replay the execution process of activity - *Replay* ( )
To reflect the POE phases in the material – *POE's phases*
To watch the related animation after the explanation with POE's phases **–** *Continue* (>)
To reflect the instructions in the execution process of the experiment activity **–** *Next instruction*
To close the animation **–** *Close the animation* (X)
In addition, the meanings of the relevant icons were included on the icons in the screen display of the activity.
The activity material was put into the final form by taking the recommendations of the instructor and making the necessary corrections (Sample screenshots of the experiment area relevant to the developed material are given in Appendix Figure 1-9).

FINDINGS

The data obtained from the survey and the interviews conducted in the scope of the study were arranged and presented in accordance with the aim of the research as follows.

Survey Findings

As a result of the survey conducted to determine the science and technology student-teachers' views on the approach developed within the scope of the research, the teachers' gains concerning pre and post application process especially concentrated on the following skills based on the aim of the study: explaining the advantages and limitations related to the approaches, methods, and techniques by observing the applications of the activities developed for different laboratory approaches intended for the same gains (2.69-4.14); observing whether the methods recover each other's defects by using the same gains together in the context of different laboratory approaches (2.52-3.92); observing the contributions of applying different laboratory approaches, methods, and techniques to building a sufficient interaction with students in the execution of laboratory applications (2.76-4.03); developing skills related to the scientific process (2.55-3.81), setting an effective learning-teaching environment by considering different approaches, methods, and techniques in science and technology laboratory applications (2.71-3.94), preparing and applying a testing apparatus based on different laboratory approaches, methods, and techniques considering the same gains (2.71-4.01), develoing and using simple tools and equipment (2.87-4.11), reinforcing the fundamentals and application principles of different laboratory approaches, methods, and techniques (2.62-3.93), choosing efficient laboratory approaches, methods, and techniques for the same gains (2.72-3.95), developing activities pertinent to different laboratory approaches, methods, and techniques considering the same gains (2.59-3.82) (Appendix Table 2).

The considerations of the student-teachers in the sample, in terms of effect level of the conducted application on the development of applying their skills to different laboratory approaches, methods, and techniques in the pre and post implementation processes, were organized and graphed (Figure 1).

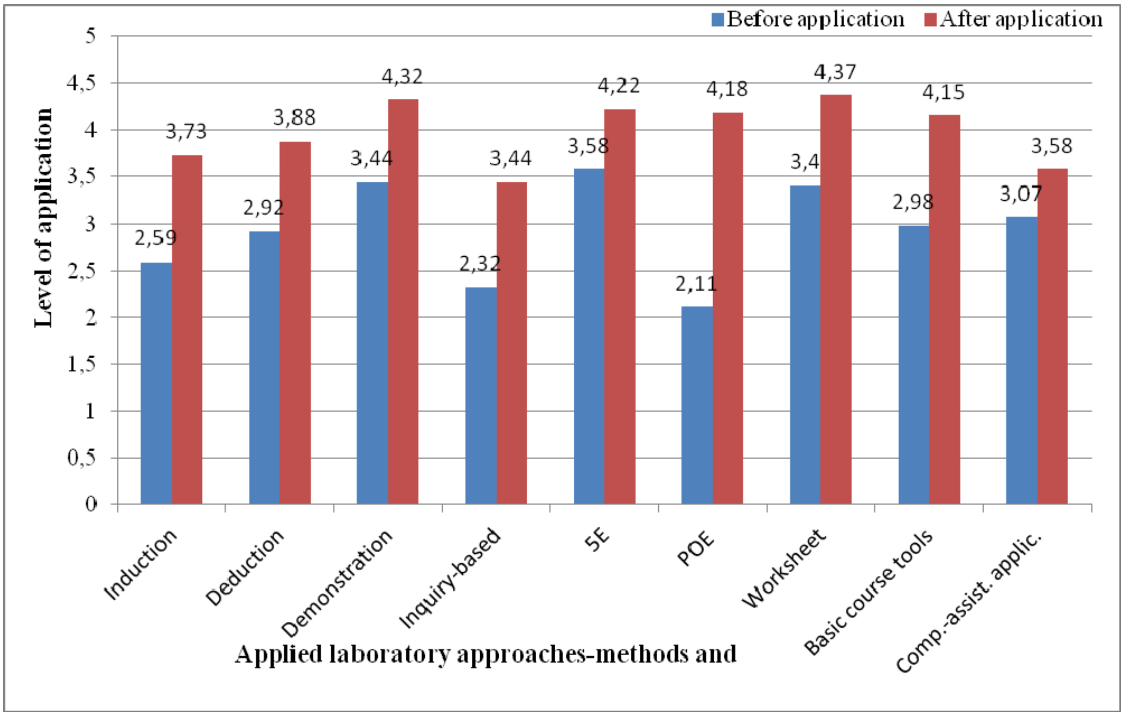

Figure 1. Student-teachers' application level of different laboratory approaches, methods, and techniques concerning the pre and post aplication processes of the developed approach.

In the context of the implemented approach, science and technology student-teachers' development at the highest level is in POE (2.11-4.18), basic course tools (2.98-4.15), and an induction approach (2.59-3.73); while their development at the lowest level is in computer assisted application (3.07-3.58), 5E (3.58-4.22), and demonstration (3.44-4.32) methods in turns. Also, the highest average values at the end of the application belong to worksheet (4.37), demonstration (4.32), and 5E model (4.22) (Figure 1).

Questionarrie Findings

The views of 45 student-teachers about the conducted application, chosen randomly from the sample, were organized by catgorizing them under three titles: "possitive aspects", "negative aspects", and "suggestions for improving the quality of the conducted application".

Positive Aspects

Taking an active role in the application of the course,
Following the choice of method, carriying out the application eagerly and in a motivated manner,
Gaining the skills toward developing and applying alternative laboratory approaches, methods, and techniques,
Developing the skill to choose the best laboratory approach, method, and technique for the subject,
Gaining the ability to evaluate for efficient use of laboratory approaches, methods, and techniques by observing the applications different laboratory methods for the same gains,
Possesing the skill to conduct laboratory applications through a method in an orderly way,
Reinforcing the attention to the course and learning the laboratory methods and techniques more effectively by taking an active role,
Enhancing the interaction level by group work,
Probing the methods to be implemented at an upper level following the improvement of interaction level,
Developing the skill to write a qualified activity report according with laboratory methods and techniques,
Understanding the advantages and disadvandages of laboratory methods and techniques in detail,
Using the limited time period in the apllication efficienly,
Gaining experience toward providing students' active participation,
Enhancing the quality level of the subsequent applications by considering the constructive criticism about the applications,
Developing the ability to explain,
The fact that experiencing an enjoyable student centered application process saves the course from being monotonous,

The fact that the effect level of visual and three-dimensional means realizes a retentive learning,
Improving self-confidence by justifying the presented information,
Building a positive competitive environment by referring to investigation,
Obtaining the opportunity to think broadly by participating in an application that include detailed student-centered roles and responsibilities for the first time,
Featuring and observing the theroretical knowledge about the methods and techniques in the process of implementation, gaining personal experience, and securing the removal of bias against the course,
Formulating its original teaching style since it enables teaching practice,
Perceiving the significance of activiating students,
Having experience about the positive effects of computer-assisted applications,
Developing their own applications by observing the applications of the chosen laboratory methods and techniques,
Gaining the skill to use everyday tools and equipment as material,
Perceiving the importance of conducting similar students-centered applications in the process of performing their profession.

Negative Aspects
Boundedness of activity application time with 20 minutes,
Observing the fact that not all subjects can be presented by means of all the laboratory methods and techniques since some subjects take longer time,
The existance of a boring application when the appropriate laboratory method and technique can not be chosen,
Teacher's being more active than students in some methods,
The lack of the opportunity to have different applications of the methods and techniques these are suitable for the gains.

Suggestions for improving the quality of the conducted application
In order to carry out the application more efficiently and realistic, an application with the students in a real classroom environment at the chosen schools can be conducted.
The students' insufficiencies can be explained through one to one interactions instead of motivating and criticising them by grades.
More opportunities toward different laboratory methods and techniques can be provided by increasing the weekly course hours.
More experience in the execution of the laboratory approaches, methods, and techniques can be secured before teaching practice.
Much time can be allocated since the application period is limited.
To conduct these kinds of courses which are student centered, the applications having similar qualifications must be carried out starting from first year of the university.

DISCUSSION AND CONCLUSIONS
While science and technology student-teachers were developing activity plans based on the different laboratory approaches, methods, and teachniques in the implementation process of the devloped application within the study, they had discussions among themselves based on causal relationships. It was asserted that these discussions would contribute to the development of their professional skills for the principles and application of the different laboratory approaches, methods, and teachniques that could be employed in the process of science and technology teaching. In this regard, the student-teachers stated, in terms of the positive aspects, in the interviews that the approach employed in the scope of the study enabled them, especially, to have knowledge about the different laboratory approaches, methods, and teachniques; be able to choose and evaluate the best ones for the subject; and gain skills to develop and apply activities considering the chosen method. Also, they remarked that the implementation process was an enjoyable application that included detailed student-centered roles and responsibilities; and that they had perceived the significance of conducting similar student-centered applications in the process of their professional practice. It is indicated that student-teachers' gaining experience in the applications of laboratory approaches, methods, and techniques by executing science and technology laboratory applications based on the student-centered approaches in the pre-service education contributed to the student-teacher's skills development in this field (Morrisey, 1981). In addition, the application of different teaching methods in science and technology teaching is attached great importance to most teacher education training curriculum (Palmer, 1992). In the context of the developed approach, student-teachers take part in classroom teaching activities based on different laboratory approaches, methods, and techniques by taking the same gains into consideration in the pre-service education process. In this process, it is claimed that student-teacher's observing their teaching skills toward their own laboratory applications in other student-teachers provides them with an evaluation process that facilitates their professional skills development and enhances their

potential of reasoning (Saka, 2005). This applied approach was concluded to enable the student-teachers to explain the advantages and limitations of the activity applications toward different laboratory approaches for the same gains; use the methods together to compansate for the defects of every method; build a qualifed interaction; develop scientific process skills; construct efficient learning-teaching setting; prepare and apply a differenciated testing apparatus; develop and apply simple course tools and equipment; reinforce the fundamentals and application principles of different laboratory approaches, methods, and techniques; choose an efficient laboratory approach; and develop skill for designing activity (Appendix Table 2). This research has revealed that the reflective process provides practitioners with different kinds of dimensions to understand the sophisticated aspects of different methods in laboratory application for science and technology teaching.

In the interviews conducted in the context of the study, the science and technology student-teachers also emphasized that the application conducted saved the course from being monotonous, built a positive competitive environment by referring to investigation, and formulated their original teaching style by enabling teaching practice. Accordingly, it was underlined that when student-centered laboratory applications were conducted, the student-teachers would not have difficulty in structuring their teaching styles and building classroom rules in the teaching process (Wubbels & Korthagen, 1990). Also, in the scope of the applied approach, the student-teachers achieved the highest level of development in POE, basic course tools, and induction approaches respectively (Figure 1). The possible reason for this is thought to be the fact that the student-teachers gained insights in the POE application in the previous term; and that compared to the other methods, they had higher level of interest in the use of basic tools. The evaluations based on the examinations conducted at the end of laboratory applications by student-teachers' trainers and all the practitioners, and discovering and sharing the experience reflect the gains of applications carried our in the context of different laboratory approaches, methods, and techniques. In this regard, attention was called upon the fact that the execution of science and technology teaching based on different laboratory methods differenciated teaching through enhancing student-teachers' skills of learning and teaching science, and their motivation (Lunenberg & Korthagen, 2003; Moshe & Pinchas, 1991). This process provides the student-teachers with the opportunity to understand and question the active and efficient experiences, with an environment for collective learning taking advantage of the developed activities. Thus, the need for building learning environments that would give the students teachers the opportunity to examine their personal theories and ideas in the context of teacher training curriculums was stressed (Wideen, Mayer-Smith & Moon, 1998). The studies underlined that teachers' doing observation in the process of education is the most effective method in changing their approaches (Dindar ve Yaman, 2002).

In the study, the student-teachers also found the opportunity to identify their problems with laboratory applications. Therefore, they will have the chance to overcome the inabilities in applying different laboratory methods in practice. In this process, they are expected to think over their inabilities, and make their own decisions to overcome these insufficiencies. Hence, this process can be considered a vital part of their professional development. Accordingly, the developed approach introduces the science and technology student-teachers to an efficient and a reflective process to gain varied methods in laboratory applications. On the other hand, the process gives them the opportunity to conduct prepatory activities and plans related to their laboratory teaching experiences that will soon take place. For this reason, this process is stressed to provide all the student-teachers with indirect experiences to display and discuss their science and technology teaching experiences, and share each other's experiences by working in collaboration (Saka, 2004b). Also, it is thought that the interaction and shared experiences and the reinforcement of communication among the science and technology student-teachers will promote the academic success in the teaching process. With this regard, the diversity of methods in laboratory applications is stated to facilitate students' success as well as increasing the teaching quality (Büyükkurt, 1998). Therefore, it is indicated that peer teaching in faculty as an intensive early field experience in the preparation of pre-service teacher education contribute to improve the ability of science and technology student-teachers in relation to reflection on laboratory applications (Metcall, Ronen-Hammer & Kahlich, 1996).

In the interviews conducted as a part of the study, the student-teachers remarked that they acquired experience with the positive effects of computer-assisted applications, and that they developed their skills of using simple tools and equipment in everyday life as course materials. However, the student-teachers achieved the lowest level of development in computer assisted application, 5E, and demonstration methods (Figure 1). This situation can be explained with the fact that science and technology student-teachers conducted the computer-assisted applications based on their individual skills without taking theoretical courses at a sufficient level. Furthermore, it can be evaluated as a result of their having newly perceived the effects of such kinds of practices in the laboratory applications after observing computer-assisted POE applications. POE applications, when conducted with computer assistance, goes well with the constructivist learning approach since it is easily possible to support students in building social communication and to obtain the reflections of their personal views. Carrying out the POE application in the computer environment enables the students to control the process. It also provides the teachers with the opportunity of more communication in revealing students' views and thoughts (Choo, Eshaq, Samsudin & Guru, 2009; Kearneyl, Treagust, Yeo & Zadnik, 2001). It was concluded that student-teachers believed that compared to the other teachers, they would be able to apply worksheet preparation, demonstration method, and 5E model more effectively (Figure 1) at the end of the application implemented in the study since they thought that they had learn worksheet preparation at the Instruction Technology and Material Design course, and that worksheet preparation required more extensive technical knowledge and skills when compared to computer-assisted applications. The reason the student-teachers developed their ability at higher level relatively can be given to the fact that they had practice in 5E applications previously. The high level of for the use of demonstration method is thought to be caused by its practicality and easiness in application.

As for the negative aspects of the applications mentioned by the student-teachers in the interview, especially, the following points were indicated: boundedness of activity application time with 20-25 minutes, the existance of a boring application when the appropriate laboratory method and technique can not be chosen, the lack of the opportunity to have different applications of the methods and techniques, which are suitable for the gains. On the other hand, as suggestions for improving the quality of the conducted application, the attention was, in particular, attracted on the following points: conducting an application with the students in a real classroom environment at the chosen schools in order to carry out the application more efficiently and realistically, providing more opportunities toward different laboratory methods and techniques by increasing the weekly course hours, securing more experience in the execution of the laboratory approaches, methods, and techniques before teaching practice, and carrying out the applications having similar qualifications to conduct these kinds of courses which are student centered, starting from the first year of university. When science and technology student-teachers have longer periods of practical experience or more essential experience practice in laboratory teaching, this ensures they will be in a better position for adapting their experiences to practical tasks (Tillema, 2000). In addition to these, it is concluded that science and technology student-teachers would practice laboratory teaching in advance of actual practice in schools to take part in the laboratory courses in front of their peers during pre-service teacher education. So, the identified limitations could be minimised to a reasonable degree by recognising and inquiring after a lack of experiences and science and technology student-teachers will gain conscious by applying this approach. Thus, when science and technology student-teachers engage in self directed laboratory applications, their peers could improve their invaluable thoughts through reflections (Tillema, 2000).

SUGGESTIONS

In the process of pre-service teacher education, by giving priority to different laboratory approaches, methods, and techniques in application of courses concerning science and technology teaching, the instructors must aim at developing student-teacher's skills in this field at the expected level through ensuring they gain sufficient experiences. With similar approaches to be developed, the skills to apply different approaches, methods, and techniques must be developed in process of pre-service teacher education for the science and technology student-teachers starting from the first year of the university, and during in-service process for the teachers, carried on throughout their professional careers. In this context, in order to provide the student-teachers in pre-service teacher education, and the teachers, carrying out their profession at present with the the abilities to develop computer-assisted activities, the enhancement of their skills to design animation activites for science and technology teaching, through Flash program, in particular must be attributed great importance.

The development of student-teachers' skills to gain method diversity in laboratory applications for science and technology teaching must be facilitated at the desired level through some arrangements. For this aim, the student-teachers must be given greater opportunities in different courses during pre-service teacher education in order help them to practice more approaches, methods, and techniques suitable for the gains in the science and technology curriculum. In this way, the goal must be to have science and technology student-teachers gain method diversity out of different laboratory applications before they professionally take part in teaching practices. This approach reveals the need for further research in a number of areas which are related to the impact of practitioners on how many skills related to laboratory applications can be gained among varying approaches, methods and techniques to improve their own professional skills throughout their laboratory applications. One of the main implications of this research for future research would be to find out how this approach works as a framework for student-teachers' continuing improvement.

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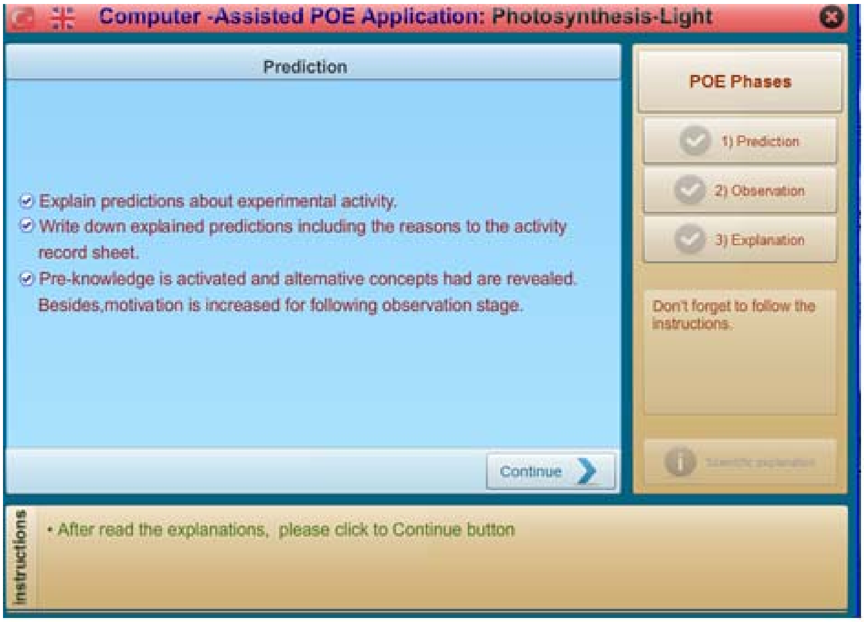
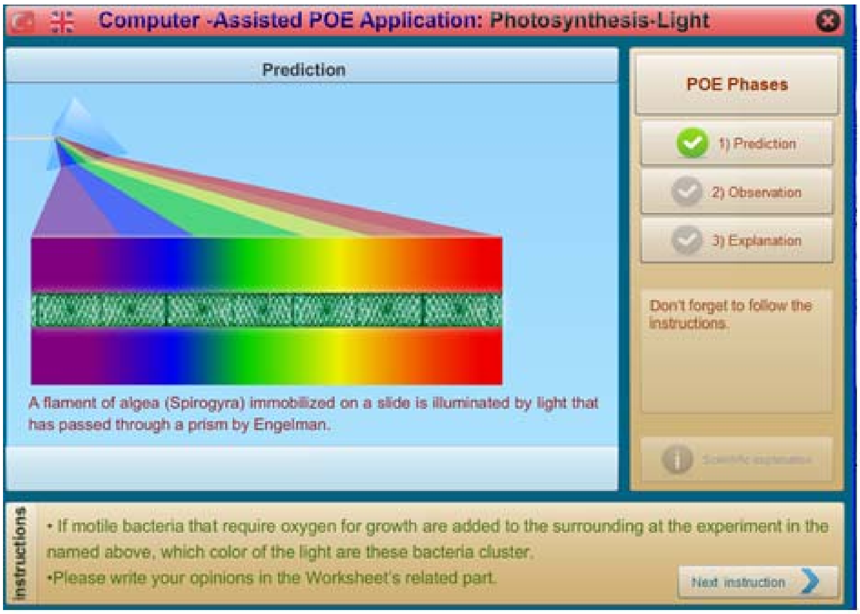
Appendix Figure 1. Screen image of main menu

Appendix Figure 2. Screen image when it is clicked the "POE Phases" button in the next step.

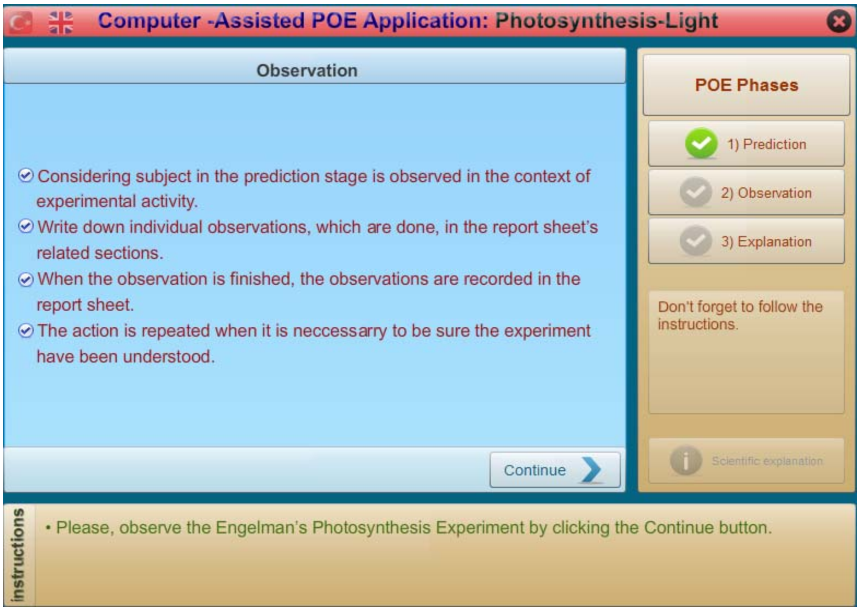
Appendix Figure 3. Screen image when it is clicked the “Prediction” button.



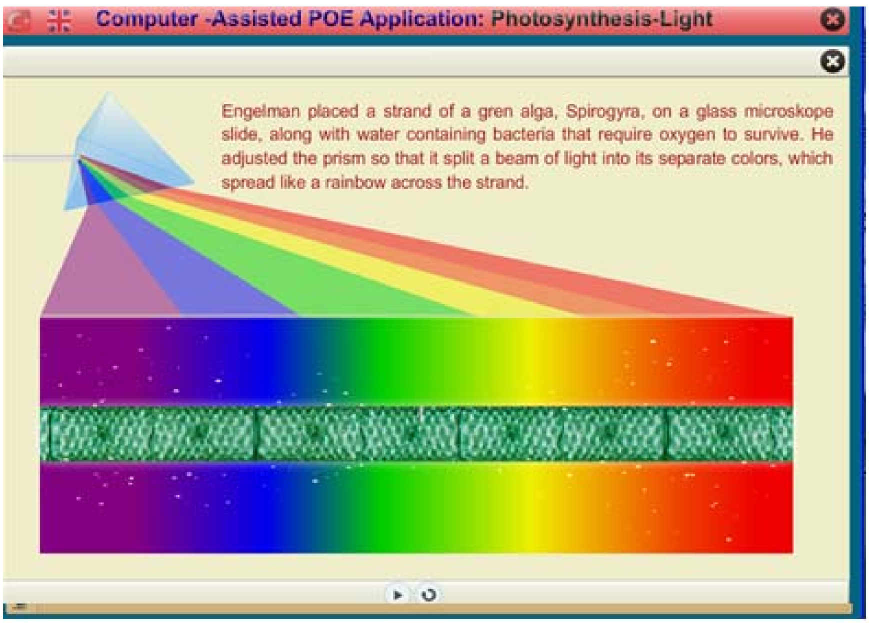
Appendix Figure 4. Screen image when it is clicked the “Continue” button in the Prediction phase.



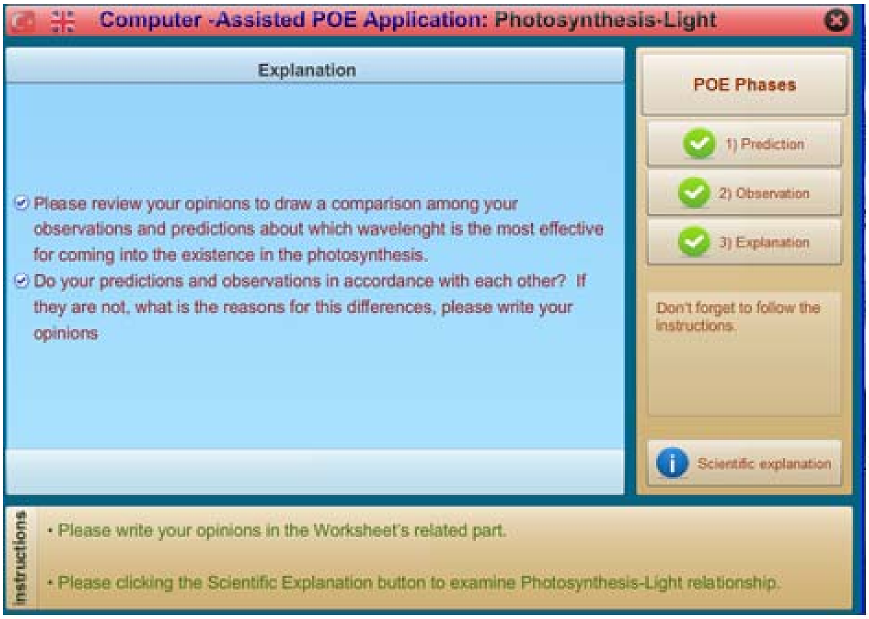
Appendix Figure 5. Screen image when it is clicked the “Observation” button.



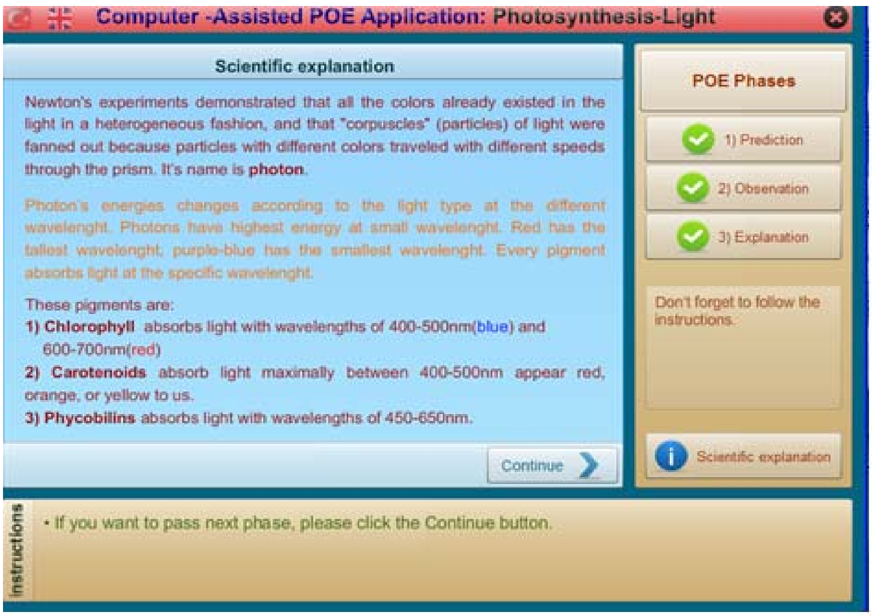
Appendix Figure 6. Screen image including the animation when it is clicked the “Continue” button in the Observation phase.



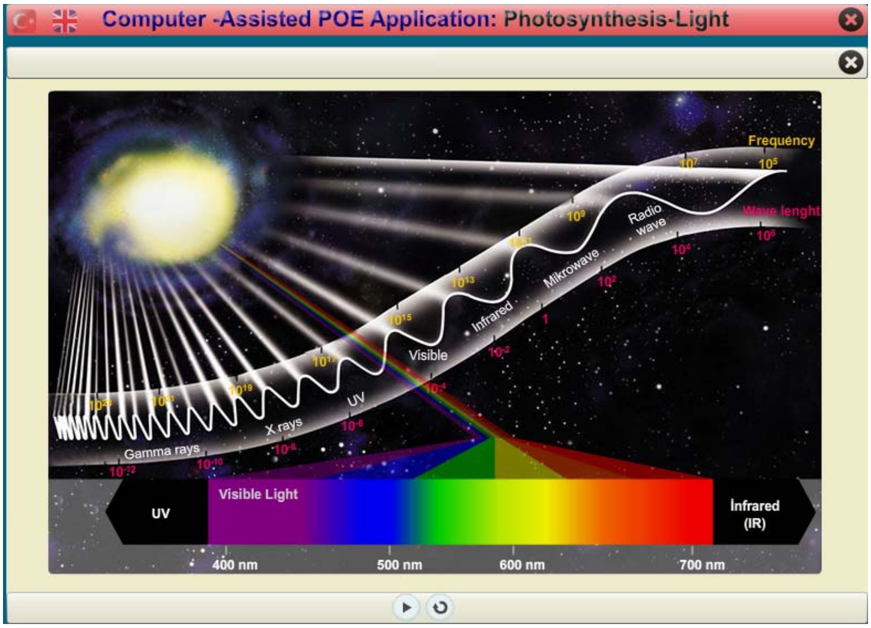
Appendix Figure 7. Demonstrative screen image requires to click the "Scientific explanation" button when it is clicked the "Explanation" button instructions are completed.



Appendix Figure 8. Screen image when it is clicked "Scientific explanation" button at the end of the POE application.



Appendix Figure 9. Screen image when it is clicked the “Continue” button in the “Scientific explanation” screen.



Appendix Table 1. Criterions for Student-teachers' presentations in the Science Teaching Laboratory Applications-I course

Criterions for Student-teachers' presentations in the Science Teaching Laboratory Applications-I course				
Each criteria has 5 point -----(D:Deficient (2 point), A: Acceptable (3 point), W:Well-trained (5 point))				
	Criterions	**D**	**A**	**W**
	Planning			
1	Introduction the laboratory approach which is used in the activity.			
2	Determination of approaches and techniques which are suitable for gains.			
3	Choosing suitable tools-equipment and material.			
4	Preperation an effective material.			
	Classroom management			
5	Suitable entrance into subject/to associate subject with everyday life.			
6	Relating subject with other courses.			
7	To attract attention and interest to subject.			
8	Ensuring continuity for interest and motivation to subject.			
	Teaching process			
9	Reflecting considered and suitable attitudes for class level when activity is prepared.			
10	Reflecting application phases of considered laboratory approach when activity is developed.			
11	Properly usage of selected approach when activity is developed.			
	Use of time effectively.			
12	Organizing activities for students' effective participation.			
13	Consideration of individual differences in teaching process.			
14	Usage of teaching tool-equipment and material for class level properly.			
15	Answering students' questions properly and sufficiently.			
16	Evaluating degree for obtaining of gains.			
	Communication			
17	Communication with students effectively.			
18	Giving obvious explanations and instructions.			
19	Effective usage of voice tone.			
20	Effective usage of verbal and body languages.			
	Total			

(D:Deficient, A: Acceptable, W:Well-trained) (C: Criteria)------ *C1-30 Point (W:15point, A: 20 point, G: 30 point); C2-40 Point(W:20point, A: 30 point, G:40 point); C3-30 Point (W:15point, A: 20 point, G: 30 point)*				
	Criterions	**D**	**A**	**W**
1	Level of writing the activity plan obviously and understandable (explaining plan's section; unit, class, gain, approach-method-technique, tool-equipment, aim, level of applied approach)			
2	Level of giving place to application' phases and principles of applied laboratory approach.			
3	Obeying the rules for writing report. (writing the principle of the applied approach on a italic style and passive basis, writing font (12), margins (2,5cm), general pattern, level of explanations to be plain and understandable)			
	Total			

Appendix Table 2. The standard deviation and mean values for student-teachers' gains in relation to the executed application in the pre and post application process of the developed approach. (***STLA-I: Science and Technology Laboratory Application-I; Sd: Standart deviation))***

Acquired behaviour	**Before STLA-I course**		**After STLA-I course**	
	Mean	**Sd**	**Mean**	**Sd**
Choosing efficient laboratory approach, method, and technique for the same gains.	**2.72**	**0.781**	**3.95**	**0.597**
Developing appropriate activities for different laboratory approaches, methods, and techniques considering the same gains.	**2.59**	**0.845**	**3.82**	**0.698**
Developing laboratory activity overcoming individual differences.	2.57	0.937	3.71	0.763
Using the same gains in different laboratory approaches, and observing whether the methods compensate each other's deficiencies	**2.52**	**0.916**	**3.92**	**0.752**
Developing the skills for scientific process	**2.55**	**0.796**	**3.81**	**0.650**
Explaining the advantages and limitations of the related approaches, methods, and techniques by observing the implementation of the activities intended for different laboratory approaches aiming at the same gains.	**2.69**	**1.035**	**4.14**	**0.743**
Gaining the skill to concretize abstract concepts by applying different laboratory approaches, methods, and techniques to the same gains.	2.72	0.882	3.93	0.742
Setting integrity between the theory and practice in the execution process of the course.	2.89	0.823	3.98	0.749
Reinforcing the fundamentals and application principles of different laboratory approaches, methods, and techniques.	**2.62**	**0.860**	**3.93**	**0.684**
Preparing and using testing apparatus based on different laboratory approaches, methods, and techniques by considering the same gains.	**2.71**	**0.849**	**4.01**	**0.701**
Developing and using simple course tools and equipment.	**2.87**	**0.953**	**4.11**	**0.741**
Using tone of voice efficiently in the execution of laboratory applications.	3.29	0.945	4.11	0.849
Achieving classroom management in implementation of laboratory applications.	3.28	0.890	4.12	0.788
In the execution of laboratory applications, observing the contribution of applying different approaches, methods, and techniques to set a qualified interaction with students.	**2.76**	**0.890**	**4.03**	**0.749**
Building effective learning-teaching environment in science and technology laboratory applications by considering different approaches, methods, and techniques.	**2.71**	**0.842**	**3.94**	**0.685**
Using time efficiently in the implementation of laboratory applications.	2.94	0.888	3.95	0.806
Building a democratic learning setting in the execution process of laboratory applications.	3.27	0.951	4.07	0.735
Developing the ability to explain.	3.20	0.920	4.13	0.720
Developing applying different teaching materials for laboratory applications.	2.98	0.910	4.07	0.686

A TEACHER PROPOSED HEURISTIC FOR ICT PROFESSIONAL TEACHER DEVELOPMENT AND IMPLEMENTATION IN THE SOUTH AFRICAN CONTEXT

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ABSTRACT
This qualitative interpretive exploratory case study investigated a sample of South African teachers' perceptions of the requirements for successful implementation of Information and Communication Technology (ICT) Professional Teacher Development (PTD) within disadvantaged South African township schools in the Port Elizabeth district in South Africa. The participating teachers' (n=30) perceptions and experience of ICT PTD were explored via qualitative semi-structured interviews, an open-ended questionnaire, internet user group responses, reflective journal writing and facilitator reflections. The findings indicate that they value three aspects, namely facilitator related aspects, training context aspects and school related aspects. These findings underpin the $C^2RHOAR^3FS^2R^2$ framework offered as a heuristic for ICT related PTD and subsequent school and classroom implementation. The $C^2RHOAR^3FS^2R^2$ acronym refers to <u>C</u>are, <u>C</u>ompetence, <u>R</u>elate, <u>H</u>ands-on, <u>O</u>n-going, <u>A</u>ssessment, <u>R</u>eflection, <u>R</u>ead, <u>R</u>evise-replan, <u>F</u>eedback, <u>S</u>hare, <u>S</u>upport, <u>R</u>ecognition and <u>R</u>esources. The expectations of the teachers resonate with international expectations of Professional Teacher Development and underscore the magnitude of the task for those who aspire to meet the challenge they present.
Keywords: Professional Teacher Development, ICT, teacher expectations, technology, computers

INTRODUCTION
The South African *White Paper on e-Education* makes explicit the type of learning envisioned, the ICT levels that are needed, and the type of school that is required for successful ICT provision (Department of Education, 2004). In 2007, the Department of Education published *Guidelines for Teacher Training and Professional Development in ICT* (Department of Education, 2007) which recognizes the need for Professional Teacher Development (PTD). This document highlights the importance of the teacher in the implementation process, and the need for teacher training in order to establish ICT knowledge, skills, values and attitudes. However, it provides very little information on how teachers and schools are expected to practically integrate or make use of ICT within the South African context. Similarly, Hodgkinson-Williams (2005) has also referred to this *'missing link'* previously with special reference to the *White Paper on e-Education* (Department of Education, 2004). These sentiments have also been echoed by the South African National Research Foundation (NRF) website which likewise highlights the need for research regarding ICT and PTD. Educators are also recognized internationally as key role players in successful implementation and integration of ICT (Ertmer, 1999; Fullan & Smith, 1999; Prensky, 2008) and, as such, the purpose of this paper is to provide a snapshot of the perceptions of a sample of practitioners who participated in a year-long PTD intervention as to what they believe is required to best facilitate ICT teacher development and integration of ICT in their schools.

Professional Teacher Development (PTD)
Research suggests that Professional Teacher Development (PTD) should be embedded in constructivist learning environments, be situated in real classroom contexts, and make provision for reflection opportunities, classroom observations, and peer collaboration (Hawley & Valli, 1999; Sandholtz, Ringstaff & Dwyer, 1997; Vrasidas & Glass, 2005). Williams, Coles, Wilson, Richardson and Tuson (2000) provide evidence that a hands-on approach, reflection, 'on the spot' support and the sharing of ideas among participants are important elements during planning and the implementation of PTD. They also point out that poor facilitation, a too quick a pace and information overload contribute to unsuccessful implementation. Hoban (2002) and Turbill (2002) concur on the importance of teacher reflection during PTD, but also add that PTD should embrace the development of a community of practice, i.e. people at the centre assisting those at the periphery until they also become experts.

Ertmer (2001) and Hawley and Valli (1999) suggest that teachers should be encouraged to identify their needs where possible and what kind of assistance they require. They also propose the need for collaborative problem solving and the sharing of expertise related to problems experienced and problems that have been solved by the participants during PTD (Hawley & Valli, 1999). Burns (2002) agrees and adds that the sharing of experiences, discussion of the use of specific instructional approaches or/and software within the classroom, and training embedded in real-life contents allow teachers to experience PTD as enjoyable and useful. Birman, Desimone, Porter and Garet (2000), Garet, Porter, Desimone, Birman & Yoon (2001), Lawless and Pellegrino (2007) and Royer (2002) believe that PTD should be on-going and that 'one-shot sessions' are not effective. Glazer, Hannafin and Song (2005) argue for on-going support, but add that this support should be designed in such a manner that it can be rendered to teachers' during the school day. Glazer et al. (2005), Hinson, Laprairie and Cundiff (2005), Hinson, Laprairie and Heroman (2006) and Royer (2002) all argue that teacher professional development has to transcend the intensive seminar approach and must become situated within the teachers' working contexts, and move away from a transmission model (see Hoban, 2002) to a responsive dissemination approach, focusing on on-going feedback, on-going development and continuous improvement.

Watson (2001) believes that teacher-as-leaders should be developed at school so that they can provide on-going on-site support while Richardson (2003) highlights the importance of an outside source as facilitator/staff developer. Tiene and Luft (2001) also note the importance of an outside administrative facilitator to schedule meetings and serve as a liaison between the participating schools and the professional developers; a staff member who can assist in realizing the curricular suggestions made by the teachers. Hayes (2005) points out that technical support is also crucial, as do Tiene and Luft (2001) who call for a staff member to be available to work directly with the teachers and the learners, assist with implementation, and be responsible for technical support.

Herrington and Kervin (2007) and Herrington and Oliver (1997, 2000) summarize the key elements in PTD succinctly by recommending that PTD should embrace authentic contexts that reflect the way that knowledge will be used in real life using authentic activities; it should provide access to expert performances and modelling of the intended processes; it should foster the collaborative construction of knowledge; it should provide opportunities for reflection, discussion and feedback sessions to enable tacit knowledge to be made explicit; it should provide the necessary safety nets through coaching and scaffolding by community members at critical times, and it should be built around a community of practice (see Dennen, 2004).

RESEARCH DESIGN AND METHODOLOGY

Teachers from disadvantaged schools located in the Missionvale Township of Port Elizabeth in the Eastern Cape Province voiced a need, via their principals and other school representatives, to be empowered to become skilled users of computers and the Internet. These disadvantaged schools serve the poorest of the poor in black South African township and have minimal financial resources and access to ICT resources is virtually non-existent. In order to assist some of these schools, the Dell Foundation was approached by the Centre for Educational Research, Technology and Innovation (CERTI) at the Nelson Mandela Metropolitan University (NMMU) in 2008 to provide sponsorship for six of these schools (four primary schools and two high schools). This resulted in a sponsorship of 20 computers for each of the six schools. Five schools were provided with 'line of sight' wireless Internet connectivity sponsored by the Hermann Ohlthaver Trust. The connections were installed by NMMU ICT specialists. Thirty teachers, distributed fairly evenly over six schools, participated in a year-long ICT PTD intervention and participated in the research aspect of the study.

Data gathering tools

Data were collected by means of internet user group records, audio-taped semi-structured interviews, an open-ended questionnaire, teacher journals and facilitator reflections. The internet user group data was generated via open-ended online questions which the participants answered during training; questions such as *"What characteristics should the project leader (facilitator) keep in mind while training? Why?" What should the project leader (facilitator) keep in mind (think about) during the preparation process? Why?"* and *"What was positive about the development program / process so far? (What did you like?)."*

The journals, which the teachers completed weekly, provided responses in writing to questions such as *"What problems did you experience?"*, *"What was positive about the development program / process so far?"* and requests to *"Make suggestions on what to change or how to improve."* The open-ended questionnaire contained questions such as, *"What skills does a good facilitator or coach need to be successful in the ICT project?"*, *"What factors are necessary to be successful in this ICT project?"*, *"How can the facilitator or coach of this project ensure that this project is a successful project?"* Interview questions that were posed with reference to PTD, included *"Tell me what do you think are the needs of the teachers?"*, *"What do you think are the main challenges at your school?"*, *"You said you require training, who should do the training?"*, *"What do you think they will need during training?"*, *"What do you think the facilitator should do during the sessions, how should he teach or facilitate?"*

Data analysis, interpretation and trustworthiness

Codes were assigned using a demonstration version of the software package MAXQDA in order to explore patterns and regularities (Coffey & Atkinson, 1996; Yin 2003a, 2003b) which might have implications for both theory and practice (Drew, Hardman & Hosp, 2008). Validity or trustworthiness was addressed by using multiple sources of evidence and attempting to establish a chain of evidence (Cohen, Manion & Morrison, 2007;

Yin, 2003a, 2003b). While the findings do not allow generalization, modest extrapolations which could lead to applicability in other similar, but not identical, situations, can be made (Patton, 2002).

Ethical measures

The teachers from the participating schools were volunteers, could disengage with the project at any stage, and were informed that the data generated would be used for publication purposes. Aspects of the process, for example the internet user group, were anonymous. The project was approved by the Department of Education (Port Elizabeth District Office) and principals and school representatives attended a number of meetings where the research project was explained and discussed.

RESULTS

Inspection of the data suggested three main dimensions or categories, these being aspects which relate to the facilitator, the training context and the school. These categories, and the sub-categories in each, are elaborated below and reference made to previous research which the respondents intuitively supported.

Facilitator related aspects

Care and Relate

The participants suggested that the personal attributes of a facilitator is a vital aspect contributing to the success or failure of a project (O'Connor & Ertmer, 2006; Havelock & Zlotolow, 1995). Data from the anonymous internet user group suggest that a successful facilitator would be friendly, approachable, patient, tolerant, a good listener and knowledgeable, hence portraying a caring attitude or approach (George & Camarata, 1996; Harris, 2002; Havelock & Zlotolow, 1995). Examples of statements supporting these perceptions are; *"Patience is needed as I belong to old school of thought and computers are new to me"*, *"A facilitator has to be friendly, approachable"* and *"Patience, determination and openness"* and *"We need somebody who is open, who we can approach easily"*.

The importance of care is apparent in the following interview comments; "*I would like the facilitator to be kind and patient because the teachers have got old minds"*, *"They must keep in mind that some teachers do not have a computer background so they must be at least tolerant because they will have to start from scratch."* Such issues are also reported in the work of George and Camarata (1996), Harris (2002) and Havelock and Zlotolow (1995). Interview data also suggest that relating to teachers as individuals is an important dimension, as illustrated by the following transcripts; *"Perhaps they have a fear of not knowing how to use a computer"*, *"The main characteristic is patience and be willing to endure because the teachers come with their own schedule and workload so they need to understand, the seed needs to be sown and they need to be inspired. If it's going to be forced down it's not going to help them."*

Competent, listener, clear in explanations and passionate

Data generated via internet user groups indicated that the teaches believe a project facilitator should be competent and passionate: *"Someone who has passion, someone who has knowhow of dealing with the primary learners, primary teachers, someone who is used in doing workshops and somebody who would make a very good follow-up and understand and evaluate the work that would be done"*. Others concurred, stating *"He [should] know his job, know how to deal with people and be really understanding"*.

The data also suggest that clarity was something that was important for the teachers; *"I suppose the first and foremost thing is to know the computer and be able to explain clearly so that teachers can hear and understand what you are saying. I think that those are the things that are important"*. Other data indicate that the participants believe that a facilitator should be positive, passionate, accessible, and helpful and have some degree of understanding of the participants, as espoused by, amongst others, Ertmer (2001), Hawley and Valli (1999) and Royer (2002).

Training context aspects

Hands-on, practical, empowering and fruitful

The teachers felt that it was important that the professional development context should be empowering and provide the skills necessary for school level implementation. A need for fruitfulness became evident when participants stated, "*Everything they do must be practical and he must show them always the relation between computers and their learning areas, how it combines. If they can't see the significance of having a computer and how it will help their learning areas then they won't buy much into it. For example drawing up a lesson plan if they can see we can use the internet for information and they see the usefulness of it. They must eventually see that the computer can enable them and assist them in their work so the instructor must constantly emphasise the* *usefulness of the computer in education"*. This need was explicitly stated as; *"Other programmes [from the DOE for example] have been too theoretical, but this one was hands-on"*.

Assessment of prior knowledge and progress during the training process

Participants also mentioned the assessment is an important aspect during teacher professional development (Birman et al., 2000; Garet et al, 2001; Herrington & Kervin, 2007; Hoban, 2002). Assessment prior to the training was viewed as important, as it enables a facilitator to have insight in where to 'meet' his participants, *"[The facilitator] Must first find out who are computer literate"* and *"I should think it's about the known to the unknown so the facilitator should know that the level of knowledge about technology of those teachers is very much minimum so he must not take for granted that these teachers know computers or they know how to go about, he has to take them step by step so the approach is very important also he has to know that these are the people, as much as they are professionals, they are starting from the lower level and he builds up to their expectations."*

Regular monitoring of progress during the training sessions was also seen as being important, as this would enable the facilitator to ascertain who are in need of assistance and to plan for subsequent training sessions. This perceived need became evident when participants stated, *"[The facilitator should] Try to make it a point that a least everybody understand the day's work and make sure that manuals are available before the training starts so that we are able to go through this at home before attending the next day"* and others mentioned "*The skill of monitoring those who don't understand"* is important as *"He must be observant, must be good in assessing."*

Manuals and hand-outs are important

The importance of well documented notes or hand-outs (Hodgkinson-Williams, 2005) was also mentioned in the open-ended questionnaire and journals; *"Make sure that manuals are available before the training starts so that we are able to go through this at home before attending the next day"*; *"Participants must have notes. They must be shown what to do and check if they have mastered"* and *"I am the kind of person who wants to achieve the best in anything. So if I can have a textbook that guides me, I will use it for sure."*

On-going training sessions

Participants stated that the training should not be limited to a once-off one-day or once-off one-week training programme, which is the usual format used by the Department of Education training (Hinson et al., 2005; Lawless & Pellegrino, 2007; Royer, 2002). In the words of a participant when she stated that what is required is that *"It should be continuous [over a period of weeks] rather than getting a week's training and you are left with a certificate [like the Department of Education's training], but knowing nothing. [And then] You are not confident to teach others."*

Work at own pace and accommodate everyone

The participants indicated that what they require from teacher development is that it should focus on creating learning spaces in which they can work at their own pace (Ertmer, 2001), and that they should not be expected to grasp everything that is required at once; *"The fact that we are not pushed, we are taught so as to know not in a rush"* and *"This one [ICT training project] accommodates everybody even if they don't have the computer skills."*

Collaborative non-threatening atmosphere conducive to learning

The participants indicated that what they valued of the current ICT teacher training sessions were the fact that the classroom training context was experienced in a non-threatening way (Havelock & Zlotolow, 1995; Mahn & John-Steiner, 2002). This became evident in responses such as, "*The environment is very relaxing*", "*The presenter of the program is welcoming makes one feel free to ask questions for any difficulty that one comes across with"*, *"I feel comfortable and stress free. The facilitator does not harass us. I am beginning to feel a bit confident on typing, although I am still slow, I am improving"*, *"The facilitator's explanations and gives help when everyone even you need it."*

Reflection is important for the participants and the facilitator for learning and planning

Interview data revealed that the teachers valued completing the reflective journal sheets at the end of each training session (Hoban, 2002; Turbill, 2002), and stated that it was important that these sheets should be returned to them at the beginning of each new session. The participants also noted that the journal reflection sheets provide opportunities for a facilitator to determine where the participants need assistance, adding that a successful project facilitator would make a special effort to provide feedback ; *"We need feedback so that we can see how far have we gone and what we need to do … to continue on the right track"*. Another participant concurred when he stated; *"They [journal reflection sheets] are of value, because it is very important to the* *participant to know in order to repeat what you [the participant] left out in the past lecture." "It is important for me, because the instructor is trying to make me understand ... [so when I have a problem, I can indicate the problem in the journal] and [then the project facilitator can] explain clearly that particular question that I do not understand."* Others believed that the teacher reflective journal entries could assist a facilitator's planning; *"It will also enlighten the facilitator what to prepare for the next lesson and where to start so that you can know exactly the information that the educators have*.

School context aspects

Sharing experiences with peers at school is important to show the value of ICT and to learn from one another

The sharing of experiences was seen as important (Birman et al., 2000; Garet et al., 2001; Nonaka, 1994; Vrasidas & Glass, 2005) as it would assist in communicating the benefits of ICT training, *"Teachers should share with their peers in terms of reporting to them how the training was, what did they learn, going back to the class, encouraging their peers."*

Sharing experiences was also viewed as a developmental process, i.e. helping one another to learn from one another (see Nonaka, 1994). This is evident from the following interview response; *"It would be about what we call developing each other and to see how far each and every educator from the others in terms of knowledge and how to handle the software and technology and it would be done through staff development so that whoever has been lacking behind has to be in the group and work as a team and also knows different methods, different approaches, different ways of dealing with problems because I really feel that if I'm having this problem I'm sure someone else has experienced such a problem and he has tried to handle it in a better way maybe more than myself so the exchange of ideas and showing each other and trying to top up the knowledge that they got, that is what will make them successful so the practice and the practice and sharing ideas it will make them to be perfect."*

Support with implementation and resources from the Department of Education

Participants were adamant that support is one of the key elements that could ensure success (Ertmer, 1999; Glazer et al., 2005; Mueller, Wood, Willoughby, Ross & Specht, 2008). *"For me it would be very helpful if the department of education can get on board."* Another educator alluded the fact that support is not forthcoming; *"The very department who has employed us should be our biggest supporters, but the problem is that when you go there they have empty promises so now you need support from somebody who is going to be following up and who is going to be genuine with the love that he has for the computer"* Another teacher noted; *"Past experience has taught one that NGOs are the people who develop schools"*, *"Eastern Cape Department is dead as compared to other provinces"* and *"The Department of Education is full of promises."*

The participating teachers also lack support in the form of their own computer resources. The need for having their own computers were voiced when on computer literate teacher stated that the problem is that *"They [the teachers] don't even have computers in their home, they don't know internet they don't go to the café shop."* The responses in the open ended questionnaire affirmed the need for resources from the Department of Education, *"Supply us [as teachers] with our own computers at home to all those who attend, please because we are in need"* and *"Subsidize attendees with computers."*

On-going support with implementation from the facilitator

The support role of the training facilitator (Herrington & Kervin, 2007; Herrington & Oliver, 1997, 2000; Tiene & Luft, 2001; see also Dennen, 2004) was also highlighted as an imperative; *"There must be somebody that goes around the schools to see how we are doing … So that he can see maybe that a particular person needs some more support or information will be able to get that." "You need to not disappear. You need to guide us, constant observation. Look what we are doing because [Organisation A] made the mistake of giving the computers and then see for yourself what you can do. There is no way you can leave the school"*. Another participant stated, *"After he [facilitator] has trained, he must check them in a classroom performance for instance he has trained me and then he must check me the things he has taught me, that have you followed, where are you know, what are you doing, what is your problem, so those are the things that are very important, because there must be a friendship relationship."*

The importance of continuous on-going support to assist with solving problems is evident in the following response; *"Continuous support for the school [is required] because there will be times that even after training we encounter a problem and not being able to complete a task at hand and you ask the facilitator to help with solutions and they show their willingness to help and in the end there is proper communication with the school and the NMMU."* Participants also mentioned that they should not wait for a long time to receive support at school; *"If we need you, you must be available."*

Support from the inside the school: Principal and staff development sessions

Participants also felt that there should be support and monitoring from the leadership structures in schools (Hayes, 2005; Wilmore, 2000), for example from the principal or through the establishment of a supporting computer committee; *"The principal must support because he is the mouth piece/middle man. He must attend the meetings. I'm just the ones who give the instructions, but he is the person who must get the teachers involved."* Another teacher concurred that the role of the principal is paramount, as the principal should create opportunities for teachers to develop their ICT skills, especially those who are not yet computer literate; *"She must assist us in training teachers, as not all of us are computer literate."* The importance of having school staff based development sessions organised by the schools was seen as vital (see Tiene & Luft, 2001) as these sessions could provide opportunities to 'pull up' those who are lacking in ICT skills and experience.

Support in the form of a specially appointed teacher at school

Calls were made to have one person appointed enable learners to visit the computer room on a regular basis (Hayes, 2005; Richardson, 2003; Tiene & Luft, 2001; Watson, 2001;). The rationale behind this is that high teaching loads do not allow teachers to take their learners to the computer room on a regular basis and use the facility in an integrative manner. The following excerpt illustrates the above, *"Our learners are so interested, they are so motivated to visit the computer lab, but the problem is that most of the educators they are so loaded with the other subjects that it is not easy for them to be there the whole day at the computer lab, otherwise if you can get, even the department, we were trying to request so that there can be somebody specialising there who will be there for the whole day so that even after school, the learners who are not attending can get a chance to attend but we have got no way the department is not going to give us a post."*

Recognition motivates

Participants reported that feeling valued is important and that rewards serve as a motivator, *"It's like you tell them within this training you are going to get a certificate so the carrot for the rabbit is the certificate."* Another one concurred an added that the more advanced ICT teachers should be provided with opportunities to further their training with an accredited university module, as this could further heighten interest and hence motivate, *"I'm a little bit advanced compared to the other teachers here at school maybe allow me opportunities if the university has a course that will ensure I will get a certificate which will make me more interested in training more people."*

Proposed framework and recommendations for future PTD

The following framework for ICT PTD based on the findings in this study and the research findings of others reported earlier in this paper is proposed (Figure 1). The acronym $C^2RHOAR^3FS^2R^2$ is used to encompass all the aspects of the framework (as indicated by each letter in the acronym). Care refers to establishing a learning context in which the participating teachers feel that they are cared for and believe that the will be able to succeed. Competence refers to the fact that the facilitator should be knowledgeable not only about what is presented, but also the manner of 'how' it is done. Relate refers to building a relationship between the facilitator and the participating teachers as well as knowing their needs.

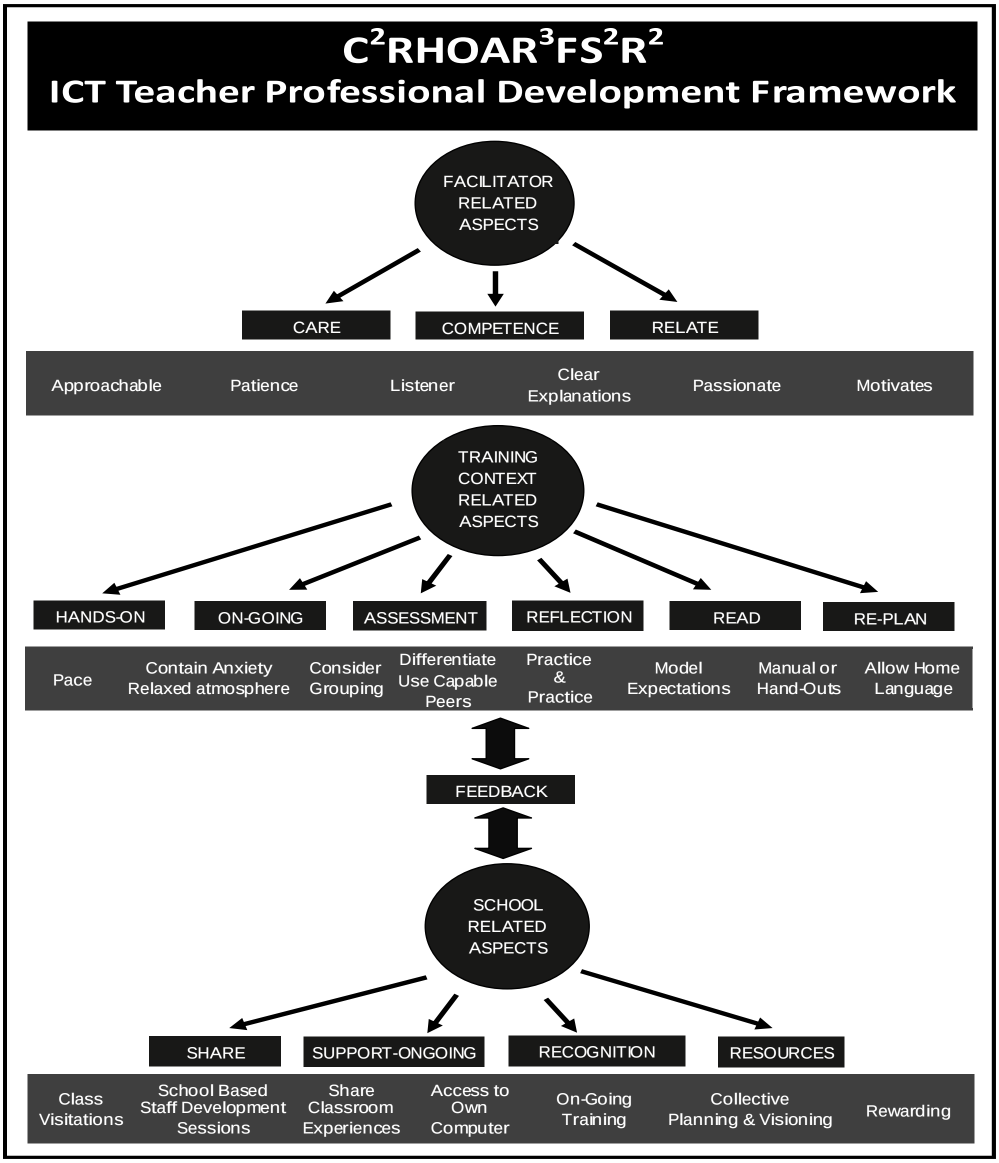

Figure 1: A proposed heuristic for ICT Professional Teacher Development

Hands-on refers to the fact that participant should be trained within context and in a practical manner. On-going suggests that the teacher development sessions cannot be once-off, while assess implies that a facilitator should obtain an understanding of the participating teachers' needs, prior knowledge and skills throughout the teacher development process, as well as how they progress at school within the classroom context. Reflection in the framework refers to the completion of reflective journals where participants can reflect on their progress. The rationale behind the reflective journals is that these journals serve as a tool, enabling both the designer and the participating teachers to obtain a snapshot of their progress, enabling a facilitator to plan for subsequent PTD sessions and assisting the participants to indicate where they need assistance. Reading and re-planning using the teachers reflective journals are interlinked - the facilitator reads the journals to plan, re-plan or/and make the necessary revisions for the next session. The reflective journals sheets could also become an identifier of 'capable peers', i.e. participants who are more advanced or who are progressing faster and who could be used as co-assisters during training sessions.

Constructive feedback provides an overall picture of the community of participants' progress sharing refers to opportunities for the participants to share their experiences of the learning process with their peers - either in their groups or with the whole class - in order to articulate their tacit knowledge, experiences, successes and needs, both during training and at school level. Support implies classroom visits by either the project facilitator and/or other capable peers in order to render assistance and/or to discuss the successes, the areas where assistance is required and to plan how to address the identified issues at hand. The teachers in this study suggested the establishment of an internal school based support group which would meet regularly and that the principal and the senior management team (SMT) should create the necessary learning space, as well as emotional and motivational resources as well as opportunities to share what has been learned. An aspect of support could also be the appointment of a dedicated person responsible for ICT implementation at schools who is responsible for initiating and sustaining the implementation process. The data highlights the fact that recognition serves as a motivator and the importance of teachers having access to computers or laptops as resources that can be used at home.

CONCLUSION

The proposed framework for ICT related teacher professional development - the $C^2RHOAR^3FS^2R^2$ heuristic for ICT implementation and integration in schools - encompasses the need for competent, caring, enthusiastic and knowledgeable facilitators who can relate to teachers' needs and who can establish learning contexts in which the participants progress at their own pace. Such facilitators would need to work hand-in-hand with a view to initiate reflective practices, provide opportunities for the sharing of ICT classroom experiences, motivate teachers to attend on-going teacher development sessions, help schools secure on-going school-based support, recognize technology leaders at schools, and help teachers secure personal ICT resources. The expectations of the teachers who participated in this study resonate with international expectations of Professional Teacher Development and the findings of research on ICT PTD that have been published over the past two decades. Apart from providing further evidence of the authenticity of the claims, they underscore the complexity of the task for those who aspire to meet the challenge of effectively promoting the use of ICT in schools via PTD.

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AUDIOVISUAL NEWS, CARTOONS, AND FILMS AS SOURCES OF AUTHENTIC LANGUAGE INPUT AND LANGUAGE PROFICIENCY ENHANCEMENT

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ABSTRACT
In today's audiovisually driven world, various audiovisual programs can be incorporated as authentic sources of potential language input for second language acquisition. In line with this view, the present research aimed at discovering the effectiveness of exposure to news, cartoons, and films as three different types of authentic audiovisual programs on improving the language proficiency of low level language learners. To this end, 60 low level language learners were selected based on a language proficiency test and were assigned into three groups as group one, two, and three randomly. During the study which lasted for 10 weeks, the first group of the participants had exposure to a sample selected audiovisual materials from news, the second group of the participants had exposure to a sample selected audiovisual materials from cartoons, and the third group of the participants had exposure to a sample selected audiovisual material from various films. At the end of the study, another sample language proficiency test was administered to all the three groups to find out which group could gain significant language proficiency improvement. The results of the post-test were indicative of the fact that group one (news) failed to improve its language proficiency. In contrast, groups two (cartoons) and three (films) could improve their language proficiency. More importantly, the cartoon group participants' improvement was more significant than that of the film group. The results showed that audiovisual programs generally are a great source of language input for teaching purposes. However, more caution should be given to the selection of the type of audiovisual programs for low level proficiency learners. Cartoons and films with good story lines seem to motivate the learners to absorb the language input better and have a significant effect on the language improvement.
Keywords: news, cartoons, films, authentic language input, language proficiency

INTRODUCTION

In the last few years, the world of educational technology has witnessed a rapid development in various audiovisual technologies which offer many possibilities for the teachers to construct activities around listening to various authentic programs, watching related videos, and holding conversations in real world. Considering this issue, the use of authentic materials to provide the necessary language input in foreign/second language learning has a long history. For example, Sweet (1899) is considered as one of the first linguists who made use of authentic texts in his books because he was aware of their potential advantages over contrived materials. Authentic language input is any materials in English which have not been specifically produced for the very purpose of language teaching. Examples of these materials are films, songs, stories, games, and play. Although these materials are not made for language teaching purposes, they contain the characteristics of language used by the native speakers (Taylor, 1994). In the same line, Gilmore (2007) defined authentic language input as the language conveying a real message which is produced by a real speaker or writer for a real audience. Nunan (1999) also defined authentic language materials as spoken or written language materials that have been produced in real communication not specifically for language teaching. Nunan (1999) further highlighted the assumption that authentic language input can be extracted from many different sources including TV and radio broadcasts, recorded conversations, meetings, and newspapers.

From the linguistic point of view, authentic language input refers to the use of authentic materials from the target culture which is presented in the target language such as different programs, for example, news, films, songs, soap opera, and comedy as audiovisual mass media materials provided by various technologies. In this relation, desktop technologies such as computers and non-desktop technologies such as TV and radio can provide easy access to authentic audiovisual language input for language learners in both EFL and ESL contexts. Examples of audiovisual materials can include different print materials accompanied by related video and audio supplements, audiotapes and CDs with accompanying textbooks, and videotapes with textbooks.

There is a general agreement among foreign/second language instructors that authentic language input can be utilized in second language learning. According to many scholars (Bacon & Finnemann, 1990; Brinton, 1991;

Gebhard, 1996; Gilmore, 2007; Martinez, 2002; Melvin & Stout, 1987; Nunan, 1999; Porter & Roberts, 1981; among others), there are many advantages associated with authentic language materials which make these materials pedagogically valuable sources of great amount of exposure to the target language.

With regards to this, Martinez (2002) provided a number of sound advantages for incorporating authentic language materials for language teaching. An initial advantage is that authentic language materials provide a wide range of language change of the target language. For example, through listening to authentic songs and stories in the target language, language learners will be able to hear dialectal differences of various countries that speak the target language (Martinez, 2002). These dialectal variations from one target language speaking country to the next can be used for a class discussion. Brinton (1991) underscored the point that authentic materials from media can reinforce the direct relationship between the language classroom and the outside world for the students.

Melvin and Stout (1987) found an overall increased motivation to learn in the students when they use authentic language materials for the study of culture. As the language learners gained more confidence working directly with authentic materials, they also reported an increased understanding of the practical benefits of being able to use the language in real world scenarios. Melvin and Stout (1987) went on to state that authentic language input would be helpful for language learners to practice skills they might need outside the classroom and learn about cultures on their own. In relation to the motivating aspect of authentic materials, Nunan (1999) and Gilmore (2007) acknowledged that it is essential for language learners to have exposure to various kinds of authentic language material because it helps to motivate them by bringing the content and the subject matter to life. Moreover, it enables them to make the important connections between the classroom world and the real world outside the classroom setting.

Besides the above-mentioned benefits of authentic materials, limited drawbacks have been stated by few researchers. Martinez (2002) underlined the problem associated with the utilization of authentic language materials in the classrooms with different language proficiency levels. According to Martinez (2002), the authentic language materials which are used for language learning may be too culturally biased and the vocabulary may be irrelevant to the language learners' needs. More importantly, low level language proficiency or beginner level language learners may have a hard time interpreting what they hear or read because of the mixed structures that are used. Other researchers such as Widdowson (1996) also argued that there are some difficulties associated with the use of authentic materials such as the difficult vocabulary used which may de-motivate language learners. Much of the difficulty language learners experience with the use of authentic language materials originates from the students lack of familiarity with authentic language input and the processing strategies required for comprehending it (Bacon & finneman, 1994).

In the view of the above, the present research aims at discovering the effectiveness of exposure to news, cartoons, and films as three types of authentic audiovisual mass media programs on developing the language proficiency of low level language learners.

REVIEW OF THE RELATED LITERATURE

The growth of various audiovisual technologies in transforming the process of learning is unbelievable (Mayya, 2007). In today's audiovisually driven world, audiovisual devices such as satellite and conventional televisions can offer easy access to authentic programs which are considered to be a rich source of language input for SLA. The immediacy of current affairs programs ensures that learners' exposure to the language is up-to-date and embedded in the real world of native speakers. Indeed, by recognizing the limitations in the environment in EFL and some ESL contexts to provide language input in a social situation, various audiovisual technologies can be incorporated as sources of authentic language input (Bahrani & Tam, 2012). With regards to this, there are unlimited sources of authentic language materials such as TV commercials, quiz shows, cartoons, news clips, comedy shows, films, soap operas, songs, and documentaries that language teachers and learners can utilize for language learning purposes (Gebhard, 1996).

In view of the above, the review of the literature on the integration of different audiovisual programs that provide authentic language input into language learning underscores the pedagogical value of such materials for the very purpose of language teaching. For the purpose of the present research, some studies which have particularly focused on the use of news, cartoons, and films as authentic language input to develop language learning are reviewed.

Audiovisual news as pedagogically valuable and rich source of authentic language input to be utilized for language learning has attracted the attention of many qualitative as well as quantitative studies since the 1970s

(Baker, 1996; Beach & Somerholter, 1997; Bell, 2003; Berber, 1997; Blachford, 1973; Brinton & Gaskill, 1978; Mackenzie, 1997; Poon, 1992; to name only a few). Almost 40 years ago, Blachford (1973) emphasized the implicit pedagogical value embedded in TV news episodes anecdotally. As audiovisual mass media news consistently includes the same words and utterances, the lexico-syntactic feature of news genre is what makes audiovisual mass media news a valuable source of vocabulary input for language learning (Blachford, 1973).

A few years later, Brinton and Gaskill (1978) conducted a study on the effect of listening to TV news programs on improving EFL/ESL students' listening comprehension. The study was conducted in Germany as an EFL context and in the United States of America as an ESL context where videotaped news broadcasts from TV as a source of authentic language input were incorporated in advance EFL/ESL classes once a week for approximately six months to find out whether or not any improvements would be achieved on listening comprehension.

With regard to EFL students' difficulties comprehending fast speech, Brinton and Gaskill (1978) noted that when EFL/ESL learners encounter the rapid native speech, they often fail to comprehend it mainly because of their insufficient amount of exposure to TV and radio news. According to Brinton and Gaskill (1978), classroom materials which are used to enhance listening comprehension are not sufficient enough to help the language learners cope with rapid speech. For that reason, TV news language input has the potential to improve the listening skill because different newscasts bring reality into the classroom and enable the students to focus on substantive issues. Additionally, because of the recycling feature of vocabulary in different audiovisual mass media TV news, EFL/ESL language learners can become more familiar with many contextualized vocabulary items during a long period of exposure.

In the 90s, similar studies empowered by quantitative data also focused on using TV news to improve listening comprehension (Baker, 1996; Poon, 1992). Poon (1992) investigated the effectiveness of listening to news on listening comprehension in English as a second language (ESL) context as compared with the effectiveness of non-news listening materials. The participants of the study were 66 language learners in diverse disciplines, 34 in the experimental group and 32 in the control group. During the period of study, the experimental group was taught by incorporating the recordings from audiovisual mass media news materials. In contrast, the control group was taught using several non-news listening materials including commercial listening comprehension materials. The results of the study indicated that the experimental group participants made more progress in their listening than the control group. Baker (1996) also found out that the use of TV news in EFL classes can enhance listening comprehension.

To go further, the possibility of using audiovisual news reports as authentic language materials for lower proficiency levels of EFL/ESL learning was the focus of a research conducted by Mackenzie (1997). The study rejected the assumption that because the reporters speak too fast, the content is too complex, and the vocabulary is too difficult, TV and radio news cannot be used at lowest levels of EFL situations. As a matter of fact, Mackenzie (1997) highlighted the point that with the careful selection of TV news items and applying some simple techniques, news reports can be used even at elementary or intermediate levels. In order to support his claims, Mackenzie (1997) shared his own experience of using TV news stories with careful selection of the news items and some techniques with elementary and intermediate levels at the Simul Academy in Japan. However, no empirical evidence was provided to prove that low level language learners can also improve their language proficiency or a particular skill through exposure to audiovisual news materials.

The effectiveness of exposure to audiovisual news materials and non-news materials on improving the speaking proficiency of intermediate language learners was also the focus of a more recently conducted study by Bahrani and Tam (2011). The research was conducted with 60 intermediate language learners who were divided into two groups as group one and group two. During the experiment, the participants in the first group were exposed to authentic materials from audiovisual news while the second group of participants was exposed to non-news materials. The findings of the research indicated that exposure to audiovisual news promotes intermediate language learners' speaking proficiency more than exposure to non-news materials.

Unlike news, the pedagogical value of cartoons as authentic language materials has been the focus of limited number of anecdotal studies (Clark, 2000; Doring, 2002; Rule & Ague, 2005). In an anecdotal study conducted by Clark (2000), it was highlighted that cartoons can engage the attention of the learners and present information in a non-threatening atmosphere. Besides, cartoons have the potential to encourage thinking processes and discussion skills (Clark, 2000). Another study was carried out by Doring (2002) focusing on the effect of exposure to cartoons on language learning. The results of the study were indicative of the fact that the language learners who had exposure to cartoons could produce oral answers that were very proactive and interesting in different discussions held in the classes. Moreover, the discussions were rich and the students had high confidence. It seems that the high confidence that the language learners acquired was due to exposure to cartoons which created low affective filter atmosphere for learning.

In the same line, Rule and Ague (2005) conducted a study providing evidence of the students' preferences to use cartoons in language learning. According to Rule and Ague (2005), cartoons are preferred because they create low affective filter atmosphere which causes high degree of motivation. This high confidence and motivation achieved through exposure to cartoons has the potential to enhance the memory (Rule & Ague, 2005). Rule and Ague (2005) also claimed that the students who use cartoons can improve different language skills and achieve higher test scores. However, they did not specify which language skill(s) can be improved through great amount of exposure to cartoons.

Besides audiovisual news and cartoons, films as another source of authentic language input has also been investigated by some researcher (Chapple & Curtis, 2000; Gebhardt, 2004; Heffernan, 2005; Ryan, 1998). Chapple and Curtis (2000) carried out a research on the utilization of different films as authentic and appropriate teaching materials in content-based instruction approaches in EFL classrooms in Southeast Asia. The study emphasized how intrinsically motivating materials such as films along with content-based instruction can help to improve language learning. According to Chapple and Curtis (2000), films have many cross-cultural values, provide excellent basis for the development of critical thinking skill, provide a rich source of content for language learners, and offer linguistic diversities. These features of films along with the motivating feature facilitate language learners' oral communication (Chapple & Curtis, 2000). Similar studies were also conducted by Ryan (1998), Heffernan (2005), and Gebhardt (2004) focusing on enhancing motivation and language learning through the use of films in language classrooms. However, neither of the studies provided empirical evidence to support this claim.

In a nutshell, wide arrays of audiovisual mass media programs are available as authentic sources of language input for SLA in EFL and ESL contexts. What can be concluded from the related studies can be summarized in the following 3 parts: 1) The claims made by the studies conducted regarding the pedagogical values of the use of news, cartoons, and films as authentic audiovisual mass media programs to provide the necessary language input for SLA are mostly anecdotal, 2) most of the studies have investigated psycholinguistic aspects of various audiovisual mass media programs. For example, cartoons and films can enhance language learning through creating low affective filter atmosphere, and 3) few studies have provided limited empirical evidence on the effect of utilizing audiovisual mass media news in language learning classrooms. However, the findings are limited to improving only the listening skill through exposure to audiovisual mass media news at the intermediate or advance level classes. In fact, language proficiency as a whole or various language skills have not been investigated particularly at low level of language proficiency.

Research questions

In the view of the above, the present research was set to answer the following three questions:

1. To what extent, does exposure to audiovisual news improve low level language learners' language proficiency?
2. To what extent, does exposure to cartoons improve low level language learners' language proficiency?
3. To what extent, does exposure to films improve low level language learners' language proficiency?

Significance of the study

This study will guide low level EFL/ESL learners on ways to improve their language proficiency that is through effective exposure to news, cartoons, or films as authentic audiovisual programs from various technologies. The findings may also be important to language teachers, practitioners, and institutions for investment in authentic audiovisual mass media programs for language learning by exposing the low level language learners more than before to news, cartoons, or films as authentic language input for the enhancement of language proficiency.

METHODOLOGY

Participants

Initially, 107 language learners aged from 18 to 23 majoring in teaching English as a second language (TESL) including both males and females went through the research voluntarily. Then, a smaller population of 60 low level language learners was selected out of the initial 107 participants based on a sample International English Language Testing System (IELTS) language proficiency test which was also considered as a pre-test. The 60 low level participants were divided into three groups of equal number randomly.

Instruments and Materials

The first instrument to gather the necessary data for the present research was a set of two parallel IELTS language proficiency tests. Prior to the study, the sample IELTS language proficiency tests were verified to be parallel to ensure the internal validity of the findings. IELTS test was selected to measure the language proficiency of the participants because it was one of the valid standardized tests which the researchers could utilize.

For the audiovisual materials used as authentic language input, news, cartoons, and films were selected as 3 types of authentic audiovisual programs. The first set of materials which was given to group one to work on in the classroom was a collection of 10 hours of authentic audiovisual news programs from CNN, BBC, Press TV, and CBS. Different channels, both British and American English programs, were selected to focus on both forms of English. The collection of the news programs consisted of news headlines, sports news, economy news, political news, scientific news, and social news. Moreover, the most important criterion for selecting various news programs was the content and linguistic difficulty (Bell, 2003). Efforts were made to select non-episodic news programs which do not require prior knowledge of the story. Moreover, the researcher tried to select various news programs with almost the same speech-rate. The second set of materials which was given to group two to work on in the classroom was a collection of 10 hours of various cartoons from *Shrek 1*, *Ice Age 1*, and *Toys*. These cartoons were selected because of their interesting stories. The third set of materials given to group three was a collection of 10 hours of various films (such as *Matrix and Final destination*) Similar to the news programs, the content of the second and third collections also contained both British and American forms of English.

Data Collection Procedure

The present research employed quantitative method and pre-post test design. The procedure consisted of the following stages:

Verifying the instruments

The first step to take before the study was carried out was to verify that the two sample IELTS language proficiency tests were parallel to assure the internal validity of the data obtained from the pre-post tests. According to Bachman (1990), in order for two tests to be considered as parallel, they should measure the same ability or skill(s). In other words, an individual's true scores on one test should be the same as his/her true scores on the other. However, Bachman (1990) highlighted the point that because it is never feasible to know the actual true scores for a given test, the definition of parallel tests in classical measurement theory should be utilized in order to verify that the sample selected tests are parallel. According to the operational definition of parallel tests put forth by Bachman (1990), parallel tests are two tests of the same ability that have the same means and variances when administered to the same group. In the same line, although we may never have strictly parallel tests, we treat the two tests as parallel if the differences between their means and variances are not statistically different (Bachman, 1990).

In view of the above, both sample IELTS language proficiency tests were administered to 10 trial language learners majoring in TESL at a short interval of two weeks. Then, the means and the variances of both tests were calculated separately. Table 1 represents the descriptive analysis of both the tests:

Table 1: Descriptive Statistics related to the administration of the two tests to the same group

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
First Test	10	4.00	6.50	5.217	0.758	0.541
Second Test	10	4.50	7.00	5.350	0.745	0.551

According to the statistical analysis of the data obtained from the administration of both tests to the 10 participants, the means and the variances of both tests were almost the same. This was indicative of the fact that the two sample IELTS tests were parallel. By utilizing the same scores obtained from the administration of both tests to the trial group, the correlation between the first and the second tests was 0.872 which indicated that the two tests were also verified in terms of reliability.

After verifying the sample IELTS tests, the actual data collection procedure of study was conducted. Accordingly, the data collection procedure comprised of two stages: one stage was concerned with the selection of the participants which was the pre-study selection stage and the other stage included the actual data collection from the pre-post tests.

Pre-study selection
The pre-study selection stage was concerned with the selection of the participants for the research. To do so, one of the parallel IELTS language proficiency tests was administered to a population of 107 language learners including both males and females majoring in TESL to select 60 low level language learners. According to IELTS Band score, those who scored 4 or 4.5 out of 9 Band score were selected as low level language learners (entry level).

Data collection from pre-post tests
The data necessary for the present study was obtained from the two parallel IELTS pre-post tests. The duration of the research was 10 weeks. During the experiment, group one had exposure to news materials, group two to cartoons, and group three to films in three separate classes which met 3 hours a week accompanied with some discussion in relation to the viewed programs. In other words, the researchers provided each group of participants with different type of audiovisual mass media program to work on inside the classroom. One of the researchers monitored and ran all the three classes.

After 10 weeks of exposure of group one to news, group two to cartoons, and group three to films, all the participants took the second sample language proficiency test from IELTS as a post-test to find out whether there was any improvement in their language proficiency. After the post-test, the scores of all the three groups gained from pre-test (pre-study selection stage) and post-test were compared by means of a paired sample t-test analysis to determine the differences.

RESULTS AND DISCUSSION
In order to answer the research questions, the scores obtained from the administration of pre-post tests to group one, two, and three were compared statistically by means of a paired sample t-test. The following tables represent the statistical analysis of the pre-post tests scores obtained by the participants in groups one, two, and three.

Table 2: Descriptive statistics related to group one (news) pre-test and post-test results

Groups	N	MEAN	SD	t-test
Group one pre-test	20	4.09	0.64	-1.305
Group one post-test	20	4.16	0.54	P=0.086

T-observed=-1.305 T-critical=1.729 T-observed smaller than t-critical P>0.05

Table 3: Descriptive statistics related to group two (cartoons) pre-test and post-test results

Groups	N	MEAN	SD	t-test
Group two pre-test	20	4.13	0.48	-2.756
Group two post-test	20	5.67	0.53	P=0.013

T-observed=-2.756 T-critical=1.729 T-observed bigger than t-critical p<0.05

Table 4: Descriptive statistics related to group three (films) pre-test and post-test results

Groups	N	MEAN	SD	t-test
Group three pre-test	20	4.12	0.64	-1.824
Group three post-test	20	4.85	0.62	P=0.024

T-observed=-1.824 T-critical=1.729 T-observed smaller than t-critical p<0.05

In relation to group one's performance in the pre-post tests, it should be mentioned that the mean score of the participants in group one in the pre-test was 4.09 out of 9. The mean score rose to 4.16 in the post-test which was indicative of the fact that minor progress was made in their performance. Using the statistical analysis of a paired sample t-test for group one, it was observed that the t-critical (1.729) was higher than the observed (-1.305). This means that the improvement was not statistically significant (p>0.05). The point should be mentioned that it makes no difference whether the t-observed is positive or negative in reading the table. Because the distribution is symmetrical, the minus quantities would be the same (Hatch & Farhady, 1982).

In relation to the data obtained from the pre-post tests by group two, the mean score in the pre-test was 4.13 and in the post-test was 5.67. The major difference can be interpreted as improvement. However, in order to find out whether the change in the mean score can be interpreted as a significant improvement or not, a statistical analysis of a paired sample t-test was run for the scores of group two. The results of the paired sample t-test indicated that the t-critical (1.729) was smaller than the t-observed (-2.756) which was indicative of the fact that the change in the mean score was high to lead to a significant improvement ($p<0.05$).

The final analysis of the data was carried out for the results obtained from the pre-post tests for group three. Accordingly, the mean score in the pre-test was 4.12 and in the post-test was 4.85. This positive change in the mean which was more than that of the first group and less than that of the second group can be interpreted as improvement. However, in order to find out whether the change in the mean score can be interpreted as a significant improvement or not, a statistical analysis of a paired sample t-test was run also for the scores of group three. The results indicated that the t-critical (1.729) was slightly smaller than the t-observed (-1.824) which indicated that the change in the mean score led to language proficiency improvement.

The results of the statistical analysis of the paired sample t-tests for the data obtained from the pre-post tests scores of all the three groups were indicative of the fact that groups two and three i.e. cartoons and films respectively, did improve their language proficiency during the period of the research and this leads to the conclusion that it was probably due to the type of audiovisual exposure. In contrast, the participants in group one who had exposure to news did not significantly improve their language proficiency.

More particularly, in relation to the first research question about the effectiveness of exposure to news on developing low level language learners' language proficiency, the findings proved that exposure to audiovisual news did not significantly improve the language proficiency of low level language learners. This sheds more light to the findings of previous studies (Bahrani & Tam, 2011; Baker, 1996; Blachford, 1973; Brinton & Gaskill, 1978; Mackenzie, 1997; Poon, 1992) which found that audiovisual news as a type of authentic language input has proved effective in developing language learning of only the intermediate or advance level language learners. In other words, the results obtained by the present research do not support the pedagogical value of audiovisual news as authentic language input for low level language learners. This result is probably due to what Martinez (2002) put forth regarding the disadvantages of incorporating authentic language materials in low level language proficiency classes. He emphasized that beginner or low level language learners may have a hard time interpreting what they hear or read because of the mixed structures used in authentic materials. Indeed, the utterances of news programs may include a lot of incomprehensible language input that the low level language learners may have difficulty comprehending and internalizing. Bacon and Finneman (1994) also highlighted the point that language learners may encounter comprehension difficulties with the use of authentic language materials.

Another probable reason behind this might be traced back to the type of specialized vocabulary items which are used in some types of authentic materials such as the news genre and the speed of the speech. According to Martinez (2002) and Widdowson (1996), low level language learners have difficulty interpreting and understanding some types of authentic materials because of the difficult vocabularies used. For the current research, the point should be underscored that the researcher did his best to present news episodes which focused on general topics which the language learners had schemata to help them comprehend the information better. Moreover, audiovisual news episodes with normal speech rate were selected. The researcher also provided the first group of language learners with a gloss of specialized vocabulary items. Regardless of all these efforts, the participants in the first group still had problem comprehending the language input of the news. According to the observations of one of the researchers, a few of the participants could get the main idea of the news episodes presented in the classroom. However, most of the difficulty was with the specialized vocabulary items which hindered comprehension. In the case of low level language learners, the recycling feature of vocabulary items in audiovisual mass media news could not ease the comprehension and the internalization of the input for SLA. This finding seems to go against the claim made by Brinton and Gaskill (1978) regarding the effect of recycling vocabulary items in news on comprehension of the news. The findings of the present research also seem to reject the claim made by Mackenzie (1997) that news can be used at low level classes.

Another probable cause for this group of low level participants' insignificant language proficiency improvement could be the higher amount of incomprehensible input received through the news genre. Indeed, exposing low level language learners to more incomprehensible language input than comprehensible language input might hinder language proficiency development.

In relation to the second research question regarding the effectiveness of exposure to cartoons as one type of authentic audiovisual program on improving the language proficiency of low level language learners, the result of the statistical analysis of the paired sample t-test was indicative of the fact that low level language learners could achieve a significant language proficiency improvement through exposure to cartoons. This finding sheds more light to the studies conducted by Clark (2000), Doring (2002), Rule and Ague (2005) which claimed that cartoons can create low affective filter atmosphere and increases motivation which boost language development. In the same line, the present research provided solid empirical evidence to support this claim. During the research period, the participants in the second group showed less difficulty comprehending the information provided in the cartoons. This could be due to the fact that the language input and more particularly the vocabulary items which are used in most of the cartoons are not specialized. Unlike audiovisual news, the language input embedded in cartoons might have included less incomprehensible input. Exposure to this optimum level of incomprehensible input might have created fewer difficulties for comprehension and internalization for the participants of this group. As a result of less comprehension difficulties, there is a high probability that they could acquire new aspects of the language which contributed to their language proficiency improvement. It should be noted as well that the participants in this group also showed great interest in watching the selected cartoons and participating in the follow up discussion about the content. As a result of greater probability of internalizing the language input embedded in the type of program which they had exposure to, they could develop their language proficiency.

Finally with regard to the third research question about the effectiveness of exposure to films as one type of authentic audiovisual program on improving the language proficiency of low level language learners, the result of the statistical analysis of the paired sample t-test for group three revealed that low level language learners could also improve their language proficiency through exposure to films. Of course, the third group improvement was less than that of the second group. Supported by empirical evidence, the finding of the present research corroborates previous anecdotal studies carried out by Chapple and Curtis (2000), Gebhardt (2004), Heffernan (2005), and Ryan (1998) regarding the pedagogical value of utilizing films to develop language learning. A probable cause might be that, similar to cartoons, the utterances in films utilize less specialized vocabulary items. This could probably boost the comprehension and internalization of the content of the films. However, although both the second and the third groups improved their language proficiency, the results of the data analysis showed that low level language learners can benefit more from exposure to cartoons that films.

CONCLUSION

With the ever-increasing developments in audiovisual mass media technologies, various audiovisual mass media programs are not limited to entertaining the audience anymore. In fact, some of the audiovisual mass media programs can be utilized as pedagogically valuable authentic sources of language input for language learning. In this regard, the present research was set out to find out the most effective type of audiovisual mass media program among news, cartoons, and films for low level language learners to further enhance their language proficiency.

Accordingly, although previous studies (Bahrani & Tam, 2011; Baker, 1996; Blachford, 1973; Brinton & Gaskill, 1978; Mackenzie, 1997; Poon, 1992) proved that audiovisual news are pedagogical valuable sources of potential language input for intermediate or advanced levels language learners to improve their language proficiency, the findings of the present research were indicative of the fact that low level language learners did not benefit significantly from having exposure to news programs. In contrast, low level language learners showed great interest and benefitted significantly when received input from cartoons and films. They showed more preference to cartoons and films probably due to the motivating feature of such materials (Clark, 2000; Doring, 2002; Heffernan, 2005; Gebhardt, 2004; Rule & Ague, 2005; Ryan, 1998).

In conclusion, although audiovisual programs generally are a great source of authentic language input for teaching/learning purposes, more caution should be given to the selection of the type of audiovisual program for low level proficiency learners. Cartoons and films with good story lines seem to motivate the learners to absorb the language input better and have a significant effect on the language improvement.

Finally, in relation to the limitations and the findings of the present research, the point should be highlighted that the participants of the present research were low level language proficiency. Hence, different results might be obtained if the study is conducted with intermediate or advanced levels language learners particularly by exposing them to cartoons and films. Another point to be considered is that the study was conducted with news, films, and cartoons as three types of audiovisual programs. The need to conduct other studies which consider the effectiveness of exposure to other types of audiovisual programs on language proficiency development is warranted.

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COMMUNICATION BARRIERS IN QUALITY PROCESS: SAKARYA UNIVERSITY SAMPLE

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ABSTRACT
Communication has an important role in life and especially in education. Nowadays, lots of people generally use technology for communication. When technology uses in education and other activities, there may be some communication barriers. And also, quality process has an important role in higher education institutes. If a higher education institute tries to pursue a quality management system, some problems may occur in this process. This study aims to reveal the communication problems faced by the teaching staff in quality processes.

INTRODUCTION
Global society is now in an information century. In this century, people are witnessing communication revolution.In this revolution, the communication technologies have been developing very fast. Especially Web 2.0 tools and other communication tools via internet get people together online (Isbulan, 2011). This development has altered the structure of education system.Especially in the quality processes people need clear and understandable communication tools. Creating effective communication among people and establishing contacts are the survival needs of human being. People cannot live without communicating (Isman, et al., 2003).New education system is more efficiency and effective because teachers and students use new technologies for teaching and learning. Modern information technology now affords organizations, businesses, individuals, and institutions of learning a variety of options for engaging in communication and information exchange (Kiyici, 2011).Using technology in the classroom sometimes creates some communication barriers for students and teachers. According to Berge & Collins (1995), certainly there are barriers to technologically rich learning environments: faculty reward structures, high front-end costs, training, equal access, student support, administrative, technical issues, copyright issues, and faculty resistance to name a few.

Knapp & Glenn revealed that teachers who teach with technology:
- Expect more from their students and expect their students to take more care in preparing their work
- Can present more complex material
- Believe students understand more difficult concepts
- Can meet the needs of individual students better
- Can be more student-centered in their teaching
- Are more open to multiple perspectives on problems
- Are more willing to experiment
- Feel more professional because, among other things, they spend less time dispensing information and more time helping students learn (Knapp, & Glenn, p. 17, 1996).

As the quality refers having product or service differentiation within a competitive environment, higher education institutions need to be involved in quality improvements by service differentiation to gain competitive advantage (Aksal, F. 2009). With technology, especially communication and communication tools has gained lots of developments. These developments have facilitated communication. At the same time, with technology, quality process has lots of developments. Many universities in the world are trying to implement quality processes. They also want to increase the quality of education and alumni. To do that, learning and teaching environment at the universities should be redesigned because there is a big diversity among students. Higher education institutes should offer different programs for their diverse students because each student would like to prefer to take different courses for their future. In other word, there should be a flexible curriculum. If they take their "most wanted" courses, they will be ready to compete with other national and global alumni all over the world to find a good job. If their alumni find a good job in the global market, they will be "most wanted" higher education institute. The students are universities costumers. Their demands should be taken into account by universities. In addition, the universities should take students' attention in order to get more students applications.

To be able to take students' attentions, higher education institutes should know Quality management models. These models may be appropriate for different global universities. Becket & Brookes (2008) explain Quality management models in Table 1.

Table 1: Quality management models

Model	Definition
TQM	A comprehensive management approach which requires contribution from all participants in the organization to work towards long-term benefits for those involved and society as a whole.
EFQM excellence model	Non-prescriptive framework that establishes nine criteria (divided between enablers and results), suitable for any organization to use to assess progress towards excellence.
Balanced scorecard	Performance/strategic management system which utilises four measurement perspectives: financial; customer; internal process; and learning and growth.
Malcolm Baldridge award	Based on a framework of performance excellence which can be used by organizations to improve performance. Seven categories of criteria: leadership; strategic planning; customer and market focus; measurement, analysis, and knowledge management; human resource focus; process management; and results.
ISO 9000 series	International standard for generic quality assurance systems. Concerned with continuous improvement through preventative action. Elements are customer quality and regulatory requirements, and efforts made to enhance customer satisfaction and achieve continuous improvement.
Business process re-engineering	System to enable redesign of business processes, systems and structures to achieve improved performance. It is concerned with change in five components: strategy; processes; technology; organization; and culture.
SERVQUAL	Instrument designed to measure consumer perceptions and expectations regarding quality of service in five dimensions: reliability; tangibles; responsiveness; assurance and empathy; and to identify where gaps exist.

Some of these models are more suitable for industrial companies. But, all these models give more ideas for higher education institutes to establish their own quality management system.

Higher education continues to be acknowledged as one of the primary policy responsibilities of European nation-states. However, national higher education arrangements are increasingly affected by international pressures, and the higher education sector in Europe is at present significantly influenced by two European level policy developments: firstly, the higher education reforms initiated by the Bologna Process, and, secondly, the research aspects of the European Union's Lisbon Strategy for jobs and growth (Keeling, 2006).Briefly, the lead up to the 'BolognaProcess' began in 1998, when ministers in charge of higher education from France, Germany, Italy and the United Kingdom (UK) signed the 'Sorbonne Declaration' which called for the harmonization of higher education qualification systems in Europe. The Bolognaprocess was launched the following year when representatives from 29 EU countries signed the 'Bologna Declaration' and committed themselves to reform their own higher education system and achieve convergence at European level by 2010 (Bologna Decleration, 2009).One of the key differences in the way the Bologna process works lies in how this combination of EU institutions, expert groups and lead organizations was able to achieve rapid progress on a range of issues including harmonization of degree recognition that had in some cases been taxing the EU for a considerable time (Furlong, 2005).

The Bologna Process of creating the European Higher Education Area and the simultaneous emergence of the European Research Area can be viewed as two sides of the same coin: that of the redefinition of the roles, missions, tasks, and obligations of the institution of the university in Europe's rapidly changing and increasingly market-driven and knowledge-based societies and economies (Marek, 2004). For example The Engineering Education Community in Europe as represented by the European Society of Engineering Education (SEFI) and the Conference of European Schools for Advanced Engineering Education (CESAER) have repeatedly expressed that in general they support the aims and objectives of the Bologna Process (Heitmann, 2005). However, the higher education institutes should create their own quality management model according to the Bologna Process and communication skills have very important place in this issue.

Purpose

This study aims to reveal the communication problems faced by the teaching staff in quality processes. After determining the technology barriers faced by the teaching staff, it was tried to investigate if there is a communication barriers according to teaching staffs';

- Gender
- Computer education
- Academic title
- Computer usage experiences
- Internet usage experiences

Data Collection Tool
In order to collect research data a survey was used which was developed by Isman and others in 2008. Survey was re-organized according to the quality process itemsafter having obtained permission from the researchers. The data collection tool used in the research consisted of 6 questions defining demographic characteristics and processes, 16 questions measuring tool identifying barriers faced by instructors within the framework of quality processes.

The data collection tool was distributed to the instructors by hand and the ones who were willing to contribute were given 3 days for submission. The 136 questionnaires that were returned from the faculty members at the end of the data collection process were used as the source of the data in research.

Findings

Table 2. Demographic characteristics of participating teaching staff

		Frequency	Percent
Gender	Male	85	62.5
	Female	51	37.5
Computer training	Yes	83	61.0
	No	47	34.6
Position	Prof.Dr.	12	8.8
	Assoc.Prof.Dr.	15	11.0
	Assist.Prof.Dr.	43	31.6
	Lecturer	11	8.1
	RA / TA	55	40.4
Faculty	Faculty of Education	34	25.0
	Faculty of Science	23	16.9
	Faculty of Fine Arts	7	5.1
	Faculty of Medicine	9	6.6
	Law School	3	2.2
	Faculty of Engineering	18	13.2
	Faculty of Theology	1	0.7
	Faculty of Economics and Administrative Sciences	11	8.1
	Faculty of Technology	3	2.2
	Faculty of Computer and Information technology	5	3.7
	Faculty of Business Administration	17	12.5
	School of Physical Education and Sports	3	2.2

Demographic characteristics of instructors participating in the survey are summarized in Table 1. According to the research results of the instructors participating in the survey, 62.5% were male and 37.5% were female, 61% of the instructors who participated in the research had computer training while 34.6 % did not have computer training.

The distribution of titles revealed that, of the instructors participating in the study, 8.8%, were professors, 11% were associate professors, 31.6% were assistant professors, 8.1% were instructors and 40.4% were research assistants. The distribution of the instructors who participated in the research were employed in the faculties as follows. Faculty of education: 25%, faculty of arts and science: 16.9%, faculty of engineering: 13.2%, faculty of economics and administrative sciences: 12.5%.

Table 3. Statistical information about the lecturers' experience of using computers and the Internet

	experience of using computer	experience of using the internet
Mean	15.59	12.41
Median	15.00	12.00
Std. Deviation	4.547	3.078
Minimum	6	5
Maximum	28	20

According to table 2, faculty members participating in the survey are summarized in descriptive statistics about their experience in using computers and the internet. Table 2 shows that faculty members participating in the survey have an average of 15.59 years of experience of computer use and 12.41 years of experience of internet use. In addition, when looking at the experience of using the computer at extreme values,the least experienced computer user had 6 years of experience while the most experienced one had 28 years of experience and the least experienced internet user had 5 years of experience while the most experienced one had 20 years.

Table 4.Responses to the items of the questionnaire according tothe t-test results of gender

	Items	t	df	p
1	I believe that I don’t take an effective education about quality process	1,367	132	0,174
2	I believe that there are no well organizations to catch different units during quality process	0,830	132	0,408
3	I believe that there is a lack of incentives and release time during quality process.	0,288	131	0,774
4	I believe that female faculties have positive attitudes towards quality process.	0,160	129	0,874
5	I believe that I feel socially isolated because of having lack of person to person contact during quality process.	0,132	132	0,895
6	I believe that I have negative attitudes to quality process.	0,897	132	0,371
7	I believe that I have no connection with my friends during quality process.	1,846	131	0,067
8	I believe that I need non-verbal feedback (movie, presentation etc.) communication during quality process.	0,672	131	0,503
9	I believe quality process irritates me.	-0,305	132	0,761
10	I believe that I don’t like to explore institutional innovations during quality process.	1,633	132	0,105
11	I believe that the structure of culture of society in where I live blocks quality process.	0,207	132	0,836
12	I believe that writing guide book about quality process prevents me to adopt quality process.	0,853	132	0,395
13	I believe that gender plays a key role in quality process.	0,201	128	0,841
14	I think ethics issues are not considered in quality process.	-0,600	130	0,550
15	I believe that my belief affects my institution quality process.	0,326	128	0,745
16	I believe that I don’t understand the terms about quality process.	-0,240	128	0,811

After t-test values analyses it is stated that there are no significant differences ($p<,05$) between gender andresponses given to the items.

Table 5.Responses to the questionnaire items according to the t-test results of receiving computer training.

	training	N	Mean	T	df	p
I believe that there are no well organizations to catch different units during quality process.	Yes	83	3,70	3,856	127	0,000
	No	46	3,00			
I believe that there is a lack of incentives and release time during quality process	Yes	83	3,90	4,256	127	0,000
	No	46	3,13			
I believe that I feel socially isolated because of having	Yes	83	2,91	2,683	127	0,008

lack of person to person contact during quality process.	No	46	2,85			
I believe quality process irritates me.	Yes	83	2,98	2,143	127	0,034
	No	46	2,50			

The t-test was administered in order to determine whether or not the lecturer responses given to the questionnaire revealed any differences according to whether computer training was received or not. According to t -test results, the responses of the instructors differed in onlyfour items according to whether computer training was received or not. T-test results revealed that participants who received computer training believe that “there are no well organizations to catch different units during quality process” than participants who did not receive computer training within the framework of quality processes (t(127)=3,856,p=0.000). It was witnessed that participants who received computer training believe that “there is a lack of incentives and release time during quality process” than participants who did not receive computer training within the framework of quality processes (t(127)=4,256,p=0.000). And also t-test results revealed that participants who received computer training believethat“they feel socially isolated because of having lack of person to person contact during quality process” (t(127)=2,683,p=0.008) and “believe quality process irritates them” (t(127)=2,143,p=0.034) than participants who did not receive computer training within the framework of quality processes.

Table 6.Responses to the items of the questionnaire according tothe t-test results of computer experience

	Items	t	df	p
1	I believe that I don’t take an effective education about quality process	0,876	128	0,383
2	I believe that there are no well organizations to catch different units during quality process	0,906	128	0,367
3	I believe that there is a lack of incentives and release time during quality process.	0,418	127	0,677
4	I believe that female faculties have positive attitudes towards quality process.	0,302	126	0,763
5	I believe that I feel socially isolated because of having lack of person to person contact during quality process.	1,753	128	0,082
6	I believe that I have negative attitudes to quality process.	0,134	128	0,894
7	I believe that I have no connection with my friends during quality process.	0,927	128	0,356
8	I believe that I need non-verbal feedback (movie, presentation etc.) communication during quality process.	0,740	127	0,461
9	I believe quality process irritates me.	0,947	128	0,345
10	I believe that I don’t like to explore institutional innovations during quality process.	0,039	128	0,969
11	I believe that the structure of culture of society in where I live blocks quality process.	0,789	128	0,432
12	I believe that writing guide book about quality process prevents me to adopt quality process.	2,089	128	0,059
13	I believe that gender plays a key role in quality process.	0,594	125	0,554
14	I think ethics issues are not considered in quality process.	1,523	127	0,130
15	I believe that my belief affects my institution quality process.	0,475	124	0,636
16	I believe that I don’t understand the terms about quality process.	1,000	124	0,319

After t-test values analyses it is stated that there are no significant differences ($p<,05$) between computer experiencesand responses given to the items.

Table 7.Responses to the items of the questionnaire according tothe t-test results of internet experience

	Items	t	df	p
1	I believe that I don’t take an effective education about quality process	0,460	128	0,646
2	I believe that there are no well organizations to catch different units during quality process	0,631	128	0,529
3	I believe that there is a lack of incentives and release time during quality process.	0,036	127	0,971
4	I believe that female faculties have positive attitudes towards quality process.	0,473	126	0,637
5	I believe that I feel socially isolated because of having lack of person to person contact during quality process.	0,433	128	0,666
6	I believe that I have negative attitudes to quality process.	0,444	128	0,658
7	I believe that I have no connection with my friends during quality process.	1,144	128	0,255

8	I believe that I need non-verbal feedback (movie, presentation etc.) communication during quality process.	1,080	127	0,282
9	I believe quality process irritates me.	0,234	128	0,815
10	I believe that I don't like to explore institutional innovations during quality process.	0,753	128	0,453
11	I believe that the structure of culture of society in where I live blocks quality process.	0,024	128	0,981
12	I believe that writing guide book about quality process prevents me to adopt quality process.	0,124	128	0,901
13	I believe that gender plays a key role in quality process.	0,266	125	0,791
14	I think ethics issues are not considered in quality process.	0,780	127	0,437
15	I believe that my belief affects my institution quality process.	1,021	124	0,309
16	I believe that I don't understand the terms about quality process.	0,102	124	0,919

After t-test values analyses it is stated that there are no significant differences (p<,05) between internet experiencesand responses given to the items.

Table 8. Responses to the items of the questionnaire according to one –way anovaTest results of research participants' titles

		Sum of Squares	df	MeanSquare	F	Sig.
I believe that there is a lack of incentives and release time during quality process	BetweenGroups	11,784	4	2,946	2,808	,028
	WithinGroups	134,291	128	1,049		
	Total	146,075	132			
I believe that I feel socially isolated because of having lack of person to person contact during quality process	BetweenGroups	18,102	4	4,526	4,194	,003
	WithinGroups	139,182	129	1,079		
	Total	157,284	133			
I think ethics issues are not considered in quality process	BetweenGroups	25,994	4	6,499	5,619	,000
	WithinGroups	146,885	127	1,157		
	Total	172,879	131			

In order to see if the instructors' responses differed according to their title, one way anova test was administered. According to the Anova Test Results, the responses given by the Instructors differed according to their titles, in 3 items.

In the analysis of the responses given to "I believe that there is a lack of incentives and release time during quality process" which was done according to the instructors'' titles, there were significant differences (F=4,609,p=0,028). In the post-hoc tests (LSD) administered after one way ANOVA, it was apparent that the research assistantssignificantly believethat there was a lack of incentives and release time during quality processthan assistantprofessors.Another significant difference was observed in the analysis performed according to Instructors' titles, "I believe that I feel socially isolated because of having lack of person to person contact during quality process". (F=4,194,p=0,003).). In the post-hoc tests (LSD) administered after one way ANOVA, it was apparent that the research assistants significantly believe that theyfelt socially isolated because of having lack of person to person contact during quality process than assistant professors. In the analysis of the responses given to "I think ethics issues are not considered in quality process" which was done according to the instructors' titles, there were significant differences (F=5,619,p=0,000). In the post-hoc tests (LSD) administered after one way ANOVA, it was apparent that the research assistants significantly believe that ethics issues were not considered in quality process than professors, associate professors, assistant professors and lecturers.

RESULTS

According to research results, the majority of the participants were male. Of the participants 61% of instructors had previously received computer training. The instructors' experiences of using computers and the Internet are analyzed and the instructors are reported to have been using computers for an average of 15:59 years, the internet for 12:41 years. As a result of the statistical analysis on the 16 item assessment tool, the t-test analysis revealed there are no significant differences according to gender. Analysis carried out according to receiving computer training or not, showed significant differences in only 3 items.T-test results revealed that participants who received computer training believe that "there are no well organizations to catch different units during quality process", "there is a lack of incentives and release time during quality process" and "they feel socially isolated because of having lack of person to person contact during quality process" than participants who did not receive computer training within the framework of quality processes. In The One Way ANOVAconducted according to the titles of instructors indicated significant differences in three items. In these items research assistants believe that there was a lack of incentives and release time during quality process, that theyfelt socially isolated because of having lack of person to person contact during quality process and ethics issues were not considered in quality process.

According to the research results, the instructors' perceptions of the barriers did not differ widely according to gender, computer experience and experiences of the internet. It is suggested that future research topics related to the perceptions of barriers faced by the teaching staff within the framework of quality processes should obtain the views of instructors explained qualitatively and studies should be conducted by selecting a method of qualitative research.

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COMPARISONS OF LEARNER-GENERATED VERSUS INSTRUCTOR-PROVIDED MULTIMEDIA ANNOTATIONS

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ABSTRACT
The purpose of this study was to explore the effectiveness of using learner-generated and instructor-provided multimedia annotations on foreign language reading comprehension and attitudes. The four research questions are: (1) what are the effects of using different multimedia annotations on reading comprehension for learners of different cognitive learning styles (field-dependent and field-independent)? (2) What are the effects of using different multimedia annotations on reading comprehension for learners with different learning abilities (higher-level and lower-level)? And (3) what are learners' attitudes toward using a multimedia annotation system? The results of this study are listed as follows: First, for reading comprehension, the learner-generated annotation group performed better than the instructor-provided group, no matter which cognitive learning style they were. Second, higher-level learners with learner-generated annotation performed better than those with instructor-provided annotation. However, the difference between lower-level learners with learner-generated annotation and those with instructor-provided annotation was not significant. Finally, learners had positive attitudes toward multimedia annotation use and thought text annotation was the most useful of the different types.

INTRODUCTION

Annotation refers a note that is made while reading any form of text (Chen, Hwang, & Wang, 2012). The behavior of making marks on reading material is important in traditional learning activities (Hwang, Wang, & Sharples, 2005). There is a great deal of research showing that annotation can facilitate reading comprehension (Hwang, Wang, & Sharples, 2007; Pan, 2006; Sung, 2007), including that of second language (L2) learners (Widdowson, 1984). Roby (1999) divided annotation into two types: learner-generated and instructor-provided. Learner-generated annotation refers to annotations that are made by the learners themselves when they want to comprehend the reading texts. It can help remind them of the content or the significant points of the reading materials. However, learners may miss some important information or make mistakes while making annotations by themselves.

Instructor-provided annotation is made by experts or instructors. It provides an efficient way for learners to acquire unfamiliar but important knowledge more easily. The advantage of instructor-provided annotation is that it provides more comprehensive and more correct information about the texts. It can also help less-able learners perform better. The disadvantage of instructor-provided annotation is that the annotation provided by the professional may not induce learners' interest (Ariew & Ercetin, 2004; Akbulut, 2007a; Akbulut, 2007b; Akbulut, 2008; Chun, 2001; Saker & Ercetin, 2005).

With the rapid development of technology, language learners have many opportunities to receive online reading information as hypertext with multimedia via the Internet (Ariew & Ercetin, 2004). As a result, how readers can annotate online reading materials has attracted considerable interest. Previous researchers have attempted to provide multimedia annotation tools which enable readers to make marks on online reading materials. Multimedia annotation refers to computer-based applications that provide annotation through multiple types of hypermedia, such as text, audio, video, graphics, and animation (Sakar & Ercetin, 2005).

In terms of reading comprehension, there are many factors that influence learners' reading comprehension, including annotation types (Ariew & Ercetin, 2004; Akbulut, 2007a Saker & Ercetin, 2005; Akbulut, 2008), cognitive learning styles (Akbulut, 2007a; Akbulut, 2008; Salmani-Nodoushan, 2005; Vivaldo-Lima, 1997), and learners' reading proficiency ability (Ariew & Ercetin, 2004; Akbulut, 2007b).

For annotation types, some studies have shown that learner-generated multimedia annotation (Hwang, Wang & Sharples, 2007) or instructor-provided multimedia annotation (Lomicka, 1998; Sakar & Ercetin, 2005) have a positive influence on facilitating reading comprehension. Vivaldo-Lima (1997) pointed out that there was a positive and highly important correlation between cognitive learning styles and reading comprehension. According to Salmani-Nodoushan (2005), cognitive learning styles can be divided into field-independence (FI) and field-dependence (FD). However, the result of Hwang, Wang and Sharples's (2007) study showed that there was no relationship between the quantity of annotation and the cognitive learning styles in multimedia reading environments. Proficiency level is also one of the predicators of reading comprehension in multimedia annotation learning environments (Ariew & Ercetin, 2004; Akbulut, 2007b). Hwang, Wang and Sharples (2007) pointed out that the students with higher-level ability made more annotations. However, Chun's (2001) study showed that although the higher-level students looked up fewer words than the lower-level students, the differences between the higher- and lower-level students were not significant.

To sum up, the studies which are available have revealed insufficient and inconclusive results regarding what types of multimedia annotations learners with different cognitive learning styles prefer to use, and what types of multimedia annotations facilitate reading comprehension. Thus, the purpose of the present study was to explore the effectiveness of using different multimedia annotations (learner-generated vs. instructor-provided) on English reading among different characteristics of learners (cognitive learning styles and reading proficiency levels). The specific research questions were as follows:

- Q1 What are the effects of using different multimedia annotations on reading comprehension for learners of different cognitive learning styles?
- Q2 What are the effects of using different multimedia annotations on reading comprehension for learners with different learning abilities?
- Q3 What are learners' attitudes toward using a multimedia annotation system?

RESEARCH BACKGROUND

Reading and annotation

According to Brown (2007), reading ability will be developed best in association with appropriate reading strategies. Led by Goodman's (1970) work, bottom-up and top-down processing became two distinctive reading methodologies. In terms of bottom-up processing, readers must first recognize linguistic signals to decode the texts. The linguistic signals include letters, morphemes, syllables, words, phrases, grammatical cues, and discourse markers. On the other hand, top-down processing refers to the fact that readers draw on their intelligence and experiences to understand texts.

More recent research on reading has shown that a combination of bottom-up and top-down processing, what has been called the interactive reading model, is more appropriate (Akbulut, 2008; Chun & Plass, 1997). "This model takes into account the contribution of both text-driving features (i.e., decoding of the text) and reader-driving features (i.e., interpretation based on background knowledge). In such an approach, a weakness in one area can be compensated for in another area in successful reading" (Akbulut, 2008, p.40).

Multimedia annotation offers various types of annotation, such as text, sound, graphics, video, and animation (Chun, 2001), and one major feature is the fact that it is nonlinear (Yu, Pedrinaci, Dietze, & Domingue, 2012). This means that the information units are networked, and can be processed in various orders. These features conform to the features of bottom-up processing, top-down processing, and the interactive reading model (Yang, Zhang, Su, & Tsai, 2011). Thus, they facilitate the comprehension of the texts simultaneously.

From traditional annotation to multimedia annotation

Traditional annotation means marks made by readers or professionals on reading matters (Hwang, Wang, & Sharples, 2007), which can be presented before or during reading (Hwang, Shadiev, & Huang, 2011). The major functions of traditional annotation are to provide textual information, such as definitions of words, and to offer extra information related to the topic of the text (Ariew & Ercetin, 2004). Because of the rapid development of the Internet and technology, more kinds of multimedia are emerging in traditional annotation (Chen, Hwang, & Wang, 2012; Su, Yang, Hwang, & Zhang, 2010). According to Akbulut (2008), multimedia annotation refers to computer-based applications that provide information in a nonlinear way through multiple types of annotation.

Regarding the comparison between traditional and multimedia annotation, some studies have indicated that multimedia annotation is more efficient than traditional annotation in terms of increasing learners' vocabulary size (Roby, 1991;Kim & Kim, 2012), and reading comprehension (Hwang, Wang, & Sharples, 2007; Lomicka, 1998). Chen (2009), Lomicka (1998) and Hwang, Wang, and Sharples (2007) showed that computerized reading with multimedia annotation promotes a deeper level of reading comprehension than no annotation or traditional annotation which provides only word definitions. Moreover, Lomicka (1998) claimed that those who had access to multimedia annotation generated a greater degree of ability in which learners connect events in a text at a local or global level, and thereby demonstrate comprehension. The results of Chen's (2009) study indicated that students using video annotation perform significantly better on tests than those using picture annotation.

Multimedia annotation has a positive impact on L2 learning and teaching due to its integration of various media (Hwang, Wang, & Sharples, 2007; Pan, 2006; Sung, 2007). According to Sung (2007), multimedia annotation systems have made a great contribution to language learning. First of all, learners have great motivation while using them. They provide learners with an opportunity to use a microphone to record their audio annotation for the content of the learning materials. Such systems also let them make text annotations that can help them review the information they have learned. Moreover, the learners can post some graphics that they think can remind them of the important information.

Theoretical frameworks for instructor-provided and learner-generated annotation

Table 1: Comparison of Two Theories of Multimedia Annotation

Theory	Instructor-provided annotation	Learner-generated annotation
Cognitive load theory	Providing annotation decreases the level of extraneous cognitive processing and allows generative processing.	Generating annotation increases the level of extraneous cognitive processing and limits generative processing.
Activity theory	Providing annotation does not encourage generative processing.	Generating annotation by learners encourages generative processing.

Table 1 summarizes the rationale for instructor-provided annotation on the basis of cognitive load theory and the rationale for learner-generated annotation on the basis of activity theory (adopted from Stull & Mayer, 2007, p.810). According to cognitive load theory, instructor-provided annotation can encourage learners to engage in generative processing by challenging them to see how the linear text was annotated using different modes of annotation, such as text, graphics, and so on, through organizing it into a coherent structure (Plass, Moreno, Brünken, 2010). Thus, learners are less likely to waste cognitive capacity on extraneous processing. Not asking learners to generate annotation does not necessarily encourage generative processing, but rather frees cognitive capacity that can be used for generative processing. In contrast, learner-generated annotation creates extraneous cognitive processing in which learners must focus on how to create annotation themselves, so leaving less capacity for generative processing (Stull & Mayer, 2007). This is the cognitive load theory rationale for learning by viewing.

As for the activity theory rationale for learning by doing, it is based on the claim that learning occurs when learners are encouraged to engage in productive learning activity (de Jong, 2005; Kirschner, Sweller, & Clark, 2006; Klahr & Nigam, 2004; Lillard, 2005; Mayer, 2003, 2004). Constructing annotations by learners can be considered a productive learning activity because the learner must engage in an activity that is related to the instructional objective—making relevant annotations on the text and organizing them into a coherent structure. According to activity theory, learner-generated annotation encourages generative processing, whereas instructor-provided annotation does not. Activity theory predicts that learners who read a text in which they generate their own annotation will perform better on reading quizzes than those who read the text with instructor-provided annotation (Stull & Mayer, 2007). Even though learning by doing appears to be an active treatment, it can inhibit generative cognitive processing if learners become confused as to how to carry out the task. The complexity of the activity may create extraneous cognitive processing which reduces the amount of cognitive capacity available for generative processing.

METHOD

Participants

The participants were 93 students enrolled in two different sections of an English course at a mid-sized university in Taiwan. The two annotation treatments (learner-generated vs. instructor-provided) were each to be assigned to one intact class, but participants had already self selected the class at the beginning of the semester according to their preferences and individual needs.

In order to understand the participants' reading proficiency level, they were required to complete an English proficiency reading pre-test. And then, according to the scores of the test, those whose scores were lower than the average were classified as lower-level learners. Those whose scores were higher than the average were classified as higher-level learners. Participants were also asked to complete a Group Embedded Figures Test (GEFT) to identify whether their cognitive learning styles were field-independent (FI) or field-dependent (FD).

Instruments

Reading material

Three articles included in the high-intermediate proficiency level of an English magazine were selected as the reading materials in this research. The basic vocabulary size required for the readers was 3,000-5,000 words. The magazine was chosen as the teaching material not only in consideration of the articles being novel and lively, but also because they are graded to different English proficiency levels. It was not necessary for the learners to have any pre-knowledge of any specific domain before they could understand the articles.

Pre and post English proficiency tests

The purpose of the pre- and post-tests was to evaluate the subjects' English ability before and after they read the articles. There were 25 reading comprehension test items for each test. Participants whose pre-test scores were higher than the average scores were regarded as higher-level learners. However, those whose scores were lower than the average were regarded as lower-level learners. The reliability of the pre-test was .80. The difficulty level was .56 for the pre-test and .55 for the post-test.

The comprehension questions were meant to test learners' understanding of the implications, meanings, and structures presented. Four types of questions included in the proficiency tests were: (1) factual questions, (2) inference questions, (3) main idea questions, and (4) tone questions. Factual questions are empirical questions-how/why things occur? Unlike factual questions, inference questions do not test learners' knowledge of explicitly-cited facts, but rather their ability to draw conclusions from other information. Main idea questions ask the test taker to identify the passage's overall theme, as opposed to supporting facts and arguments. Tone questions usually ask what the author's tone is, but may occasionally ask for the author's attitude.

Group embedded figures test (GEFT)

The original GEFT test designed by WitKin et al. (1971) was utilized to measure the students' FI/FD cognitive learning styles in this study (Chen, 2005, p.42). The number of simple figures correctly identified on the last two sections constituted the scores ranging from 1 (strongly field dependent) to 18 (strongly field independent). Those whose scores were higher than the average scores of all participants were assigned as having an FI cognitive style, while those whose scores were lower than the average were assigned as having an FD cognitive style.

HyperMedia Editor (HME) annotation software

HyperMedia Editor (HME) is free annotation software designed by Thibeault (2001). Learners can not only use this software to make text annotations, but can also use it to make graphics, audio, video, and web-link annotations. These functions of HME make it easier for learners to review the content they have read, and also help learners to become familiar with the habit of using multimedia-based learning material. The participants received two points for making one annotation.

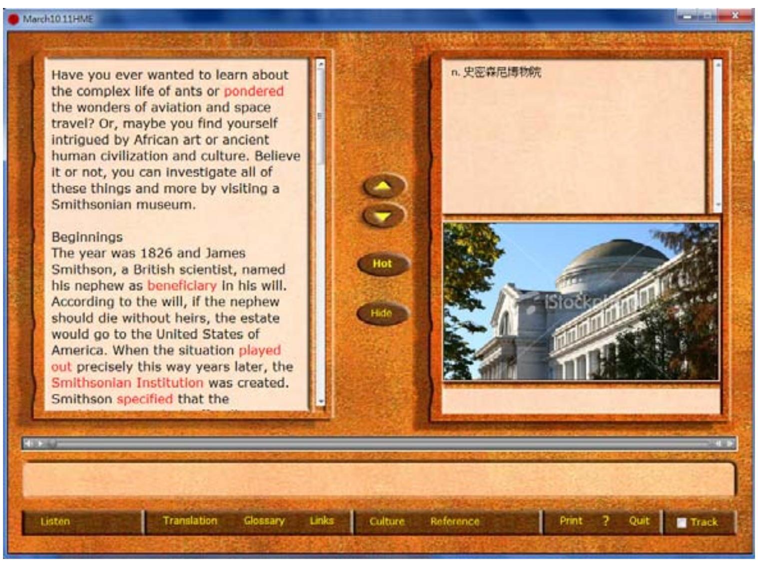

Figure 1: A screen shot showing the interface of HME annotation (adopted from Liu, Chuang, Chen, & Yang, 2010)

Annotation assignments and rubric
The participants in the learner-generated group had to use HME to make multimedia annotations for the three articles as annotation assignments, and then turned in the assignments in class. The highest possible score for each type of annotation (text, graphics, audio, video, and web-link) was 20 points, and the total score of the assignment was 100. The rubric for the annotation assignment is as below (adopted from Yang, 2010, p. 44):

Table 2: The Rubric of Annotation Scores

Annotation type	points	Description
Text Annotation	20	Make one text annotation, get 2 points (make over 10 text annotations, get 20 points)
Graphic Annotation	20	Make one graphic annotation, get 2 points (make over 10 graphic annotations, get 20 points)
Audio Annotation	20	Make one audio annotation, get 3 points (make over 7 audio annotations, get 20 points)
Video Annotation	20	Make one video annotation, get 10% (make over 2 video annotations, get 20 points)
Web-link Annotation	20	Make one web-link annotation, get 4 points (make over 5 web-link annotations, get 20 points)
Total	100	

Annotation attitude questionnaire
The questionnaire was revised from Pan's (2006) study, and included 40 items using a Likert five-point format (Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree) and five personal information items. The main purpose of this questionnaire was to examine the learners' perceived usefulness (N = 15), perceived ease of use (N = 10), and learning satisfaction (N = 15) regarding five functions of HyperMedia Editor (HME), namely text, graphic, audio, video, and web-link annotation, after the experiment.

This paper utilized the SPSS software package to analyze the reliability of the questionnaire. The results are shown in Table 3. From the results, Cronbach alpha values in all dimensions are higher than .70 (total = .98). This shows the reliability of the questionnaire is sufficiently high.

Table 3: Questionnaire dimension and the Cronbach alpha values

#	Dimension	Cronbach alpha value
1	Perceived usefulness of HME	.95
2	Perceived ease of use of HME	.94
3	Learning satisfaction	.96
Total Cronbach alpha value		.98

Procedure
The experiment lasted for eight weeks. The English reading proficiency pre-test was administered in the first week to know participants' reading proficiency (higher-level vs. lower-level), and the result also confirmed that there was no significant difference in the pre-test for the two classes (t = - .83, p = .41). In the second week, the two classes were randomly assigned to the learner-generated annotation group and the instructor-provided annotation group. Both groups were asked to complete the Group Embedded Figures Test (GEFT) to know their cognitive learning styles (FI/FD). The third week took place in the computer lab and lasted two hours. After a one hour demonstration on how to operate the HyperMedia Editor (HME) annotation software, all participants were asked to practice using HME, and the learner-generated annotation group needed to practice how to make multimedia annotations for texts.

From the fourth to six weeks, the participants in the learner-generated annotation group were asked to read one article each week, use HME to make annotations, and then turn in their annotation assignment in class. For the instructor-provided annotation group, participants were asked to use HME to read one article each week in class for general comprehension with annotations provided by the researcher.

In the seventh week, a post-test was conducted in class to know participants reading comprehension of these three articles. The post-test took 20-30 minutes to complete. In the last week, all participants completed the Annotation Attitude Questionnaire to know their attitudes toward HME. Data were reported as means, ranks, and percentage of Likert scales for each annotation function.

RESULTS

Learner-generated annotation had positive effects on both cognitive style learners

To answer RQ1 - What are the effects of using different multimedia annotations (learner-generated vs. instructor-provided) on reading comprehension for learners of different cognitive learning styles (FI vs. FD)? The means and standard deviations for the different multimedia annotations of the learners of the different cognitive learning styles on the reading post-test are reported in Table 2.

Table 4: Descriptive Statistics of Participants' Reading Achievements by Annotation Type and Learning Style

Learning style	Annotation type	*N*	*M*	*SD*
Field-independent	Learner-generated	27	67.41	15.68
	Instructor-provided	30	44.40	18.95
	Total	57	55.91	17.32
Field-dependent	Learner-generated	17	62.35	20.15
	Instructor-provided	19	38.53	16.77
	Total	36	50.44	18.46

Two-way ANOVA was used to analyze the data to identify the interaction between using different multimedia annotations on reading comprehension for different cognitive learning style learners. Overall, the results revealed that learners with different learning styles had no significant difference in their reading achievements no matter what type of annotation they used ($F = .23$, $p = .63$). However, there is a significant difference between learners' reading achievements by annotation type ($F = 50.18$, $p = .00$*). The learner-generated annotation group performed better than the instructor-provided annotation group no matter which cognitive style the learners were.

Table 5: Results of Two-way ANOVA Analysis of Using Different Multimedia Annotation Types on Reading Comprehension for Learners of Different Learning Styles

Source	*SS*	*df*	*MS*	*F*	*p*
Annotation Type	9969.52	1	9969.52	50.18	.00*
Learning Style	53.88	1	53.88	.27	.60
Annotation Type * Learning Style	45.87	1	45.87	.23	.63
Error	17681.79	89	198.67		
Total	269695.49	93			

*$p < .05$

Higher-level learners benefited more from learner-generated annotations

To answer RQ2 - What are the effects of using different multimedia annotations (learner-generated vs. instructor-provided) on reading comprehension for learners with different proficiency levels (higher-level vs. lower-level)? The means and standard deviations of the different proficiency level learners' performance on the annotation assignments by multimedia annotation type are reported in Table 5. The higher-level learners performed better than the lower-level learners no matter which multimedia annotation type they used.

Table 6: *Descriptive Statistics of Participants' Reading Achievement by Annotation Type and Proficiency Level*

Ability	Annotation type	*N*	*M*	*SD*
Lower-level	Learner-generated	37	41.71	18.02
	Instructor-provided	35	38.67	20.69
	Total	42	40.19	19.34
Higher-level	Learner-generated	37	69.95	13.45
	Instructor-provided	14	48.00	11.64
	Total	51	58.98	12.55

Two-way ANOVA analysis revealed that there was a significant interaction between the learners with different annotation types and proficiency levels ($F = 4.79$, $p = .03$*) (see Table 6). Learners with different proficiency levels had significant differences in their reading achievement when they used different types of annotation. The main effects of annotation type ($F = 12.09$, $p = .00$*) and proficiency level ($F = 23.45$, $p = .00$*) are also significant. By running the following two independent t-tests for learners with different proficiency levels, the results indicated that learner-generated annotation has more influence than instructor-provided annotation for higher-level learners on reading comprehension ($t = 5.38$, $p = .00$). However, there was no significant difference found for the lower-level learners.

Table 7: Results of Two-way ANOVA Analysis of Using Different Multimedia Annotation Types on Reading Comprehension for Learners of Different Proficiency Levels

Source	*SS*	*df*	*MS*	*F*	*p*
Annotation Type	1895.70	1	1895.70	12.09	.00*
Ability	3684.35	1	750.34	23.45	.00*
Annotation Type * Ability	750.34	1	156.82	4.79	.03*
Total	269695.49	93			

*$p < .05$

Table 8: Results of Independent Samples T-test: learning achievements of lower level

	Annotation type	*N*	*M*	*SD*	*t*	*p*
Lower-level	Learner-generated	37	41.71	18.02	.36	.72
	Instructor-provided	36	38.67	20.69		
Higher-level	Learner-generated	37	69.95	13.45	5.38	.00*
	Instructor-provided	14	48.00	11.64		

*$p < .05$

Participants favored text annotation than others

Regarding the perceived usefulness part, the main purpose of the questionnaire was to explore participants' attitudes toward the usefulness of HME, including the text, graphic, audio, video, and web-link annotations. The results show that the participants thought the "text" (*M*=3.36), "audio" (*M*=3.35), and "graphic" (*M*=3.33) annotations made their reading more effective during the online reading process. As for their reading performance, the participants thought the "text" (*M*=3.50), "video" (*M* =3.44), and "graphic" (*M*=3.42) annotations did improve it.

Table 9: Analysis of Perceived Usefulness of HME

Annotation Function	*M*	Rank	SD 1	D 2	U 3	A 4	SA 5
Q (1.4.7.10.13): I think the annotation makes reading online become more effective.							
Text	3.36	1	3.5%	8.1%	41.9%	41.9%	4.7%
Graphic	3.33	3	1.2%	10.5%	47.7%	36.0%	4.7%
Audio	3.35	2	2.3%	12.8%	41.9%	33.7%	9.3%
Video	3.23	4	0.0%	15.1%	51.2%	29.1%	4.7%
Web-link	3.17	5	1.2%	19.8%	45.3%	27.9%	5.8%
Q (2.5.8.11.14): I think the annotation was useful during my online reading process.							
Text	3.49	1	2.3%	8.1%	36.0%	45.3%	8.1%
Graphic	3.40	2	2.3%	8.1%	44.2%	38.4%	7.0%
Audio	3.40	2	2.3%	14.0%	32.6%	43.0%	8.1%
Video	3.40	2	0.0%	11.6%	44.2%	37.2%	7.0%
Web-link	3.23	3	1.2%	16.3%	44.2%	34.9%	3.5%
Q (3.6.9.12.15): I think the annotation did improve my online reading performance.							
Text	3.50	1	1.2%	8.1%	36.0%	48.8%	5.8%
Graphic	3.42	3	1.2%	8.1%	44.2%	40.7%	5.8%
Audio	3.36	4	2.3%	12.8%	39.5%	37.2%	8.1%
Video	3.44	2	0.0%	8.1%	45.3%	40.7%	5.8%
Web-link	3.26	5	2.3%	15.1%	45.3%	29.1%	8.1%

Note. SA: strongly agree; A: agree; U: undecided; D: disagree; SD: strongly disagree.

Regarding the results of perceived ease of use of annotation, most of the participants considered that "text", "graphic", and "video" can all be used without training and are easy to use (M > 3.40).

Table 10: Analysis of Perceived Ease of Use of HME

Annotation Function	*M*	Rank	SD 1	D 2	U 3	A 4	SA 5
Q (16.18.20.22.24): I think people can use the annotation without training.							
Text	3.45	1	3.5%	12.8%	30.2%	41.9%	11.6%
Graphic	3.43	2	1.2%	10.5%	40.7%	39.5%	8.1%

Audio	3.35	4	2.3%	18.6%	30.2%	39.5%	9.3%
Video	3.40	3	0.0%	14.0%	40.7%	37.2%	8.1%
Web-link	3.31	5	1.2%	18.6%	36.0%	36.0%	8.1%
Q (17.19.21.23.25): I think the annotation was easy to use.							
Text	3.44	2	5.8%	10.5%	30.2%	40.7%	12.8%
Graphic	3.49	1	1.2%	8.1%	41.9%	38.4%	10.5%
Audio	3.34	4	2.3%	16.3%	34.9%	38.4%	8.1%
Video	3.40	3	0.0%	17.4%	34.9%	38.4%	9.3%
Web-link	3.33	5	1.2%	18.6%	34.9%	37.2%	8.1%

Note. SA: strongly agree; A: agree; U: undecided; D: disagree; SD: strongly disagree.

The learning satisfaction part mainly explored participants' interest, their satisfaction with their learning achievements, and their satisfaction with the interaction in terms of the five annotation functions of HME (text, graphic, audio, video, and web-link annotation). Most of the participants thought that the "graphic" (*M*=3.53), "text" (*M*=3.45), and "video" (*M*=3.44) annotations used in this class did increase their interest in the reading materials. They also experienced more happiness in their learning.

For improving learners' reading achievements and the interaction between learners and the content of the materials, materials with "text", "video", and "graphic" annotations were considered useful. Text annotation was the most popular. The ease of use of text, graphic, and video annotation may be the reason for the result that they were the top three popular kinds of annotation while reading online. On the other hand, audio annotation was considered the least useful.

Table 11: Analysis of Learning Satisfaction

Annotation Function	*M*	Rank	SD 1	D 2	U 3	A 4	SA 5
Q (26.29.32.35.38): Compared with those online materials that did not provide annotation mechanisms, materials with annotation used in this class did increase my interest in the materials. I experienced more happiness in learning.							
Text	3.45	2	1.2%	9.3%	40.7%	40.7%	8.1%
Graphic	3.53	1	0.0%	10.5%	36.0%	43.0%	10.5%
Audio	3.33	5	1.2%	16.3%	39.5%	34.9%	8.1%
Video	3.44	3	0.0%	10.5%	41.9%	40.7%	7.0%
Web-link	3.37	4	0.0%	14.0%	40.7%	39.5%	5.8%
Q (27.30.33.36.39): Compared with those online materials that did not provide annotation mechanisms, materials with annotation used in this class did improve my learning achievements.							
Text	3.53	1	0%	9.3%	34.9%	48.8%	7.0%
Graphic	3.43	3	0%	12.8%	41.9%	34.9%	10.5%
Audio	3.31	5	1.2%	12.8%	44.2%	37.2%	4.7%
Video	3.42	2	0%	10.5%	43.0%	40.7%	5.8%
Web-link	3.41	4	0%	11.6%	44.2%	36.0%	8.1%
Q (28.31.34.37.40): A well-known saying is "Instruction is an interactive process among students, teachers and learning materials". The annotation used in this class did increase the interaction between the learners and the content of the materials.							
Text	3.52	1	0.0%	10.5%	36.0%	44.2%	9.3%
Graphic	3.45	2	0.0%	11.6%	39.5%	40.7%	8.1%
Audio	3.37	5	0.0%	11.6%	48.8%	30.2%	9.3%
Video	3.43	3	1.2%	9.3%	41.9%	40.7%	7.0%
Web-link	3.38	4	0.0%	14.0%	43.0%	33.7%	9.3%

Note. SA: strongly agree; A: agree; U: undecided; D: disagree; SD: strongly disagree.

According to the participants' responses, text annotation was regarded as the most helpful and useful annotation type, while graphic annotation was regarded as the easiest to use. However, web-link annotation was regarded as the least helpful and the least useful. The learners also felt that audio annotation was effective and useful for reading comprehension, but was not easy to use. In sum, the exploration of the attitudes of learners showed that text annotation was thought to be the most useful type and that it can increase the interaction among learners and materials, although graphic annotation was considered the easiest to use, and learners felt interested in making graphic annotations because they got more happiness from it.

DISCUSSION

Learning by doing is better than learning by viewing for most types of learners

Since both Q1 and Q2 were to explore the effectiveness of using different multimedia annotations among different characteristics of learners, the researchers dealt the results of these two research questions together in this section. The examination of different types of annotation used by the learners revealed that the learner-generated annotation group performed better than the instructor-provided annotation group for both cognitive style learners and for higher-level learners. This result supports the findings of Pan (2006) and Sung (2007) who pointed out that learner-generated multimedia annotation can make a great contribution to language learning. Moreover, Dollon and Gabbar (1998) and Ariew and Ercetin (2004) claimed that higher-level learners perform better when they use learner-generated annotation.

The results conformed to the activity theory which claims that deep learning occurs when learners are encouraged to engage in productive learning activities, and generating learner-generated annotation encourages generative processing. It is the learning by doing rationale that claims that learners must engage in an activity that is related to the instructional objective. In order to comprehend the text, learners in the learner-generated annotation group were asked to surf the Internet and find some related information to make different types of annotations by themselves, including text, graphic, audio, video, and web-link annotations. Thus, they had more opportunities to learn by themselves than those who read the texts with instructor-provided annotations.

One of the reasons may be that their high linguistic competence might have enabled the higher-level learners to use good reading strategies to promote their reading comprehension of the text in a multimedia environment (Ariew & Ercetin, 2004). Furthermore, the learner-generated annotation provided the higher-level learners with a better situation to develop their learning autonomy. Besides, higher-level learners have their preferred learning strategy uses and would not rely on instructor-provided annotations for reading comprehension, and they might be distracted by much less important information provided by instructor-provided annotations while reading texts. Learner-generated annotation reinforces learner autonomy because learners have opportunities to choose what they think is useful for their learning. While using the annotation system, in order to enhance their reading comprehension, learners can use different kinds of annotation, such as text, graphic, audio, video, and web-link annotation to help them remember the content or the significant points of the reading materials (Roby, 1999).

However, learners in the instructor-provided annotation group were asked to view the different types of annotation provided by instructors to comprehend the texts, so they did not learn by making their own annotations. They just needed to view the annotations they liked. According to the activity theory, learner-generated annotation encourages generative processing. However, instructor-provided annotation does not. The activity theory predicts that learners who read a text in which they generate their own annotations will perform better on reading quizzes than those who read the text with instructor-provided annotations. Therefore, the results of this research question comply with the rationale that learning by doing is better than learning by viewing.

Learners have positive attitudes toward multimedia annotation use

The learners thought that the “text” and “audio” annotation types were particularly useful for online reading. Especially, “text” annotation was regarded as an effective tool for reading performance. Besides, during the reading process, the participants thought that “text” annotation did improve their reading achievement and enhance the interaction between the learners and the content of the reading materials. The results also conformed to Hwang, Wang, and Sharples (2007), Pan (2006), and Sung (2007) who have all claimed that learners feel that by using “text” annotation and other functions of annotation systems, like graphic, audio, and video annotations, it becomes easier for them to review the content of the learning materials. The results also support those of Chun (2001) and Mayer (2001) who have claimed that extraneous cognitive load can be decreased by presenting reading material accompanied with words and pictures instead of only in words. Thus, one of the reasons may be that “text” annotation was easy to use, and it can be used without training. Another reason is that there was no cognitive overload because the dual coding theory maintains that learning can be facilitated when materials that involve both verbal and visual systems are utilized simultaneously. The results of Chen’s (2009) study, which indicated that learners using video annotation perform significantly better than those using picture annotation on tests, also conformed to the argument that viewing various kinds of annotation encourages generative processing.

However, not all types of annotation facilitate reading comprehension (Akbulut, 2008). Web-link annotation and audio annotation were regarded as the two least helpful and least useful annotation types by the students in this study. These findings partially comply with the findings of Ariew and Ercetin (2004) and Saker and Ercetin (2005), who found that audio annotation might distract readers, and that it has a negative impact on reading comprehension. As for cognitive theory, one of the reasons may be that presenting too many elements to be processed may lead to cognitive overload. Another reason may be that viewing various types of annotation causes cognitive overload.

Another reason may be related to the difficulty of using audio annotation, because learners need to download and implement other software to record their annotations. Thus, some of the learners may feel that it is troublesome, and thus it may have decreased their willingness to use audio annotation while reading in the multimedia environment. In addition, as for web-link annotation, although it is easy to use, the content and information it provides may not have direct benefits for reading comprehension. Thus, the learners in this study seldom used this kind of annotation to help them comprehend the text.

CONCLUSION

Students scored higher on a post English proficiency test after reading articles in which they were asked to construct multimedia annotation (learner-generated) that after reading articles that contained multimedia annotation (instructor-provided). The effect sizes favoring the both cognitive style learners and higher-level learners were large ($d > 1$ for FI, FD, and higher-level learners) when they received the learner-generated annotation treatment, and was small ($d = .16$) for the lower-level ones. The low-lever learners did not differ significantly on the proficiency test, which indicates that two groups (learner-generated and instructor-provided) of lower-level learners reached the same level of learning the basic materials. Besides the lower-level learners, the learner-generated groups showed overall deeper understanding as compared to the instructor-provided groups. The pattern of results is consistent with activity theory, which predicts that students learn more deeply by doing than by viewing.

The researchers do not recommend asking lower-level learners to construct their own multimedia annotation, especially when the learning task is difficult. Generating annotation may increases the level of extraneous cognitive processing that limits generative processing, especially when the information is new and techniques are unfamiliar. While learners studying simple material or studying complex materials with unlimited time, generating annotation by themselves is a better option to promote organization and integration (Stull & Mayer, 2007).

From the results of annotation attitude questionnaire, the analysis show that most of the students have positive attitudes toward the questions for all dimensions (perceived usefulness, perceived ease of use, and learning satisfaction). These results reveal the research shows great potential of an annotation mechanism to enhance online reading. This study is limited in several areas that should be investigated in future studies. First, the sample of field-dependent participants ($N = 36$) was much less than field-independent participants ($N = 57$), which may decrease the statistical power for analyses. Future research should choose more FD observations to include in a statistical sample.

On the other hand, the English reading proficiency test and annotation attitude questionnaires were administered as dependent variables to explore the effects of using different multimedia annotations quantitatively. The content analysis of annotation behaviors and student annotation interaction are suggested to discover annotation behaviors for future examination. These quality data might be helpful for instructors to understand student thinking process and learning difficulty through the analysis.

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DESIGN AND DEVELOPMENT OF PHYSICS MODULE BASED ON LEARNING STYLE AND APPROPRIATE TECHNOLOGY BY EMPLOYING ISMAN INSTRUCTIONAL DESIGN MODEL

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ABSTRACT
The study was aimed at designing and developing a Physics module based on learning style and appropriate technology in secondary educational setting by employing Isman Instructional Design Model and to test the effectiveness of the module. The paper draws attention to the design principles which employs Isman Instructional Design Model. The prototype module was tested among two teachers and 14 participants. The findings from interviews with the teachers and students show a positive response in Physics when their learning styles are matched with appropriate technology. In the evaluation phase, two instruments were used to collect data for this study. The pre-posttest designed to identify students' achievement score and Felder Silverman's Learning Style Inventory to measure students' learning style. Findings from evaluation of the module conducted among 120 participants involving 30 participants of each learning style (visual/verbal, active/reflective) suggested that the module is effective for visual, active, reflective and not for verbal learners. The researchers also compared the effectiveness of the module according to gender. The verbal and reflective modules were effective for female learners and not for male learners. The findings from this study suggest that Isman Instructional Design Model which pays attention to instruction from the learner perspective than from content perspective is suitable in designing and developing Physics module based on learning style and appropriate technology in secondary educational setting in Malaysia. The findings of this study is also hoped to provide insights to promote teaching and learning of Physics based on learning style and appropriate technology.
Keywords: Isman Instructional Design Model; Learning styles; Appropriate technology

INTRODUCTION
Recent studies have indicated that secondary school students have difficulties in learning Physics **(**de-Marcos, Hilera, Barchino, Jimenez, & Oton, 2010; Heck & Ellermeijer, 2010; Mun, Hew, & Cheung, 2009). A key to success of science education is the use of technology tools which can greatly enhance a student's understanding of science concepts (Isman, Yaratan, & Caner, 2007). The educational technology tools can take a difficult to learn science concept and change it from abstract to concrete to make it easier to understand (Isman et al., 2007).

Identifying a learner's unique learning style is important in ensuring that learners are engaged in learning (Graf, Kinshuk, & Liu, 2009; Larkin-Hein & Budny, 2001; Yang & Tsai, 2008; Naimie, Siraj, Ahmad Abuzaid, & Shagholi, 2010). It has been observed that when instruction is aligned with the learners' learning styles learning achievements will increase together with affective and motivational advantages (Aviles & Moreno, 2010; Franzoni & Assar, 2009; Lau & Yuen, 2010; Saeed, Yang, & Sinnapan, 2009). Learning style defines how a learner concentrates, processes and retains information during learning (Dunn, 1990). Scholars have indicated that a learner's behaviors such as cognitive, affective and psychology, act as indicators in perceiving, interacting and responding with the learning environment, and that some learners tend to emphasize some learning styles compared to others (Keefe, 1987; Kolb, 1984). Each learner has his or her own learning style. There exist numerous learning styles and learning style models (Yilmaz-Soylu & Akkoyunlu, 2002).

Felder and Silverman (1988) have created a learning style model that brings focus to the learning styles aspects among the Engineering students. After three years, a psychometric instrument which is Felder-Soloman's Index of Learning Styles was created. This model has classified the students into eight categories based on four dimensions: (visual/verbal, active/reflective, sequential/global, sensing/intuitive). In the context of this study, Felder Silverman Learning Style Model is used because the Index of Learning Style (ILS) Felder-Soloman provides a practical approach for determining the dominant learning style of students (Kinshuk & Lin, 2004). ILS was devised for engineering students. Physics is one of the components in engineering; hence the ILS is the most suitable instrument for this study. Local researchers have used the model to determine the learning style of Physics and Chemistry students (Ng Sook Chin, 2005; Saedah Siraj & Nabihah Badar, 2005).

The same scenario operates in Malaysia as the students have the weaknesses in mastering Physics and they assume that Physics is something that is abstract (Abdullah Nor, 1998; Shahanom Nordin, 1994). The analysis regarding the Malaysian Education Certificate *Sijil Pelajaran Malaysia* answers for Physics Paper 2 shows that the overall performance of the candidates in delivering the facts and Physics concepts is decreasing especially those students who are moderate and weak (Ministry of Education, 2007). The Physics concepts that are found difficult for the students to master are the concept of pressure, inertia, momentum, light, waves, density, and force (Ministry of Education, 2007). In the matter that involves Physics Pedagogy, the result from the study done by Kamisah Othman, Lilia Halim, and Subahan Mohd Meerah (2006) in determining the needs analysis of 1690 Science teachers, shows that the teachers need information on how technology should be integrated in their teaching skills. Until now little research have been done on the design and development of a pedagogical module based on technology and learning style for Form 4 Physics curriculum. Although studies have been conducted on the concepts, the learning styles and technology for Biology, not much has been done on the development of Physics module. On top of that, the local research is more focused on the method of survey and only a few studies on Chemistry, Biology and Science have used developmental research (Norizan Ahmad, 2005; Sabariah Othman, Rosseni Din, & Aidah Abdul Karim, 2000; Wong, 2005).

Previous research shows that matching the Physics concept, technology and learning styles can increase the students' mastery of concepts (Hein, 1997; Ross & Lukow, 2004; Tsoi, Goh, & Chia, 2005). It can be implied that the development of Physics module based on technology and learning style would attract students' interest in Physics. Hence, this study was aimed at designing and developing a Physics module based on learning style and appropriate technology by employing the Isman Instructional Design Model in secondary educational setting and to test the effectiveness of the module. This study does not compare the effect of traditional lesson to Physics module based on technology and learning style but rather draws attention to the design principles which employs Isman Instructional Design Model and the effectiveness of using Physics module based on technology and learning style.

THE AIM OF RESEARCH

The aim of this research is to design and develop a module based on learning style and appropriate technology according to Isman Instructional Design Model for Physics in the secondary educational setting and to test the effectiveness of the module. In order to achieve this aim, the researcher set two research objectives. The first objective is to describe the design and development of a module based on learning style and appropriate technology by employing the Isman Instructional Design Model. Next, the second objective of this research is to test the effectiveness of the module by pre/posttest designed and interviewing 14 students. This study seeks to answer the following research questions:

- Are modules based on learning style and appropriate technology which was developed by employing Isman model effective?
- Are modules based on learning style and appropriate technology which was developed by employing Isman model effective according to gender?

Significance of the Study

The results of the study can be used by educators to determine the effects of Isman model in the design and development of a module based on learning style and appropriate technology in secondary educational setting in Malaysia.

Scope and Limitations

In this study, a sample size of 120 students at an urban secondary school in the state of Selangor was selected as the population reflected the proportion of the multiracial communities in Malaysia. Students' modules designed, developed and tested in this study were only on visual, verbal, active and reflective modules, as suggested by the panel of experts.

Instruments

Two instruments were used in this study: First is the Index of Learning Styles (ILS) (Felder & Silverman, 1988) for identifying the students' learning styles. The survey instrument used was Learning Style Index (LSI) developed by Felder and Soloman (1988) which had been translated to Bahasa Malaysia by Nabihah Badar and Saedah Siraj (2005) and administrated to 120 form four students in the same district as this research. The instrument has a Cronbach alpha reliability score of .72. The second instrument is two multiple choice tests used for pretest and posttest. This test was designed to analyze students' achievement on "Charles's Law" and "Boyle's Law". There were 50 items in these two instruments. The content of the instrument was validated by three Physics teachers while the language was validated by two language teachers with more than 10 years working experience.

Theoretical Framework

Employing Isman Instructional Design Model in the Development of Physics Module based on learning Style and Appropriate Technology

The major goal of Isman Instructional design Model is to point up how to plan, develop, implement, evaluate and organize full learning activities effectively so that it will ensure competent performance by students (Isman, 2011). The theoretical foundation of the new model comes from behaviorism, cognitism and constructivism views. Firstly, Isman (2011) used realationship between stimulus and response, the reinforcement factor and designing environmental condition in behaviorism theory to motivate more in this model. Secondly, motivation, intellectual learning process, experiences and contents in Cognitivism theory are used in this model to motivate students to learn more in this model. This model is interested in how to store the information into long term memory, hence instructional activities are designed in this model. Isman model also uses constructivism which pays attention to personal applications. Isman model was implemented on 100 graduate students at the faculty of education at Eastern Mediterranean University in North Cyprus with the purpose to analyze the effects of the model on academic achievement (2005). The findings of the research indicates that Isman model was implemented successfully in instructional activities in the experimental group and affected academic achievement and so, it may be said that this model could be implemented to design instruction. Hence, the researchers aim to employ Isman model in the design and development of Physics module based on learning style and appropriate technology in Malaysian secondary educational setting and to test the effectiveness of the module. The Isman Instructional Design Model is described in a five-step systematic planning process. These are input, process, output, feedback and learning as shown in Figure 1.

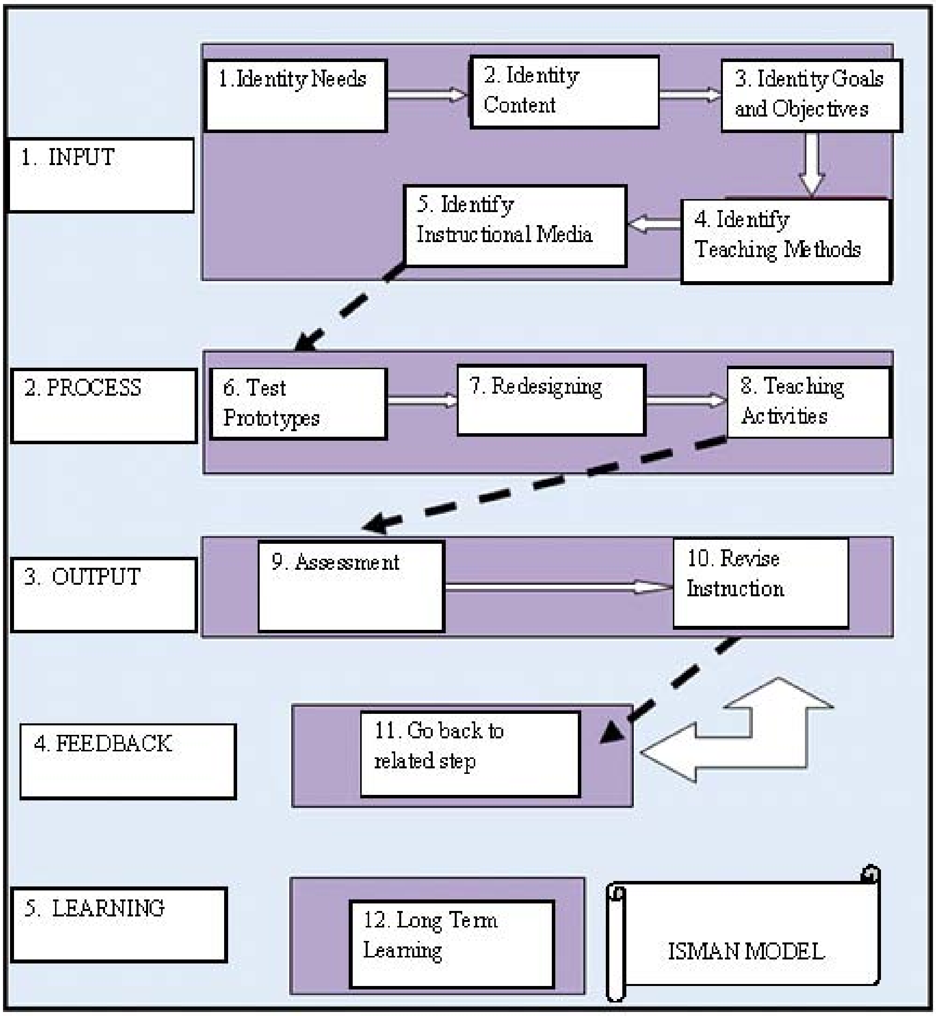

Figure 1: Isman Instructional Design Model (Isman, 2011, p.139)

The first step in the Isman model is input. The input step involves identify needs, identify contents, identify goal-objectives, identify teaching methods, identify evaluation materials, and identify instructional media. Isman (2005) states that the main goal of first step is to identify factors for input. In this research, we use a panel of experts to identify the input for the module including the needs of the module which is a Physics module based on learning style and technology, identify contents, goal and objectives, teaching methods, evaluation material and instructional media.

The expert panel comprises five criteria such as two Physics master teachers, one ICT master teachers, a Professor in Physics Education and a head of department of curriculum and ICT in a local university. The experts review suggested that the pedagogical module should be developed for four learning styles such as active, reflective, visual and verbal involving two gas laws such as “Charles’s Law” and “Boyle’s Law”. Next, the expert review suggested two modules to be developed; one each for teacher and student. The elements of the Physics module based on learning style are as follows:

Table 1: Active learning style elements for “Lesson 1 and Lesson 2: Gas Law”

Technology Tools	Electronic Digital Resource	Teaching Technique	Activities	Exercises
Laptop	Webquest	Group Project	Post answers in the blog	Do group work

Table 2: Reflective learning style elements for “Lesson 1and Lesson 2: Gas Law”

Technology Tools	Electronic Digital Resource	Teaching Technique	Activities	Exercises
laptop	Video clip	Individual drill	wiki	Produce mind map

Table 3: Visual learning style elements for “Lesson 1 and Lesson 2 : Gas Law”

Technology Tools	Electronic Digital Resource	Teaching Technique	Activities	Exercises
laptop	Webquest	Experiment/demonstration in pairs	wiki	Produce Power point

Table 4: Verbal learning style elements for “Lesson 1 and Lesson 2: Gas Law”

Technology Tools	Electronic Digital Resource	Teaching Technique	Activities	Exercises
Laptop	Video clip	lecture	tutorial	Present assignment

The webpage for the Physics module based on learning style and appropriate technology for teachers and students (visual, verbal, active and reflective) was designed. The contents of teachers’ lesson plan and students’ instruction of the lesson were integrated in the respective modules. Next, the teachers’ module and students’ module were uploaded and published in the internet server. An example of a students’ module is as shown in Figure 1.

The second step in the Isman model is process. The process step involves testing prototypes and redesigning of instruction and teaching activities. We also used the expert panel to redesign the website produced. The expert review suggested that the introduction of the module should be able to guide the teachers and students independently. Further the expert review also suggested that the blog for teachers should be made according to the students’ learning style. Lastly, the expert review suggested the implementation schedule for testing of the module.

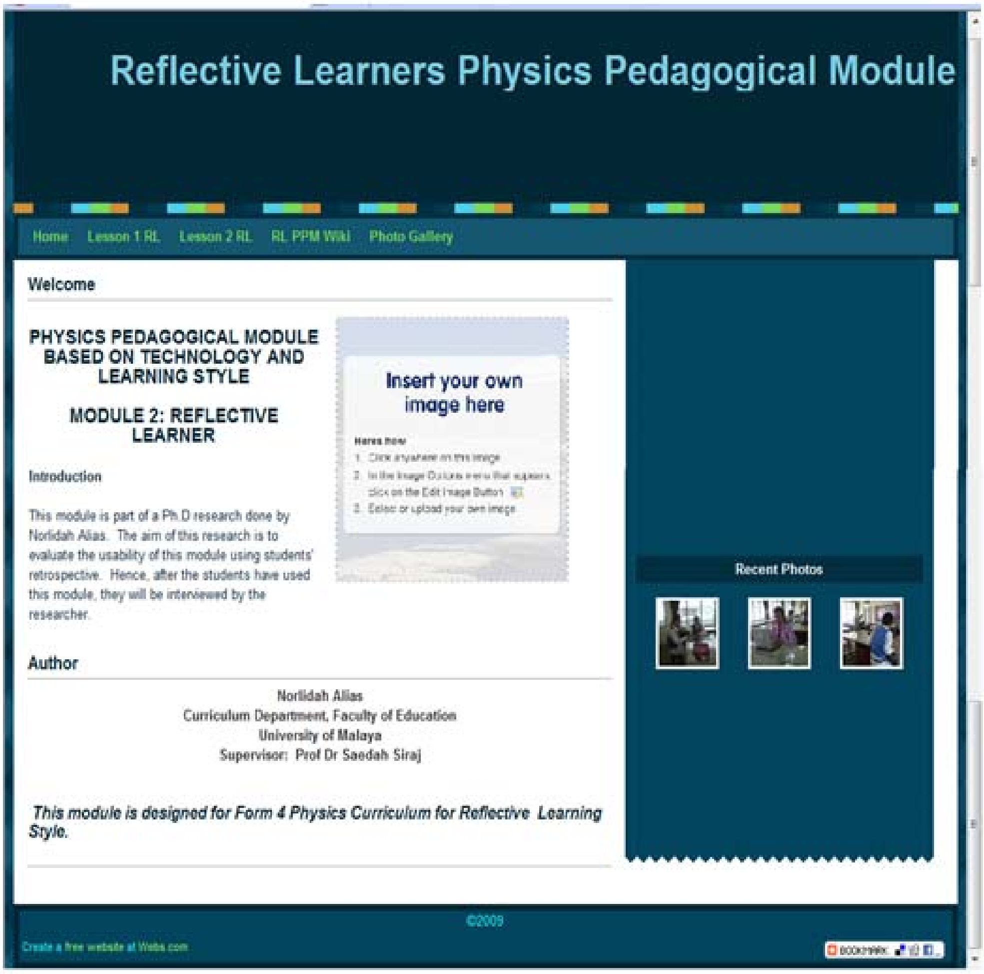

Figure 2: Main Page of Online Module for Reflective Learner Website.

The third step in the Isman model is output. The output process involves testing and analyzing results. To determine student learning, educational measurement and evaluation process should be implemented by teachers. In this research we tested the prototype by implementing the modules with two teachers and 14 students.

The fourth step in the Isman model is feedback. The feedback process involves revising instruction based upon the data collected during the implementation phase. If, during the phase, teacher finds that students are not learning what the plan wanted them to learn, or they are not enjoying the learning process, teacher will try to revise and improve some aspect of their instruction to enable the students to accomplish their goals. In this research, we revised the instruction according to the teachers' and students' comments.

The final step in the Isman model is learning. The learning process involves full learning. In this process, teachers want to ensure that their students have learned what the instructional plan wanted them to learn. This is when the pre/posttest was conducted to test the module effectiveness.

Employing of the Isman model to design and develop a Physics module based on learning style and appropriate technology is documented in work logs as illustrated in Table 5:

Table 5: Use of Isman model to design and develop a Physics pedagogical module

Steps	**Work log**	**Descriptions**
Step 1 Input	Identify needs Identify contents Identify goals-objectives Identify teaching methods	Designing Physics module based on learning style and technology by a panel of experts. Designing the webpage for teachers' module and students module for visual learners, verbal learners, active learners

	Identify evaluation materials Identify instructional media	and reflective learners.
Stage 2 Process	Testing prototypes Redesigning of Instruction Teaching activities	Using expert panel to redesign the website produced.
Stage 3 Output	Testing Analyze Results	Implementing the modules with two teachers and 14 students.
Stage 4 Feedback	Revise Instruction	Revise the comments given by students and teachers.
Stage 5 Learning	Learning	Pre/posttest was conducted to test the effectiveness of the module.

RESULTS

The effectiveness of the Physics module based on learning style and appropriate technology which was developed by employing the Isman model was analyzed across visual, verbal, active and reflective modules. Findings from the module evaluation conducted among 120 participants involving 30 participants of each learning style (visual/verbal, active/reflective) suggested that the module is effective for visual, active and reflective but not for verbal learners. Next, we also compared the effectiveness of the module according to gender. The module was effective for visual and active learners regardless of gender. However, the verbal and reflective modules were effective for female learners and not for male learners. A *t*-test was performed to determine if there were significant differences between the groups in the achievement scores. Table 6 to Table 9 shows the results of *t*-test comparison of pre/posttest achievement towards Physics module for visual learners, verbal learners, active learners and reflective learners respectively. In addition a *t*-test was also performed to determine if there were significant differences between genders among the groups in the achievement scores. Table 10 to Table 12 shows the results of *t*-test comparison of pre/posttest achievement in the Physics module for visual learners, verbal learners, active learners and reflective learners respectively according to gender.

The effectiveness of modules based on learning style and appropriate technology developed using Isman model

Findings from evaluation of the module conducted among 120 participants involving 30 participants of each learning style (visual/verbal, active/reflective) suggested that the module is effective for visual, active, reflective and not for verbal learners.

Table 6: t-Test comparison of pre/posttest achievement towards Physics module for Visual learners

	Pretest (n = 30)	Posttest (n = 30)	*t*-value	*p*	Effect size
Mean	53.37	56.23	6.11	< .05	0.73
SD	17.23	16.25			

Table 6 shows that there is a significant difference between pretest (mean = 53.37, SD = 17.23) and posttest (mean = 56.23, SD = 16.25) marks, t (29) = 6.11, $p < .05$. The mean scores indicate posttest have significant higher achievement towards Physics module for Visual Learner than pretest.

Table 7: *t*-Test comparison of pre/posttest achievement towards Physics module for Verbal learners

	Pre test (n = 30)	Post test (n = 30)	*t*-value	*p*	Effect size
Mean	52.97	53.80	0.960	>.05	0.06
SD	16.14	14.55			

Table 7 shows that there is no significant difference between pretest (mean = 52.97, SD = 16.14) and posttest (mean = 53.80, SD = 14.55) marks, t (29) = .96, $p > .05$. The mean scores indicate posttest does not have significant higher achievement towards Physics module for Verbal Learner than pretest.

Table 8: t-Test comparison of pre/posttest achievement towards Physics module for Active learners

	Pretest (n = 30)	Posttest (n = 30)	t-value	*p*	Effect size
Mean	52.07	55.03	5.55	< .05	0.69
SD	18.18	16.58			

Table 8 shows that there is a significant difference between pretest (mean = 52.07, SD = 18.18) and posttest (mean = 55.03, SD = 16.58) marks, t (29) = 5.55, p < .05. The mean scores indicate posttest have significant higher achievement towards Physics module for Active Learner than pretest.

Table 9: t-Test comparison of pre/posttest achievement towards Physics module for Reflective learners

	Pretest (n = 30)	Posttest (n = 30)	*t*-value	*p*	Effect size
Mean	51.80	54.17	3.39	< .05	0.45
SD	15.18	12.63			

Table 9 shows that there is a significant difference between pretest (mean = 51.80, SD = 15.18) and posttest (mean = 54.17, SD = 12.63) marks, t (29) = 3.39, $p < .05$. The mean scores indicate posttest have significant higher achievement towards Physics module for Reflective Learner than pretest.

Effectiveness of modules based on learning style and appropriate technology developed using Isman model according to gender

The researchers also compared the effectiveness of the module according to gender. The module was effective for visual and active learners both male and female students. However, the verbal and reflective modules were effective for female learners and not for male learners.

Table 10: *t*-Test comparison of pre/posttest achievement towards Physics module for Visual learners by gender

	Mean	SD	t-value	*p*	Effect size
Pair 1 Male Pretest-posttet (n = 15)	1.20	1.96	2.36	<.05	0.12
Pair 2 Female Pretest-posttest (n = 15)	1.97	4.53	8.96	<.05	0.85

Table 10 shows that there is a significant difference between male (mean = 1.20, SD = 1.96) and female (mean = 1.97, SD = 4.53) marks, male t(14) = 2.36, p < .05 and female t(14) = 8.96, $p < .05$. The mean scores indicate female have significant higher achievement towards Physics module for Visual Learner than male. In addition, the module is significant for both male and female.

Table 11: *t*-Test comparison of pre/posttest achievement towards Physics module for Verbal learners by gender

	Mean	SD	t-value	*p*	Effect size
Pair 1 Male Pretest-posttest (n=15)	1.33	4.68	1.10	>.05	0.08
Pair 2 Female Pretest-posttest (n=15)	3.00	3.85	3.01	<.05	0.39

Table 11.0 shows that there is a significant difference between male (mean = 1.33, SD = 4.68) and female (mean = 3.00, SD = 3.85) marks, male t(14) = 1.10, $p > .05$ and female $t(14) = 3.01$, $p < .05$. The mean scores indicate female have significant higher achievement towards Physics module for Verbal Learner than male. In addition, the module is significant for both female and not significant for male.

Table 12: *t*-Test comparison of pre/posttest achievement towards Physics module for Active learners by gender

	Mean	SD	t-value	*p*	Effect size
Pair 1 Male Pretest-posttest (n = 15)	1.47	1.36	4.19	<.05	0.56
Pair 2 Female Pretest-posttest (n = 15)	4.46	3.34	5.19	<.05	0.66

Table 12 shows that there is a significant difference between male (mean = 1.47, SD = 1.36) and female (mean = 4.46, SD = 3.34) marks, male t(14) = 4.19, $p < .05$ and female t(14) = 5.19, $p < .05$. The mean scores indicate female have significant higher achievement towards Physics module for Active Learner than male. In addition, the module is significant for both male and female.

Table 13: t-Test comparison of pre/posttest achievement towards Physics module for Reflective learners by gender

	Mean	SD	*t*-value	*p*	Effect size
Pair 1 Male Pretest-posttest (n = 15)	0.33	3.51	0.37	>.05	0.01
Pair 2 Female Pretest-posttest (n = 15)	4.40	2.99	5.69	<.05	0.70

Table 13.0 shows that there is a significant difference between male (mean = 0.33, SD = 3.52) and female (mean = 4.40, SD = 2.99) marks, male $t(14) = 0.37$, $p > .05$ and female t(14) = 5.69, $p < .05$. The mean scores indicate female have significant higher achievement towards Physics module for Reflective Learner than male. In addition, the module is significant for female and not significant for male.

IMPLICATION AND CONCLUSIONS

This paper has described an effort to design and developed a Physics module based on learning style and appropriate technology in Malaysian secondary educational setting by employing the Isman model. In addition, the effectiveness of the modules was tested and it was found that the module was effective for visual learners, active learners and reflective learners. However module was less effective for verbal learners. It indicates that Isman instructional model was implemented successfully in the design and development of the Physics module in the Malaysian secondary educational setting. The modules are now published in

freewebs.com
http://modulpedagogifizik.webs.com,
http://pedagogifizikactive.webs.com,
http://pedagogifizikreflective.webs.com,
htttp://pedagogifizikvisual.webs.com,
http://pedagogifizikverbal.webs.com)

and will be implemented in one Science Learning Centre in FELDA secondary school and Teachers Training College for two years. The outcome of this project will hopefully enhance the process of teaching and learning Physics in secondary educational setting by giving emphasis on learning style and appropriate technology.

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DESIGN AND IMPLEMENTATION OF A COOPERATIVE LEARNING SYSTEM FOR DIGITAL CONTENT DESIGN CURRICULUM: INVESTIGATION ON LEARNING EFFECTIVENESS AND SOCIAL PRESENCE

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ABSTRACT
The purpose of this paper is to investigate the learning effectiveness of cooperative learning system based on social presence theory. We develop a web-based cooperative learning system which contains personal module, admin module, course module, communication module, and learning records module to support the implementation of cooperative learning. An experiment was conducted to examine the learning effectiveness of the developed cooperative learning system for two groups' students (a self-form group and a random group). Results of the experiment indicate that students had consistently learning effectiveness in both of the heterogeneous groups, which verified the utility of the developed cooperative learning system and interactivity has significant difference, but social context and online communication has insignificant difference among three dimensions of social presence theory. Finally, research findings are discussed and future research directions are suggested.
Keywords: Cooperative Learning, Learning Effectiveness, Social Presence Theory, Digital Content, Cooperative Learning System

INTRODUCTION
In recent years, in the wake of rapid development in information technologies and organizational changes in business, the curriculum of professional education has started to diversify to meet the blossoming of the digital content industry. In this way, many universities have established related departments of digital content design which provides the courses such as information technology application, art design, project management, communications, and marketing, etc. The courses offered by these departments focus on the training of digital content generation, website building, online community creation, multimedia databases, and project management. The aforementioned courses strongly staked a claim to the creativity application and strengthening of media content skills. As a consequence, most students who graduated from the department of digital content design proactively thrive in the workplace due to their versatile knowledge and skills.

Generally speaking, students who are engaged into the study of digital content design should be familiar with advanced tools for digital content design. Thus, students are claimed to use multimedia tools, animation and graphic design software, game engine, virtual reality, scene and digital studios during the learning process. In addition, using e-Learning software to author e-learning courses is a major instructional method in digital content courses. In distance learning courses, students have to connect to e-learning systems via the Internet in order to eliminate restrictions of times and locations. Therefore, students can use e-learning systems to study the curriculum material and engage to discuss with their classmates.

In recent years, research topics on cooperative learning calls attention from academic researchers and practitioners (e.g. EL-Deghaidy & Nouby, 2008; Hutchinson, 2007; Hurtado & Guerrero, 2011). In cooperative learning, an individual's success depends on the performance of the entire group (Bölükbaş, Keskin, & Polat, 2011). The spirit of cooperative learning is encouraging students help each other and concentrated collaborations in teams, and realize common goals by accomplishing cooperatively the tasks they have been assigned. Apart from achieving goals, this approach can also boost the team's overall learning performance (Johnson & Johnson, 1999). Past literature has proposed various systems and applications supporting cooperative learning. Among the previous studies, McConnell (1994) suggested that cooperative learning system functions should include e-mail, bulletin boards, computer conferencing and sharing systems. It should be noted that current software technology makes the development of cooperative learning systems much easier. Jung (2009) designed a cooperative learning system meeting the needs of bloggers and gearing toward online information. Kienle (2009) designed a cooperative learning system supporting both synchronous and asynchronous communication environments. Furthermore, some other systems have been developed employing behavioral or learning theory. For example, Huang, Liu, and Shiu (2008) designed cooperative learning systems on the basis of learners' cognitive conflict; and Luo (2010) developed an online collaborative learning model from the constructivism learning theory. These studies developed practical collaborative learning systems on the basis of different perspectives or technologies, diversifying research on cooperative learning systems.

So far, application of cooperative learning systems in departments of digital content design has rarely been seen in previous studies. Courses of digital content design combine the aspects of business, arts, computer science, and their digital content courses allow students to use a wide variety of computer hardware and software (Lopez-Fernandez & Rodriguez-Illera, 2009). In addition, among their various instructional methods, the vast majority of digital content departments employ team projects, and the classes emphasize cooperation and discussion among students (Chickerur & Kumar, 2011).

In view of the above discussion, a cooperative learning system should provide necessary functions and well-prepared mechanism on supporting students' online cooperation such as assisting students in completing their assignments, the learning effectiveness then can be significantly enhanced. Furthermore, because students must maintain a high level of interaction with their classmates in digital content classes, investigating students' communication from the social presence perspective can shed light on the suitability of a cooperative learning system (Chou & Min, 2009; Järvelä, Volet, & Järvenoja, 2010). At present, Anderson (2004), Johnson, Johnson, and Smith (2007), and Kirschner, Paas, and Kirschner (2009) all believe that cooperative learning systems must be further examined by employing other theories or targets in order to respond to a wide range of varying educational objectives and environments. In view of this situation, the purposes of this study are: (1) to develop a web-based cooperative learning system to support digital content design curriculum; (2) to analyze student's learning effectiveness in terms of academic achievement and learning satisfaction; and (3) to examine whether individuals' perceived social presence can serve as an appropriate foundation for investigating communication in cooperative learning systems.

The rest of this paper is organized as follows. Section 2 reviews pertinent literature on cooperative learning and learning effectiveness, as well as social presence theory. Section 3 then presents the research design and process, and Section 4 describes the system architecture. Section 5 presents the experimental results, while Section 6 contains discussion on the findings. Finally, Section 7 addresses conclusions, limitations and directions for future research.

COOPERATIVE LEARNING AND LEARNING EFFECTIVENESS

Cooperative learning is a structured and systematic instructional strategy, which is suitable for any learning subject and grade. In general, students are assigned into heterogeneous groups according to different cultural backgrounds, abilities, and gender. Each heterogeneous group consists of two to four members, who will learn and work together to reach group goals (Nattiv, 1994; Slavin, 1989). Johnson and Johnson (1999) proposed five characteristics of cooperative learning: heterogeneous grouping, positive interdependence, personal responsibility, promotive interaction, social skills, and group processing. Currently, scholars have developed many methods for cooperative learning, such as student's team achievement division (Slavin, 1978), team-game-tournament (DeVries & Edwards, 1974), jigsaw I/II (Aronson et al., 1978; Slavin, 1986), group-investigation (Sharan & Hertz-Lazarowitz, 1980), cooperative integrated reading and composition (Slavin, 1990), and learning together (Johnson & Johnson, 1987). The above learning methods all have its own process, but the essence is to facilitate students to achieve cooperative learning. Thus, teachers can adopt different learning methods depending on the course content or special needs.

The outcomes of cooperative learning are focused on group performance. Thus, individual learning effectiveness is often affected by team performance. Generally speaking, learning effectiveness can be measured using two variables: academic achievement (e.g., semester grade) (Alavi et al., 1995; Shih et al., 2012) and learning satisfaction (Knowles, 1970; Marki et al., 2000; Piccoli et al., 2001). While Johnson, Aragon, and Shaik (2000) regarded learning satisfaction as learners' sense of pleasure in learning activities, Piccoli, Ahmad, and Ives (2001) and Maki, Maki, Patterson, and Whittaker (2000) believed that learning satisfaction expresses learners' satisfaction derived from the learning process and learning results. Hence, learning satisfaction is a very suitable item for assessing learners' satisfaction with cooperative learning. In summary, we can obtain better understanding of a student's learning effectiveness according to both academic achievement and learning satisfaction. As a result, we take academic achievement and learning satisfaction as two important criteria for measuring student's learning effectiveness.

SOCIAL PRESENCE THEORY

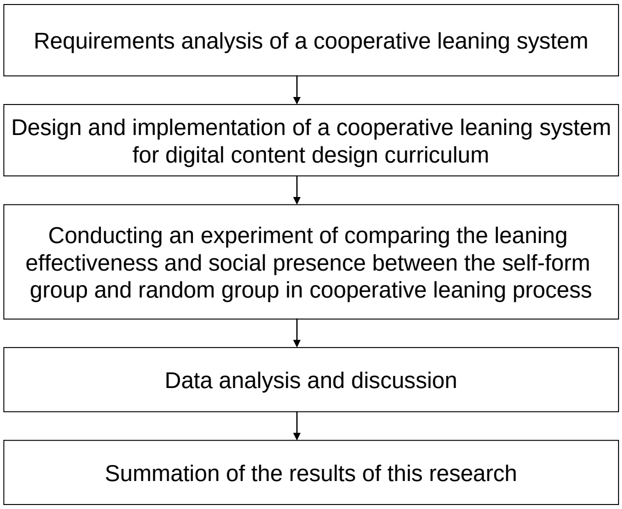
Short, Williams, and Christie proposed the social presence theory in 1976. When people communicate, they will have different social presence depending on their purpose and the communicational medium. Social presence may be warm, cool, intimate, or distant, and these feelings all project degrees of individual social presence. Social presence theory is the subject of much in-depth discussion in research on computer-mediated communication (CMC). When people use CMC to express their ideas, it is often difficult to gauge their degree of intimacy, which can be expressed in face-to-face communication through eye contact, smiles, and tone of voice. Usually, speaking in a gentle tone will cause the level of intimacy to increase; conversely, if no intimacy can be detected in the communication process, the perceived level of social presence will also be low, and there will be a low level of interaction (Garramone, Harris, & Anderson, 1986). Generally speaking, a high level of CMC indicates a high level of class participation and system use frequency among students (Ritchie & Peters, 2001; Yamada & Akahori, 2007). Furthermore, Warschauer (1997) believes that CMC is an important link and indispensable factor in the academic field of cooperative learning. In view of the above discussion, the social presence theory can serve as an appropriate academic foundation for investigating communication in cooperative learning systems.

According to social presence theory proposed by Tu (2000), applications of online learning systems, three dimensions for assessing learners' perceived social presence are explained as follows: (1) Social Context: The degree of social presence of a learner using CMC. Learners will express different degrees of social presence in different social situations; for instance, task orientation, privacy, topics, recipients/social relationships, and social processes; (2) Online Communication: The language and methods used in online communication by learners using CMC. Online text is the most convenient of the different communication functions provided by CMC systems. If text-based communications in an online environment can provide an auxiliary language or emoticons, this can compensate for the absence of tone of voice in non-verbal communication (Garramone, Harris, & Anderson, 1986), and (3) Interactivity: Whether learners employing CMC interact frequently with each other. In the learning process, interactivity expresses whether learners engage in a high level of knowledge sharing and feedback. When students have a high level of interactivity, they will usually perceive a high degree of social presence. Tu (2002) also noted in a further study that CMC also involves the special environmental factor of privacy, which constitutes a special kind of social context. When people communicate with each other in an online system, the system's functions can be reached or controlled in order to determine individuals' communication privacy. For instance, individuals can choose to engage in anonymous or confidential communication. This is a special function provided by the computer environment. We believe that a cooperative learning environment should allow team members to get to know each other and share knowledge through mutual communication. Consequently, a system's privacy function should not be applied to communication between team members, which will allow members' contributions to be recognized. In addition, team members may also use other private means of communication, such as e-mail, MSN, or telephone, to communicate with other members in order to achieve a feeling of privacy, without resorting to the confidentiality provided by the cooperative learning system. As a result, the conditions of a learning environment may be difficult to control in practice, and a system that restricts students from using other means of communication to discuss their class work will not comply with the basic spirit of cooperative learning. However, this function is applicable to other situations, such as expression of views and decision-making behavior.

Furthermore, Tu and Yen (2007) also developed these dimensions into a means of assessing learners' perceived social presence in a CMC environment. However, there still remained a lack of confirmatory research involving system deployment and a class experiment. Although Tu (2002) has used a text-based CMC as a research environment to understand users' attitudes toward social presence in communication, neither the users' satisfaction nor the system architecture was explored in much depth. In this study, Tu's views concerning social presence theory were employed to investigate students' perceived social presence when using this system, which can provide a better understanding of students' communication.

RESEARCH METHOD

In order to investigate the learning effectiveness and social presence in cooperative learning process, a web-based cooperative leaning system is developed. The subjects chosen in this study were college students in Taiwan enrolled in the department of digital content design. The name of the course was ‘Designing web graphics and layouts’ and its instructional content consisted of website design, layout, and basic hypertext markup language (HTML). The main objective of the digital content design course was to instruct students in learning the basic online presentation of image files, including such operations as image cropping, resolution, layout, and cascading style sheets (CSS). In addition, students were required to complete assignments in groups and present a team project (i.e., Web design) at the end of the semester. According to the above requirements of the course, the learning together method was suitable for cooperative learning on this course (Johnson & Johnson, 1987). Moreover, the learning together method emphasizes particularly the formation of groups and group processing. The research process is described in the following: (see Figure. 1).



(1) Requirements analysis of a cooperative learning system

Related papers on the design of a cooperative learning system were surveyed and interviews with the teachers and students in the department of digital content design were conducted. Then data model and functional model was formulated for systems design purposes.

(2) Design and implementation of design and implementation of a cooperative leaning system for digital content design curriculum

Fundamentally, a cooperative learning system can be used to support learners in learning and training processes of co-located and distributed groups (Pfister et al., 1998). In addition, Tu and Corry (2003) suggested providing online board and real-time chat to help students express their views and discuss academic issues. Thus, we develop a system to help students interact and communicate with their peers in the learning process so as to enhance learning satisfaction. According to the specification of requirements analysis, we proposed the system architecture of a cooperative learning system shown in Figure 2. Three components are consisted in the system framework described as follows:

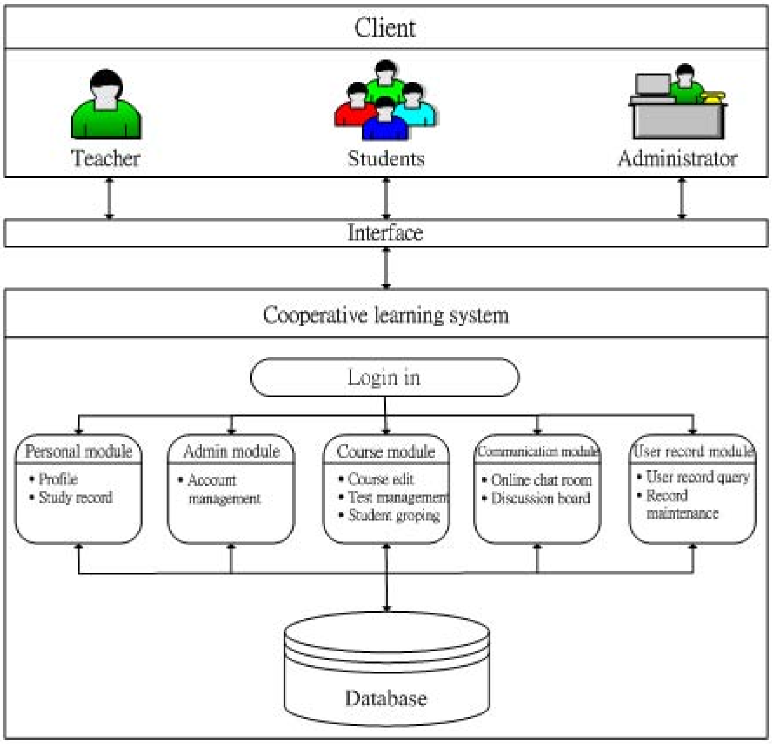


Figure 2: System architecture

A. Client

The client consists of teachers, students, and administrators. Users can log-on to the system via an Internet browser, and the system provides different functions and access rights corresponding to different roles. Students used the instructional materials provided by the system to engage in online learning, and employed online communication tools to cooperate and engage in discussions with their peers. The teacher established the course, managed online teaching materials, edited online test questions, assigned students to groups, and checked students' usage records. The major tasks of a system administrator include maintaining user accounts and learning records, while also maintaining the normal operation of the website system.

B. Cooperative learning system

The cooperative learning system is developed using web technology, and the web server employed the Microsoft®. Net framework architecture. The system was linked to a back-end database via open database connectivity (ODBC). The cooperative learning system provided numerous functions, but consisted of five modules, which are described as follows.

- Admin module

With regard to the administrator's exclusive functions in the management interface, only the system administrator possess the ability to maintain all members' basic information and perform system maintenance.

- Personal module

This module allows users to key-in and maintain their basic information. In addition, students can also query their own current usage, such as online records and messages, in order to understand their individual learning status. Due to the different needs from the admin module and the personal module, users will have individual menu interfaces (Figure 3).

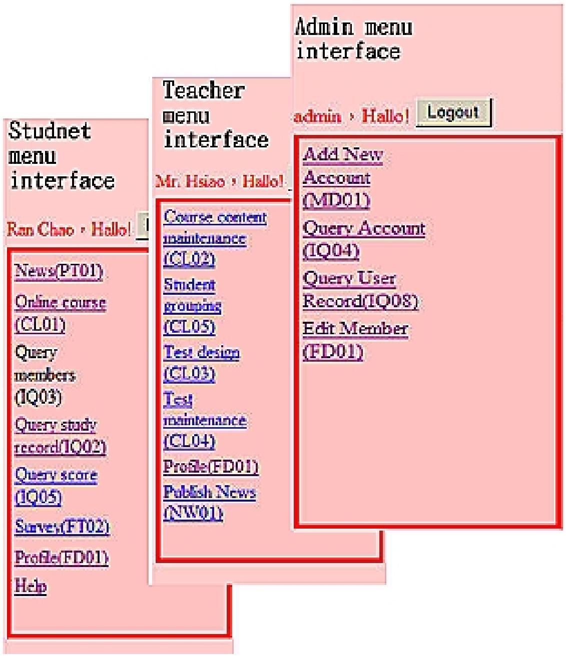


Figure 3: different user menu interface

■ Course module

The teacher's platform comprises three sub-functions, which are course editing, test question management, and student grouping systems. The teacher can post and maintain online teaching materials and information needed for the course (Figure 4), and can post online test questions. The teacher can also change students' group assignments and group students so that they can complete their cooperative learning goals. All students in each group possess a communication platform for their own exclusive use.

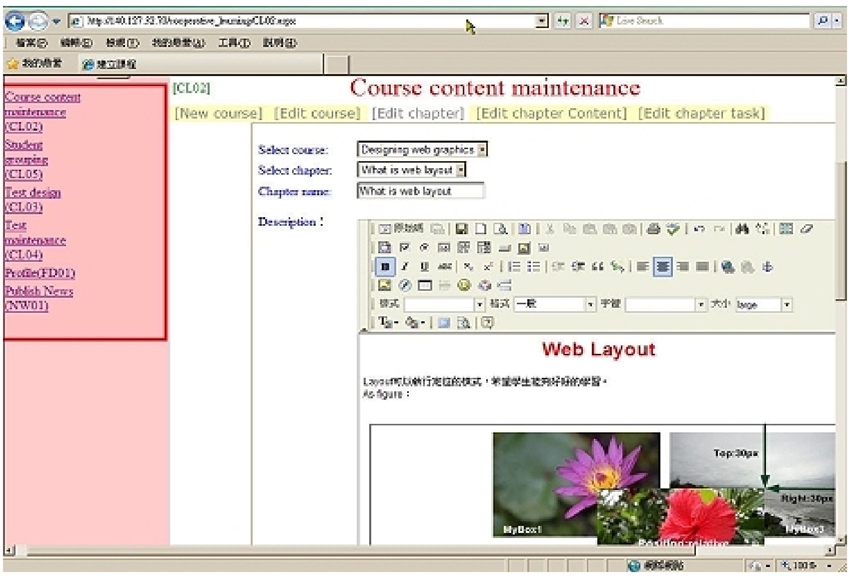


Figure 4: Online course content maintenance

■ Communication module

Perry and Edwards (2010) contended that an online learning system must possess effective interaction mechanisms in order for students to be willing to express themselves. Mason and Weller (2000) and Thomas and Carswell (2000) suggested that interaction is a key factor influencing students' learning and satisfaction in online cooperative learning. We therefore established a real-time online communication platform consisting of a chat room; this platform allows students to interact with each other via the interface (Figure 5). Derks, Fischer, and

Bos (2008) pointed out that attention should be paid to whether transmitters and receivers can understand the nuances and feelings of messages when non-verbal communication tools are used. Hence, apart from developing a real-time online chat room, we also developed an online discussion board able to support non-real-time communication. By leaving conversational and discussion messages, students can give themselves plenty of time for thinking and coming up with responses. After the conclusion of the course, the students were able to upload their assignments and thereby achieve the coursework goals of cooperative learning (Figure 6).

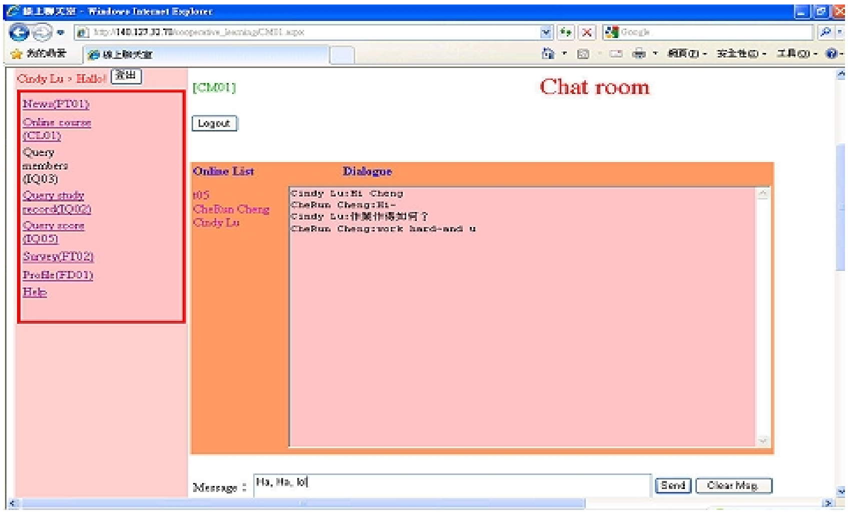


Figure 5: Online communication

Figure 6: Student work samples

- User records module

This module supports the teacher’s queries of all current student usage records (Figure 7). The teacher can use the query system to understand students’ learning and system usage. Apart from this, the module also allows the teacher to maintain the students’ discussion forum and ensure that it continues to function as a normal knowledge-sharing space.

Figure 7: Records of student used the communication tools

The database stores users' basic information, instructional materials, and learning histories. We used unified modeling language (UML) as a graphic tool, serving as the blueprint and basis for design and planning work. UML is an object-oriented language used in visualization, and its graphic output facilitates representation of true design concepts. The relationships between the core tables in this study are displayed using an UML class diagram (Fig. 8).

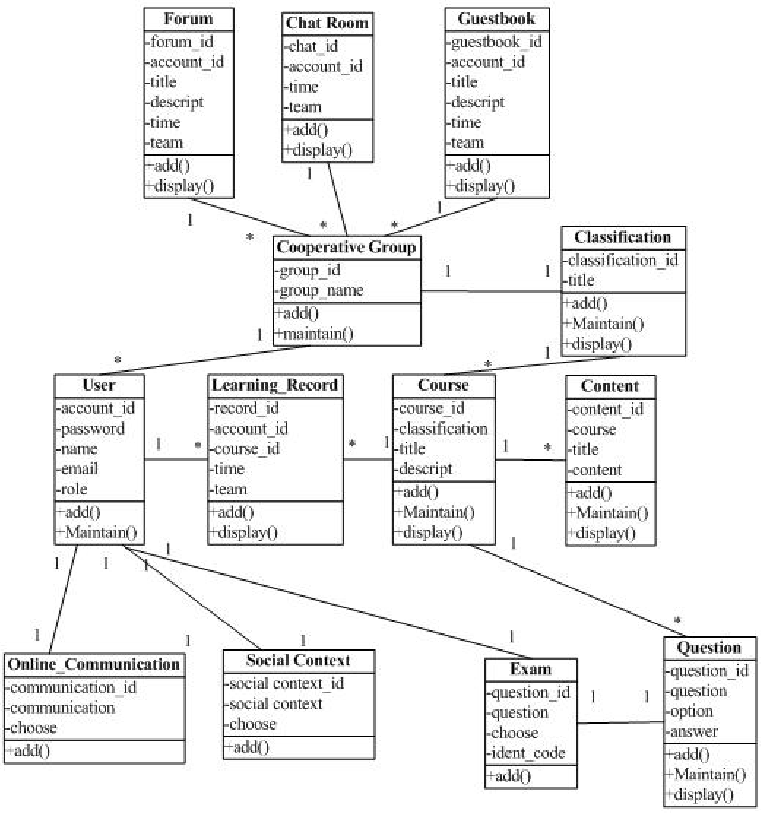


Figure 8: Relationships between core tables

C. Interface

Users can use internet browser to remote login-on the cooperative learning system using HTTP protocol. Only key-in data with correct accounts and passwords are allowed to enter the system. In addition, navigation webpage are revoked to help novice users.

(3) Conducting an experiment of comparing the leaning effectiveness and social presence between the self-form group and random group in cooperative leaning process

We used a questionnaire to gauge the level of satisfaction and the social presence perceived by the students in the two classes. The Cronbach's alpha, representing the reliability value of the whole sample, was 0.94; indicating suitable internal consistency. The questionnaire could therefore be considered representative in explaining the students' learning satisfaction and perceived social presence. The experimental process is described in the following:

Step 1: Two different types of instructional environments were employed. One group was student teams made up of randomly assigned members, and the other group was self-formed teams with members selected by themselves (Students may form teams of their own with members they prefer). In order to shed light on the effect of students' use of the cooperative learning system on learning effectiveness in the two different instructional environments, we compared the students in the two classes, creating an self-formed group and random group containing 27 and 30 persons, respectively. Slavin, Madden, and Steven (1989) indicated that cooperative learning constitutes a structured and systematic teaching strategy. When teaching, teachers instruct students forming heterogeneous groups comprising students of different genders, cultural backgrounds, and levels of ability; each group typically contains two to four persons. The members of each group study, share knowledge, and receive rewards as a team. Thefore, we created both self-formed and random groups. This course lasted 18 weeks, and team assignments were given after the students had participated in the class for several weeks.

Step 2: We encouraged the students in the two groups to make frequent use of the cooperative system for online communication and learning.

Step 3: After the end of the course, the teacher will assess the academic achievement of each group. There are five levels of scores, namely A+, A, B, C, and D, which correspond to points five to one, respectively. In this course, when a team scores five points, all members get the same academic achievement. Furthermore, a questionnaire was employed to understand the students' learning satisfaction and perceived social presence, which verified the suitability of the system. Particularly, our assessment of learning satisfaction is based on the questions proposed by Ganawardena and Zittle (1997). In terms of perceived social presence, we chiefly employed the theoretical framework of social presence proposed by Yen and Tu (2008), the questions on our questionnaire reflect those developed by Tu and Yen (2007) and Yen and Tu (2008) to assess perceived social presence. Perceived social presence includes the three dimensions of social context, online communication, and interactivity. Although Yen and Tu (2008) also discussed the influence of privacy, we do not consider privacy an aspect needed to be considered in this study. Because cooperative learning should involve open communication, in practice it should also allow private communication, and should not restrict students from using other means of communication to discuss their coursework. Responses to all questions on the questionnaire are expressed using a five-point Likert scale, in which strongly disagree is one point and strongly agree is five points. The recovered questionnaires were analyzed using SPSS version 18.0 software. Furthermore, some slight adjustments were made to the wording of the questions to ensure that they would be understood by the Taiwanese students, enhancing the exhaustiveness and appropriateness of the scale and ensuring that the questionnaire possessed excellent content validity. All items are shown in Appendix-A.

Step 4: We further to analyze and discuss the results that obtained from the learning effectiveness and perceived social presence and to provide some insights into the findings of cooperative learning.

(4) Data analysis and discussion

Table 1 shows that the results of Levene's test. As can be seen, all results were statistically significant, and the sample variances in the two groups were identical. The results of the independent sample t-test showed that neither academic achievement (p = .962 > .05) nor learning satisfaction (p = .942 > .05) reached a level of statistical significance, indicating that there was no significant difference in academic achievement and learning satisfaction between the students in the two groups. Among the three dimensions of social presence, p = .753 > .05 and p = .680 > .05 for social context and online communication, respectively; indicating no significant differences in perceived social context and online communication among the students in the two groups. However, the results of interactivity testing were not statistically significant, revealing differing cognitive levels of interactivity among students in different groups.

Table 1: Summary of survey results from different groups

	Self-formed group (*n* = 27)		Random group (*n* = 30)		Levene's test for equality of variances		t-value
	Mean	SD	Mean	SD	*F*	Sig.	
Learning effectiveness							
Academic achievement	3.95	.544	3.94	.630	.206	.652	.047
Learning satisfaction	3.89	.507	3.88	.545	.032	.859	.073
Social presence							
Social context	3.82	.646	3.88	.756	.026	.872	-.316
Online communication	3.78	.531	3.84	.665	.390	.535	-.415
Interactivity	4.11	.684	3.68	.748	.066	.798	2.244*

Note: * $p < 0.05$

(5) Summation of the results of this research

We concluded the findings of this research and research papers were written. The contents of this paper addressed about research issues, research purposes, research method, experimental process and research findings and implications to both the academic and the practitioner.

DISCUSSION

The empirical analysis results reveal that the self-formed group had a mean score of 3.89 (Max: 5) for the average of responses concerning learning satisfaction, while the random group had a mean score of 3.88. Academic achievement also shows the same results. There is clearly little difference between these two scores. Moreover, there was no significant variance in academic achievement and learning satisfaction between students in the two groups, implying that the system is able to help students engage in online collaborative learning, and is therefore useful.

This study assessed students' perceived social presence in cooperative learning system in terms of social context, online communication, and interactivity. There was insignificant difference in social context and online communication between the two groups, and these consistent results indicated that the students encountered no significant obstacles when using the online communication function. The students uniformly felt that the online communication function provided by the system allowed them to clearly express their views when discussing coursework and also enabled them to maintain individual social relationships. The results verified that the communication module developed in this study is indeed useful. Online communication is an important function of e-learning. Students can use online communication tools (e.g., discussion board, online chat room) to meet the needs of knowledge sharing. Therefore, online communication tool is necessary in e-learning. We believe that online communication featuring emerging information technology can create better online communication system to improve people's interaction. Students' social context is consistent. Previous studies (Liaw et al., 2007; Weinstein, 1991) pointed out that students have a common goal in collaborative learning environment; they will share knowledge and exchange views. Thus, there is no significant difference in perceived social context between the two groups. In addition, the two groups had differing interactivity results, as evidenced by the fact that the mean total response score of the self-formed group was higher than that of the random group (mean 4.11 > 3.68). This is because self-formed groups often comprise familiar members, who would be more interactive than those in random groups. Nevertheless, interactive behavior is important in a cooperative learning environment.

The phenomenon appearing in this study is analyzed as follows: (1) design of interaction mechanisms: designing interaction mechanisms should not consist solely of the developing cooperative system with better interaction functions in using the computer systems. Instead, a range of interaction mechanisms connected with computer communication tools should be provided to stimulate students' willingness to use the system to interact with others. For instance, a system can record the number of times students interacted with each other, and have a cumulative incentive mechanism inducing students to actively seek to interact with their classmates. There will be no need to develop a new communication tool to achieve this function, but to make some slight modifications to the current computer program. The key point is to design appealing interaction mechanisms, and not appealing communication systems; (2) teacher participation in instruction: Even when using an effective system or function, students will not enjoy good interaction if the teacher does not express his or her views or participate at appropriate times. Particularly in distance learning environments, maintenance of student-teacher relationships depends entirely upon the teacher, who should strive to lessen the distance with students. Shen and Liu (2011) also advocated that teachers should encourage students to engage in web-based self-learning. Although students who use a distance learning system may have little interaction with their teacher, teachers can participate in discussions or suggest topics that may arouse students' interest, and thus increase their interest in learning and interaction. We therefore conclude that teacher participation in instruction can help create an appropriate learning atmosphere. We recommend that, apart from students, teachers also personally use and participate in instructional systems, which will foster enthusiastic online class discussion. Furthermore, in order to maintain course quality, teachers should maintain appropriate content in online courses and discussion forums. From the perspective of system development, the system developed in this study consisted of five modules. We employed an object-oriented model in system design and development because some of the functions in these modules are intersecting, have object coupling, or use similar resources. The majority of functions are independent, which facilitates management. In addition, we used the Microsoft® .Net framework to edit online teaching materials and functions because it supports a wide array of multimedia tools; thus enabling teachers to upload images, draft forms, design font styles, and create the layout, and the interface is similar to that of Microsoft® Office. Teachers with experience using similar software were consequently able to master the system quite easily. An easy-to-use interface can greatly enhance users' willingness to use the system.

CONCLUSION AND FUTURE RESEARCH

In this paper, we developed a cooperative learning system for students in a department of digital content design in a college. In both self-formed and random groups, students demonstrate high levels of academic achievement and learning satisfaction, which verified the system's utility. The contributions of this research are summarized as follows: (1) this study verified three dimensions proposed by Tu to explain individuals' perceived social presence when using cooperative learning systems. It is found that interactivity has significant difference, but social context and online communication has insignificant difference among three dimensions of social presence theory; (2) a web-based cooperative learning system is developed. The system architecture proposed in this paper will provide useful references for practitioners in developing cooperative learning systems.

There are also limitations in this study. First, participants in this study are college students; and hence, results of this study can not be extended to other aspects. Second, the subject of experiment is "design web graphs and layouts', learning materials and times spent on the experiment are so limited. It is difficult to infer the phenomena appearing in this study are universal in another case. Therefore, two recommendations are suggested based on the experiences of this research. First, cooperative learning systems should contain better interaction mechanisms to support communication activities among teachers and students in cooperative learning process. Second, teachers should be active in involving in discussions with students to stimulate high levels of student interaction. Therefore, this study concludes that establishing n comprehensive cooperative leaning system and better interaction mechanisms will ensure higher levels of learning performance in cooperative learning process. Finally, future research directions are suggested: (1) a cooperative learning system can be enhanced using intelligent agents to provide integrated services and comprehensive functions in cooperative learning process, (2) integrating social cognition theory with social presence theory to investigate the learning performance of cooperative learning, and (3) investigating the learning effectiveness and social presence in using a cooperative system for a longer time span to ensure whether social presence theory can be extended to other learning aspects.

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Appendix A: Questionnaire

Note: CLS= Cooperative learning system

- **Perceived social presence (Tu & Yen, 2007; Yen & Tu, 2008)**

Social Context (SC)
SC1: CLS messages are social forms of communication.
SC2: CLS messages convey feelings and emotions.
SC3: CLS allows me to build more caring social relationship with others.
SC4: CLS permits the building of trust relationships.
Interactivity (IN)
IN1: Users of CLS normally respond to messages immediately.
IN2: I am comfortable participating in CLS, even I am not familiar with the topics.
IN3: I am comfortable with the communication styles employed by CLS users.
Online Communication (OC)
OC1: It is easy to express what I want to communicate through CLS.
OC2: My computer keyboard skills allow me to participate comfortably in CLS.

- **Learning satisfaction (LSAT) (Ganawardena & Zittle, 1997)**

LSAT1: I was able to learn through the medium of CLS.
LSAT2: I was able to learn from the discussion on the online course of designing web graphics and layouts.
LSAT3: I was stimulated to do additional reading or research on topics discussed on the online course of designing web graphics and layouts.
LSAT4: I learned to value others' points of view.
LSAT5: As a result of my experience with the online course of designing web graphics and layouts, I would like to participate in another online course in the future.
LSAT6: The online course was a useful learning experience.
LSAT7: The diversity of topics offered by the online course prompted me to participate in the discussion.
LSAT8: I devote a great deal of effort to learning the CLS so as to participate in the online course.

ELEMENTARY SCHOOL TEACHERS' PERCEPTIONS TOWARD ICT: THE CASE OF USING MAGIC BOARD FOR TEACHING MATHEMATICS

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ABSTRACT
This study aims at investigating elementary school teachers' perceptions toward to the use of ICT. Magic Board, an interactive web-based environment which provides a set of virtual manipulatives for elementary mathematics, is used as the case of ICT. After participating in Magic Board workshops, 250 elementary school teachers in Taiwan responded to a researcher developed questionnaire to get teachers' perceptions toward the use of Magic Board. The study revealed that teachers rated high scores on perceived teaching assistance, perceived learning assistance, and perceived competence of technology integration. The correlation among the three subscales indicates that teachers had a higher score on one scale correlated with higher scores on the other two scales. Findings show no gender difference on perceptions toward Magic Board. However, teachers who have data projectors in their classrooms rated higher scores on perceived teaching assistance and perceived competence of technology integration than those without data projectors in their classrooms. Lastly, this study discusses implications for these results and recommendations for future research.
Keywords: virtual manipulatives; mathematics learning; Magic Board; perceptions toward ICT.

INTRODUCTION

Physical manipulatives and virtual manipulatives

Many elementary school teachers have experienced using physical objects (i.e. manipulatives), such as counters, Cuisenaire® rods, pattern blocks, geometric solids, and base-ten blocks, to introduce basic mathematic concepts to young children. Piaget (1952) proposed the concept that children need concrete experiences to supplement mathematical words and symbols. Consequently, using manipulatives in teaching mathematics has come to taken for granted as a method that will help children to learn mathematics in a more meaning way. In short, they provide experiences in helping students build clearer mental images and understanding mathematical ideas (Weiss, 2006). However, using manipulatives in teaching mathematics was not as expected in practice (Gilbert & Bush, 1988; Moyer, 2001). In Moyer's study, she examined 10 middle grades teachers' uses of manipulatives for teaching mathematics using interviews and observations to explore how and why the teachers used the manipulatives as they did (Moyer, 2001). Results showed that school teachers typically thought manipulatives were fun, but not necessary for teaching and learning mathematics. She further stated that manipulatives have problems associated with implementation in the elementary classroom. These problems include lack of suitable manipulatives, organization, use, and storage, as well as classroom control issues.

Recent research on "virtual manipulatives" has brought new perspectives into the use of manipulatives for mathematics instruction and learning. Virtual manipulatives are exact virtual replicas of concrete manipulatives placed on the internet in the form of computer applets for constructing mathematical knowledge (Moyer, Bolyard, & Spikell ,2002). Many researchers believed that virtual manipulatives have the potential to overcome some of the main drawbacks of implementing physical manipulatives (Clements & Sarama, 2005; Moyer, Niezgoda, & Stanley , 2005; Yuan, Lee, & Wang, 2010). They discussed many advantageous properties of virtual manipulatives, including the potential for alteration, interactivity, flexible representations, unlimited supply, and easy to clean. The National Council of Teachers of Mathematics (2000, pp. 26-27) indicated that work with virtual manipulatives allows young children to extend physical experience and to develop an initial understanding of sophisticated concepts such as the use of algorithms. Many studies have shown that virtual manipulatives offer unique advantages, and can be as or more effective than physical manipulatives, in supporting learning (Wright, 1994; Clements & Sarama, 1998; Suh & Moyer, 2007). Yuan, Lee, and Wang (2010) examined the performance difference between using physical manipulatives and virtual manipulatives in finding the number of polyominoes. They found students in the virtual environment paid much more attention to exploring the polyomino problem. New ideas, including using new symbols to record the results and considering the influence of symmetry and rotation on the figures, also occurred in the virtual manipulative group. Using virtual manipulatives during instruction seems to be a new trend for integrating technology into mathematics learning and teaching (Lee & Chen, 2009).

Teachers' beliefs toward classroom use of technology

Over the past two decades, research has demonstrated that personal belief systems exert a powerful influence on what teachers learn from reform initiatives and staff development programs, on their curricular decision-making, and on the instructional practices, they use in their classrooms (Nettle, 1998; Vacc & Bright, 1999). Many educational reform initiatives have failed because they had little impact on teachers' beliefs or practice (Czerniak &Lumpe, 1996; Cohen & Ball, 1990), particularly, introducing educational technology into the classroom. Scholars have argued that providing a technology infrastructure will change teachers' practice (David, 1994; Sheingold, 1991) and technology can support using constructivist approaches to the teaching and learning advocated by the current reform movement (Linn, 1998; Sandholtz, Ringstaff, & Dwyer, 1997). However, the current level of technology integration has not yet reached a critical mass (Scrimshaw, 2004) and there is tension between the input of enthusiastic forerunners and the reality of a more widespread implementation (Watson, 2006).

The gap between innovation objectives and the current level of technology integration is due to the mismatch between the meanings attached to innovation by those involved in the instructional process (van den Berg, Vandenberghe, & Sleegers, 1999). In this respect, the personal willingness of teachers to adopt and integrate innovations into their classroom practice seems to be of crucial importance (Ghaith & Yaghi, 1997). Previous evidence has suggested that, if treating technology as an instructional innovation, beliefs will play a significant role in whether or how it is adopted and implemented (Czerniak & Lumpe, 1996). For example, Niederhauser and Stoddart (2001) suggested that teachers use technology in ways that are consistent with their personal beliefs about curriculum and instructional practice. Zhao, Pugh, Sheldon, and Byers (2002) reported that the further a new practice is from existing practice, the less likelihood of implementing it successfully. Given this, instructional technologists might consider introducing technology as a tool to accomplish what is already valued. Once the tool is valued, the emphasis can switch to its potential for accomplishing additional or new tasks, including those supported by broader or different beliefs (Ertmer, 2001).

Ertmer (2005) proposed the following three strategies for promoting change in teacher beliefs about technology integration.

1. Personal experience: self-efficacy literature (Schunk, 2000) highlights the importance of building a teacher's confidence through successful experiences with small instructional changes before attempting large changes. Particularly when technology is involved, starting with relatively simple uses may be a more productive path to achieving teacher change than expecting teachers to use technology, from the outset, to achieve high-end instructional goals.
2. Vicarious experiences: Zhao and Cziko (2001) found that observing successful others might increase teachers' perceived need for change as well as assure them that the required changes are not impossible. Therefore, models not only provide information about how to enact specific classroom strategies, but increase observers' confidence for generating the same behaviors.
3. Social-cultural influences: Zhao and Frank (2003) noted that change in teacher beliefs regarding the value of computers was more likely to occur when teachers were socialized by their peers to think differently about technology use. An innovation is less likely to be adopted if it deviates too greatly from prevailing values, pedagogical beliefs, and practices of teachers and administrators in the school. Teacher practice is more likely to change in professional communities that support technology integration.

Based on the above-described three strategies, Magic Board workshops provide elementary school teachers with hands-on design activities, model examples, and an on-line professional development community. Teachers can have successful personal experience in using Magic Board to design their teaching materials through hands-on activities. They can see model examples designed by other peers. Observing other similar others serves both informational and motivational functions. Teachers can register as a member of the Magic Board professional learning community, in which teachers jointly explore new teaching methods, tools, and beliefs, and support each other as they begin transforming classroom practice. The next section provides a brief introduction of Magic Board.

Magic Board

Numerous virtual manipulative websites are currently available worldwide, such as the National Council of Teachers of Mathematics Illuminations (http://illuminations.nctm.org/) and the National Library of Virtual Manipulatives (http://nlvm.usu.edu/en/nav/vlibrary.html). These resources are full of applets, and each applet is designed for teaching a specific topic. Virtual manipulatives in different applets cannot be used together within the same interface. This reduces the flexibility and the need for representing different concepts.

Different from these existing resources, Magic Board provides a collection of virtual objects that elementary teachers usually use to present mathematics concepts. Magic Board is a well-known web-based virtual-manipulative environment for teaching elementary mathematics in Taiwan, developed by Yuan (2005), and based on experiences for developing virtual manipulatives. Magic Board consists of three important components, namely Magic Board Software, a Problem Center, and an Instructional Material Center. When a user registers as a member of Magic Board, he (she) can use all the components to construct and to share his (her) problem posing materials through the Magic Board platform. A user can make use of the shared posing problems and adapt them to suit his (her) classes, which other members can subsequently share and re-use. Non-registered users (guests) can still open and utilize the Magic Board Software and can implement existing problem posing materials into their instruction. All parts and graphic files in Magic Board are directly downloadable for using in conjunction with related worksheets.

- Magic Board Software (MBS)

MBS can be accessed from the upper right corner of the website home page by clicking the "Try English version." button. MBS (See Figure 1) has the frequently used elementary mathematics manipulatives digitalized and componentized in the Toolbox, which allows teachers instant access during teaching. Teachers can drag these objects to the Display Area and a right-click allows access to property variation and operation. At the Function Button Area, the Text button allows one to enter text to pose story problems for explorations, and the Draw button can be used to scribble or mark anything which erases by clicking the Erase button. The Cheers button encourages students who are doing well or motivates students showing good efforts. The BK button allows for fast change of background and lastly, members can upload their designed materials onto the online database or download previously saved teaching materials. Clicking the Rubbish Bin located at the bottom right-hand corner clears all components from the Display Area. A user creates his/her problem on the Display Area, he/she can save the problem by clicking the Save/Upload button to save it on the web for other users to use or clicking the Load Locally button to save it in personal computer temporarily.

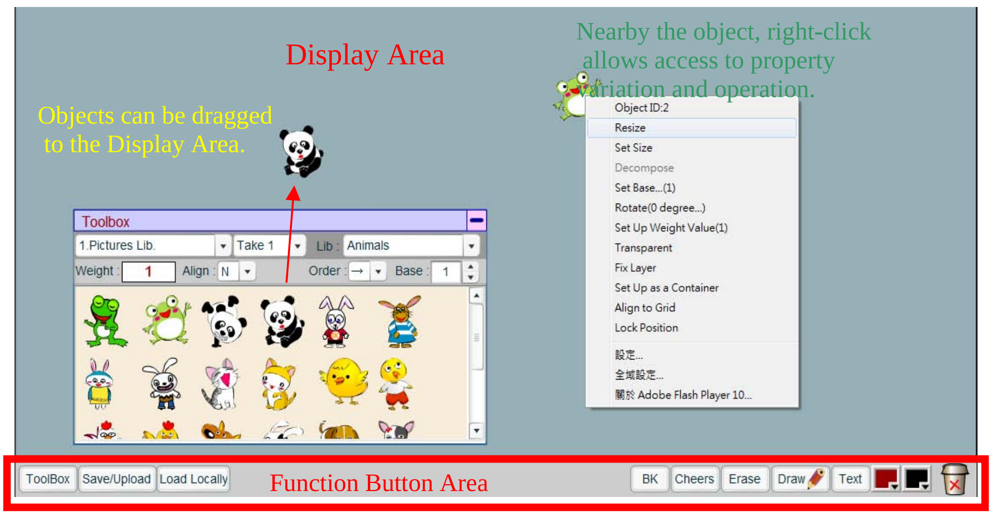

Figure 1: Magic Board software interface

- Problem Center (PC)

Users can log into the Magic Board platform to use resources from the PC. They can search for uploaded problems according to the level of their students and mathematical contents. The teaching materials can be saved and uploaded as users click on Save/Upload button on the Function Button Area, and from there follow the instruction to enter the grade of the target students and their content. Users can search for problems based on these pre-set search values. Clicking on Searching Problem on the top and selecting grade 1, measurement and length as the search values lists past problems uploaded by Magic Board members (see Figure 2).

Figure 2: Searching problems uploaded by pre-set search values

- Instructional Material Center (IMC)

By clicking on Organize Instructional Materials, users can browse through problems and choose suitable source materials, to personalize the instructional materials. Once users have entered Organize Instructional Materials (See Figure 3), searched, and clicked the problems, the right-hand column numbers the problems according to their picking order. Clicking on Finish button and entering the classification information of the instructional materials, completes the compilation. By clicking on Search Instructional Materials, users can look for shared instructional materials through classifications such as grades and mathematical concepts. Users can access and read the completed instructional materials at the IMC. Figure 4 is an instructional material presented in a story form that contains 12 problems (current screen demonstrates problem 4). Clicking on the arrow in the Function Buttons Area controls the presentation of instructional materials. As the components (such as the tables and chairs) on the screen all come from the Toolbox, they can therefore be easily shifted around to allow clearer demonstration of the texts as well as class discussion prior to problem solving.

Figure 3 : Operating interface of organizing instructional materials

Figure 4: An instructional material that contains 12 problems

Magic Board can be accessed at http://magicboard.cycu.edu.tw for free. Teachers only need to drag and copy to compile their own instructional materials, and subsequently upload them to share with other teachers. Teachers can edit and adopt instructional materials created by other teachers to an individual application. It is an all-in -one applet. Teachers can share the instructional materials they developed to save other teachers' time, and teachers can personalize instructional materials to adjust to their specific needs. Hatfield (1994) indicated that teacher competency of technology-integrated instruction is one major reason that elementary teachers decide not to use manipulatives in their classroom. Magic Board is designed to be a good assistant for elementary teachers in teaching mathematics.

THE PURPOSE OF THIS STUDY

Virtual manipulatives are one important element of mathematics teaching and learning as components of representational systems (Durmus & Karakirik, 2006). Mathematics classrooms are now using this relatively new technology with greater frequency. Therefore, this study developed a questionnaire to help understand elementary school teachers' perceptions toward ICT and the use of Magic Board is explored as a case of using ICT. A recent study indicated that male teachers showed more positive attitude toward integrating technology into instruction than female teachers on attitude and strategies used (Yuan & Lin, 2008). Therefore, an analysis of gender differences also included in the study. Generally speaking, accessibility of ICT equipment can create a significant problem for teachers' technology integration. However, a few studies indicated that increasing teachers' access to ICT dose not increase their desire to use ICT in class (Cuban, Kilpatrick & Peck, 2001; Wallace, 2004). In this study, classrooms with data projectors are investigated. With this equipment, instructional materials created by Magic Board can be easily and clearly demonstrated in front of the whole class. For this reason, this study also compared views of teachers who have data projectors with those who do not have in their classrooms.

METHODOLOGY

Instrument

To develop the Magic Board Questionnaire (MBQ), three subscales were constructed on elementary school teachers' perceptions toward Magic Board, i.e., perceived teaching assistance, perceived learning assistance, and perceived competence of technology integration. Based on the work of Lee (Lee & Chen, 2010; Lee & Yuan, 2010), and by consulting with experts in mathematics education, twenty-two items were chosen for the questionnaire. The questionnaire consisted of bipolar agree-disagree statements on a 4-1 Likert scale. All items were presented in the Chinese language. The following three statements are samples of the respective subscales.

1. Perceived teaching assistance scale (PT): An assessment of teachers' views that Magic Board assists teachers in mathematics teaching (e.g., "I feel that Magic Board is a good tool to assist teaching", see appendix PT3).
2. Perceived learning assistance (PL): An assessment of teachers' views that Magic Board aids students in mathematics learning (e.g., "I feel that using Magic Board for teaching improves students' mathematics achievement", see appendix PL5).
3. Perceived competence of technology integration (PC): An assessment of teachers' perceived competence of technology integration (e.g., "I have confidence in implementing technology integrated instruction in mathematics class", see appendix PC5).

Participants

Since the release of the Magic Board on the Internet, the study researcher has frequently been invited to host workshops in various counties and cities throughout Taiwan to promote the use of the Magic Board and gather participant feedback and opinions. If lectures are provided for explanation within relevant research and promotion activities, participants will only receive one-way functional information transmission without opportunities to actually use and operate the Magic Board. By increasing the learning or study time to 6 hours or more, the participating teachers can obtain a clearer understanding of the Magic Board's operational functions through practical applications and can have opportunities to actually complete problem posing and implement the teaching materials. Therefore, for this study, we selected 272 elementary school teachers who attended learning activities for 6 hours or more between 2007 and 2009 as the participants. The participants were recruited from Taoyuan County, Hsinchu City, Taichung City, and Kaohsiung City. Although the sample size of these teachers was relatively small, they represented different demographic backgrounds. The majority of the learning activities was provided by the Curriculum and Instruction Counselling Group for Mathematics in the four regions. Most of the participating teachers were school or teacher representatives for schools in the various cities and counties, and a number of them participated in the learning activities voluntarily.

After completing the learning activities, questionnaires were issued on-site and completed and collected. After excluding the incomplete questionnaires, we had a total of 250 valid questionnaires. Of the 250 participating teachers who completed valid questionnaires, 35 were men and 215 were women. The distribution of years of teaching experience was 53 teachers with 5 years or less, 84 teachers with 5 to 10 years, 60 teachers with 10 to 15 years, 36 teachers with 15 to 20 years, and 17 with over 20 years teaching experience. Regarding the age distribution, 52 participants were 30 years of age or younger, 141 participants were between 30 to 40 years of age, and 57 participants were older than 40 years of age. Background analysis of the teachers who received the questionnaires indicated that the majority of the teachers were women, had 5 to 10 years teaching experience, and were between 30 to 40 years of age. Detailed background information of the participants is listed in Table 1.

Table 1 : Demographics of Teachers in Study

	Taoyuan County	Hsinchu City	Taichung City	Kaohsiung City	Total
Number of teachers (*n*)	97	35	61	57	250
Gender					
Male	13	3	7	12	35
Female	84	32	54	45	215
Age					
30 years of age	23	1	13	15	52
Between 30 to 40 years of age	56	19	38	28	141
> 40 years of age	18	15	10	14	57
Teaching Experience					
5 years	27	2	15	9	53
5 to 10 years	35	13	21	15	84
10 to 15 years	22	7	17	14	60
> 15 years	13	13	8	19	53

Data Analysis

An exploratory factor analysis was applied to clarify the structure of item factors. Principle component analysis with varimax rotation to reveal the structure of MBQ was used. The MBQ response differences on some variables, such as gender and the data projector, analyzed by a series of independent t-tests, were investigated further.

Results

KMO and Bartlett's Test were used to examine the appropriateness of conducting factor analysis. From table 2, we can interpret that there is no error in 92.8 % of the sample, and the observed significance level is less than .001. These indicate that a factor analysis of the variables is a good idea.

Table 2: Result of KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.928
Bartlett's Test of Sphericity	Approx. Chi-Square	2502.761
	Df	136
	Sig.	.000

The MBQ revealed three factors, as expected. A questionnaire item was retained only when it loaded greater than 0.50 on the relevant factor, and less than 0.50 on the non-relevant factor. As a result, the initial twenty-two items were reduced to sixteen items. Table 3 shows that the eigenvalues of the three factors (perceived teaching assistance – 6 items, perceived competence of technology integration– 5 items, and perceived learning assistance– 5 items) from the principle component analysis were all greater than one: 8.13, 1.59, and 1.03, respectively. These three factors accounted for 67.19% of the variance. Internal reliability, alpha coefficient, was satisfactory for the three subscales (0.89, 0.90, and 0.81, respectively).

Table 3: Results of principal component analysis

Item	Factor 1 PT	Factor 2 PC	Factor 3 PL
PT1	**.831**	.156	.179
PT2	**.801**	.222	.249
PT3	**.722**	.284	.222
PT4	**.717**	.237	.119
PT5	**.619**	.270	.387
PT6	**.617**	.234	.300
PC1	.206	**.842**	.217
PC2	.181	**.821**	.230
PC3	.184	**.816**	.171
PC4	.294	**.778**	.170
PC5	.424	**.665**	.020
PL1	.393	.307	**.716**
PL2	.051	-.016	**.675**
PL3	.355	.417	**.657**
PL4	.440	.305	**.641**
PL5	.445	.315	**.551**
Cronbach's α	.887	.896	.806
Eigenvalue	8.133	1.585	1.032
Cum. Variance explained (%)	26.144	50.489	67.187

Note. Overall Cronbach's α .927; PC: perceived competence of technology integration, PL: perceived learning assistance, PT: perceived teaching assistance.

Table 4 shows teachers' descriptive results on the three subscales. The questionnaire applied a 4-1 Likert scale, so the maximal mean item score is 4. The mean item score was 3.49 for perceived teaching assistance, 3.32 for perceived learning assistance, and 3.41 for perceived competence of technology integration. These results indicate that teachers believed Magic Board assists teachers in mathematics teaching and aids students in mathematics learning after finishing the Magic Board workshop program. In addition, teachers perceived more competence of technology integration.

Table 4: Teachers' scores on the three subscales (N=250)

Subscale	*Items*	*Mean of items*	*SD*
PT	*6*	*3.4920*	*.45886*
PL	*5*	*3.3184*	*.48336*
PC	*5*	*3.4056*	*.49036*

Note. PC: perceived competence of technology integration, PL: perceived learning assistance, PT: perceived teaching assistance.

Table 5 reveals that all three subscales positively correlated with the other two subscales. The more teachers believe that Magic Board is beneficial for teaching and learning assistance, the more they are willing to integrate technology into their instruction. This is consistent with Ertmer's (2005) findings that integration is better determined by observing the extent to which technology is used to facilitate teaching and learning. Thus, teachers' views about perceived teaching assistance and perceived learning assistance may play an important role in the technology adoption process.

Table 5: The correlations among PC, PL, and PT (n=250)

	PC	PL	PT
PC	1	.581**	.605**
PL	.581**	1	.700**
PT	.605**	.700**	1

Note. **p<.01; PC: perceived competence of technology integration, PL: perceived learning assistance, PT: perceived teaching assistance.

Table 6 presents an analysis of results by gender, indicating no significant difference in all three subscales when comparing the responses of male teachers and female teachers. The results suggest that male and female teachers had similar conceptions toward Magic Board.

Table 6: Teachers' scores on the three subscales, by gender (N=250)

Subscale	*Gender*	*Mean of items*	*SD*	*t*
PC	Male	3.4114	.51551	.076
	Female	3.4047	.48739	
PL	Male	3.4000	.51791	1.077
	Female	3.3051	.47746	
PT	Male	3.5810	.41297	1.238
	Female	3.4775	.46518	

Note. n=35 for males, n=215 for females. PC: perceived competence of technology integration, PL: perceived learning assistance, PT: perceived teaching assistance.

Table 7 shows the results based on the possession of data projectors in teachers' classrooms, with significant differences on the subscales of PC and PT (p<.05). Teachers with data projectors in their classrooms showed significant more agreement in their perspectives on the perceived competence of technology integration and perceived teaching assistance than did those without data projectors in their classrooms. The results indicate that accessibility of ICT equipment can create a significant problem for teachers' technology integration (Means & Olson, 1997). Magic Board is an interactive web-based environment. With a data projector, instructional materials created by Magic Board can be easily and clearly demonstrated in front of the whole class. This might be a reason to get these differences between the two groups.

Table 7: Teachers' scores on the three subscales, by data projector (N=250)

Subscale	*Data Projector*	*Mean of items*	*SD*	*t*
PC	*yes*	*3.4881*	*.46743*	*2.544**
	no	*3.3318*	*.50028*	
PL	*yes*	*3.3593*	*.47900*	*1.267*
	no	*3.2818*	*.48612*	
PT	*yes*	*3.5579*	*.42499*	*2.163**
	no	*3.4331*	*.48114*	

Note. n=118 for having data projectors in their classrooms, n=132 for having no digital projectors in their classrooms. * p<.05; PC: perceived competence of technology integration, PL: perceived learning assistance, PT: perceived teaching assistance.

DISCUSSION AND CONCLUSIONS

This study presents a convenient tool to assess elementary school teachers' perceptions toward Magic Board based on perceived teaching assistance, perceived learning assistance, and perceived competence of technology integration. Using this tool, teacher educators and researchers can deeply explore the role of elementary school teachers' views about Magic Board (In the questionnaire, Magic Board can be changed into any technology tools that suit your need, such as Virtual Manipulatives).

After finishing training in the Magic Board workshop, teachers rated high scores on PT, PL, and PC. Apparently, hands-on design activities make teachers perceive the ease of using Magic Board and that model examples enable teachers to perceive the usefulness of Magic Board in the real classroom. Based on the Technology Acceptance Model (Bagozzi, Davis, & Warshaw, 1992), the greater the perceived usefulness and ease of use of an innovation, the greater likelihood of adopting the innovation. Therefore, teachers may have more confidence in technology integration after training in the Magic Board workshop. The results may imply personal and vicarious experiences, as well as social and culture norms, having some potential for altering teachers' beliefs. Moreover, teachers may become motivated to make changes in their instructional practices (Millsaps, 2000), and have an impact on their students (Patterson & Norwood, 2004). Future research needs to verify their relative impact. Furthermore, the correlation among the three subscales indicates that teachers had a higher score on PC correlated with higher scores on PT and PL. This is consistent with Ertmer's (2005) findings that integration is better determined by observing the extent to which technology is used to facilitate teaching and learning. Thus, teachers' views about perceived teaching assistance and perceived learning assistance may play an important role in the technology adoption process.

The result shows that no gender difference was found in all three subscales when comparing the responses of male teachers and female teachers. However, previous studies (e.g., van Braak, Tondeur, & Valcke, 2004) found that female teachers reported significantly lower levels of educational computer use than their male counterparts did. The training in the Magic Board workshop seemingly reduced the gender gap of teachers' conceptions toward Magic Board. With a user-friendly feature, teachers only need to possess the most fundamental computer skills to operate Magic Board. This might provide female teachers with more confidence in using Magic Board to teach mathematics.

This study reveals that access to data projectors in teachers' classrooms has an influence on teachers' perspectives about perceived teaching assistance and these teachers seemed to perceive competence of technology integration. Hennessy, Deaney, & Ruthven (2005) claimed that limited access to technology and insufficient technological support are some of the reasons why teachers might not take advantage of the educational power of technology. Although the barriers related to equipment support can cause significant problems for technology integration, teachers may solve these problems through hand-me-downs, grants, and private donations.

The results of this study support another way to promote technology adoption among teachers at different levels. Researchers need to develop easy-to-use tools so that the teacher does not need to spend extra time and energy learning to use the technology. Since Magic board is designed to support a wide range of teaching approaches, it does not require a teacher to change his pedagogy in order to use technology. Moreover, it uses a common graphic-interface web browser, making it easy to learn and use because many pre- and in-service elementary school teachers have already had experience with such software.

Future research should examine how teachers' perceptions toward Magic Board influence their choice of how and when to use it in instruction. For instance, it is important to determine if this group of teachers, influenced by the training of Magic Board workshop, are the only teachers using virtual manipulatives in ways central to their mathematics lessons or if other teachers are using manipulatives in the same ways. Further examinations, using in-depth interviews with teachers and observations of classroom implementation, have the potential to reveal additional insights into these results.

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Appendix: The questionnaire used in the study

PT1: In the proper mathematical topics, I will be enthusiastic about using Magic board to design learning materials and to integrate them into my class.
PT2: I will use Magic Board for mathematics teaching.
PT3: I feel that Magic Board is a good tool to assist teaching.
PT4: I feel that conveniently using and storing Magic Board in the classroom can save a lot of teaching time.
PT5: I feel that using Magic Board can remedy the lack of physical manipulatives.
PT6: I feel that Magic Board is easy to demonstrate and convenient for big group teaching in the classroom.
PC1: I can present teaching materials clearly by integrating technology into mathematics instruction.
PC2: I can understand the meaning of technology-integrated mathematics instruction.
PC3: I can make abstract teaching materials easy to understand by integrating technology into mathematics instruction.
PC4: It is easy for me to implement technology integrated mathematics instruction.
PC5: I have confidence in implementing technology-integrated instruction in mathematics class.
PL1: I feel that using Magic Board for teaching can help students express mathematical ideas.
PL2: I feel that using Magic Board for teaching can improve students' interest in mathematics learning.
PL3: I feel that the functions of various components in Magic Board can help students link the mathematics concept.
PL4: I hope that students can use Magic Board to learn mathematics.
PL5: I feel that using Magic Board for teaching can improve students' mathematics achievements.

EMOTIONS AND PAIR TRUST IN ASYNCHRONOUS HOSPITALITY CULTURAL EXCHANGE FOR STUDENTS IN TAIWAN AND HONG KONG

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ABSTRACT
Social and emotional dynamics have an impact on students' learning processes in online-learning situations. This study explores university students' emotions and trust levels resulting from collaborative communication behaviors when they interacted as part of a Food and Tourism course in Taiwan and Hong Kong. More specifically, students' emotions and trust levels were investigated and were founded to have varied over the course of the study. Results show that the Taiwan-based participants seemed to express their emotions more strongly than the Hong Kong-based ones. Both the Hong Kong and Taiwan groups generally felt satisfied, excited and curious, whereas they were sometimes perceived to be dispirited, insecure and angry while the project was in progress and at the end of the project. The three sources that caused most emotional comment were *self*, *social* and *others*. When it came to dealing with emotion, most students tried to solve problems by themselves. They believed that they had the ability to solve the problems and held themselves responsible for dealing with their own emotions. The pair trust survey shows that both groups gave positive responses for all items, but there seemed to be a gap between the perception of pair trust and the reality of dealing with emotion.

INTRODUCTION
Interest in food issues has surged in recent years, both in popular culture and among students and academics. Food is a part of popular culture, and the beliefs, identities, and trends in a culture affect eating habits. With the strong trend toward globalization, enhancing cross-cultural understanding through exchanges between university students from different regions will help increase students' international competitiveness in their studies and subsequent professional lives. E-learning has become particularly attractive for educational purposes in recent years. The existing research pays close attention to the significant potential of text-based interaction within a socio-cultural context (Kitade, 2008; Payne & Ross, 2005).

In social online-learning situations, social and emotional dynamics, such as social-emotional affordances and distributed emotions, are less visible, but nevertheless have an impact on students' learning processes (Wosnitza & Volet, 2005). The importance of the emotional aspect of online learning has been recognized (Derks, Fischer, & Bos, 2008; Ware, 2005; Zembylas, 2008). This study explores college students' emotions resulting from collaborative communication behaviors when subjects interacted during a Food and Tourism course in Taiwan and Hong Kong. In addition, the trust levels of the students were also examined. Finally, students' responses to the project were analyzed.

LITERATURE REVIEW
ICT and cultural learning
With the advanced information and communications technology (ICT) available these days, it is easier to gain resources with access to the Internet. For instance, computer-based or aided language learning has been proven successful (Al Musawi, Askin, Abdelraheem, & Osman, 2012; Baharani, & Sim, 2012; Bower, 2011; Kilimci, 2010; Ware & O'Dowd, 2008; Zhang, Song, & Burston, 2011). Altstaedter and Jones (2009) implemented a project in one of their undergraduate foreign-language courses that promoted a systematic inquiry-based approach to cross-cultural learning. The students completed a series of technology-enhanced tasks using programs such as Web Quests, which typically included an introduction, a task, information sources, a description of the process, guidance on how the information should be organized, and a conclusion (Dodge, 1995). Altstaedter and Jones' study revealed that tasks performed with the aid of computers can directly affect students' motivation and achievement in a positive way and the tasks can be designed in such a way that students find them enjoyable and easy to use.

Several empirical studies have been conducted in relation to ICT and cultural learning (Freiermuth & Huand, 2012; Wang, 2010; Vinther, 2011). Li and Erben (2007) attempted to develop Internet-based language and cultural learning in a more direct way: they implemented an instant-messaging system in their course instruction. In the Chinese language course, students were paired up with native Chinese speakers through online instantmessaging systems and engaged in cross-cultural interaction. The results showed a steady improvement in student participants' intercultural interaction engagement and attentiveness, and strong development in self-reflection capacities, critical-thinking skills, and greater sensitivity to and respect for intercultural differences. Participants also had predominantly positive attitudes toward e-learning in the context of intercultural learning; they felt the system to be pleasant and convenient to use.

Another study by Vinther (2011) utilized the Internet and involved two groups of students with different native languages and the same target language (L2). The students were able to achieve two things at once: exchanging cultural understandings and practicing their L2. Survey results show that students were content with the method, were more positive toward language learning as a result of using it, and were more interested learning through knowing the other group's culture. Also, it can be seen that, owing to the native languages of the two groups being different, the errors made by the two groups varied. It was therefore a truly co-operative effort to detect and correct errors. These studies show that computers and the Internet can help language and cultural learning, not only in terms of searching for resources, but also in interacting with people from different cultural backgrounds, and excellent results can be achieved through proper material design and guidance.

Using a ubiquitous hospitality English learning platform (Uhelp), Wang (2009) investigated how Internet-based projects can enhance English-language and generic skills in Asian hospitality industry students. The results showed that students responded positively to the learning experiences because of the advantages of the Internet-based projects, such as encouraging co-operation, improving hospitality knowledge, and promoting cognitive skills. However, negative comments related to the time-consuming nature of group work, a preference for traditional paperwork, and problems with using the platform. Wang (2010) further explored online communication and offline interaction between students from two colleges. The implementation of ICT tools in blended learning does promote social interaction among students and student engagement; however, it does not automatically facilitate students' adoption of active learning strategies.

Despite the success of such projects, research conducted by Wang and Ip (2010) using the same platform failed to yield positive results. They held an international tele-collaboration project between Taiwan and Macau, where students from hospitality colleges were required to read three online articles, discuss questions on the discussion board, and conduct an online project. Some challenges emerged during the course, including the dilemma resulting from the misalignment of academic calendars and the decrease in motivation resulting from excessive student workload. During the process of attempting to solve these challenges, the researchers and the students experienced different types of negative emotions, such as feelings of discouragement, anger, and anxiety.

Emotion and trust

Hargreaves (2000, p 811) emphasized "the importance of the emotions as a field of inquiry for deepening our understanding of the nature, conditions and consequences of teaching, learning and leading in schools today." Lyons, Kluender, and Tetsutani's (2005) study demonstrated that the awareness both of our own and others' emotional states can enhance cognitive performance as well as the ability to assess another person's state of mind in an Internet-based learning environment.

If it is accepted that emotions are the forgotten key to success in online learning, as De Lera Fernàndez and Almirall (2009) asserted, more research should be conducted to identify the types of emotions experienced by the teachers and the sources of those emotions. Emotion is defined as "the momentary (acute) and ongoing (chronic, continuous) disturbance within the mind (soul, spirit) caused by the discrepancy between perceived reality and one's desires" (Payne, 1989, p. 2). Derks, Fischer, and Bos (2008) defined emotional communication as the recognition, expression and sharing of emotions or moods between two or more individuals. In humans, emotion fundamentally involves physiological arousal, expressive behaviors, and conscious experience (Myers, 2004). Motivations direct and energize behavior, while emotions provide the affective component to motivation, positive or negative (Gaulin & McBurney, 2003). Emotion directly affects the effectiveness and consequences of learning for both the instructor and the students in a learning environment. It is therefore important to examine the emotions that the teacher and students experience during the implementation of ICT in language studies and in a classroom or online environment.

Previous studies (for example, Wosnitza & Volet, 2005) have indicated that emotions in computer-supported learning could be derived from the participants themselves, the context, task or technology offered, and other people, such as peers and instructors. Ware (2005) indicated that the main provokers of tension in telecommunications are (1) different expectations and norms for tele-collaboration; (2) social and institutional factors: and (3) individual differences in motivation and use of time. Ware believed the above tensions could explain the emotional changes of participants during online communication. Nummenmaa (2007) pointed out that, although technology is an existing factor in an Internet-based learning environment, what really drives and triggers the emotion are the social aspects of the learning situation, according to the finding that "Student interaction in the learning environment was mentioned as a cause of emotions more often than the technical environment itself" (p. 41). Students who rarely take part in discussions and do not actively interact with their peers, those who are known as "lurkers", generally experience more negative emotions and become less efficient in their learning in an Internet-based learning environment.

As for students who contribute to group discussions, their emotions can come from self awareness and their awareness of others. In an online discussion, it is often the case that comments can be seen by all participants at all times. As a result, students think more carefully before they post their opinions or make comments on what others have said. Also, when they read the opinions of others in the form of online comment, they react emotionally. This might be discouraging to some students and might hinder their participation, but, at the same time, some students might be attracted to this kind of openness and it may lead to their being more active and be the cause of more positive emotions. It can be said that, although the presence of others influences students' interaction in a virtual environment (Tu & McIsaac, 2002), "it is also as important an antecedent of students' affective reactions in a web-based learning environment as it is in face-to-face learning situations" (Nummenmaa, 2007, p. 41).

The integration of ICT into language acquisition and instruction can prove successful with the correct strategy, but both instructors and learners can be faced with negative emotions as computer awareness, interest, and confidence levels can affect the adoption of ICT. Moreover, collaborative online learning requires a level of initial trust, and the failure to establish trust in temporary work groups has a constraining effect on communication (Meyerson, Weick, & Kramer, 1996). People in organizations have known for a long time that trust is an important antecedent of effective teamwork. In particular, trust "has to" develop fast when a group of students is assigned a class project. So, logically, this should hold true not only in face-to-face groups, but also for virtual teams (Carroll, 2007). Building and maintaining trust is acknowledged as a necessary condition for co-operation and a key factor in effective functioning of collaborative computer-mediated groups (Johnson & Johnson, 1975; Lewicki & McAllister, 1998; O'Hara-Devereaux & Johansen, 1994).

Trust has mainly been conceptualized as a process that develops over time (Rempel, Holmes, & Zana, 1985). Ishaya and Macaulay (1999) defined trust as "a characteristic for collaboration where members believe in character, ability, integrity, familiarity and the morality of each other" (p. 145). Iacono and Weisband (1997) showed that teams which contain a high level of trust engage in continuous communication and focus on work content. Jarvenpaa and Leidner (1999) noted that different communication behaviors, including social communication and communication conveying enthusiasm, could change the trust level over time. McNight, Cummings, and Chervany (1998) stressed that it is necessary to understand the mechanisms of initial-trust formation and to be able to predict its effect on communication, performance, and satisfaction.

Although Handy (1995) argued that "trust needs touch" (p. 46), many studies have shown that trust can exist in a virtual environment through team communication and interaction for trust development (Ishaya & Macaulay, 1999; Jarvenpaa & Leidner, 1999; Wu, Wang, Liu, Hu, & Hwang, 2012). Shields, Gil-Egui, and Stewart (2004) suggested that students' apprehension when facing the prospect of working in teams in a virtual environment can be substantially reduced by exploration of the notion of trust as a key element for the successful performance of teams; also helpful is discussion of the concepts of *swift trust*, *community of practice*, and *control* as guiding principles for the establishment of practices that help build mutual reliance among virtual team members in an online classroom. Furthermore, Usta (2012) proposed "Virtual Environment Interpersonal Trust Scale" (VEITS) to manifest the effects of virtual environments on the individuals' real identities and on the sense of trust in interpersonal communication.

Bulu and Yildirim (2008) investigated pre-service teachers' trust levels and collaborative communication behaviors. The subjects consisted of 32 (24 female, 8 male) 3rd-year foreign-language students. The subjects were involved in a four-month online project in the Learning to Teach with Technology Studio (LTTS) course at Indiana University in the US. The findings showed that the groups with different trust levels showed different communication behaviors throughout the study, and the midpoint of the group life was found to be the critical moment for increasing or decreasing the pattern of communication behaviors. Coppola, Hiltz, and Rotter (2001) also studied trust building in virtual teams: the authors designed and conducted 20 semi-structured interviews with faculty. The results revealed that, in order to build swift trust at the beginning of a course, the instructor needs to structure clear contributions for each student to make, help them cope with any technical or task uncertainties, and model and encourage responses to each other's contribution. Moreover, early encouragement of social communications (and explicit statements of commitment, excitement and optimism) also strengthened trust.

To sum up, trust is a critical component of satisfaction in any kind of experience. Consequently, practitioners of online teaching need to give special attention to trust. Maintaining social interaction throughout the course/program is as important as creating a friendly social environment. They could motivate and encourage groups to build a sense of community. Further research with different learners and in different subject areas could help examine trust and collaboration behaviors in online-learning environments.

Research Questions addressed in this study listed as follows:

1. What are students' emotions resulting from online interaction?
2. What are students' trust levels in online pair work?

METHODS

Subjects

The same number of students from a hospitality college in Taiwan and an institute in Hong Kong participated in this study (44 people, 22 pairs). All of them volunteered for this online project and it was therefore assumed that they were interested in the exchange of hospitality culture and were willing to complete the tasks in their extracurricular time. The 22 students from Taiwan are all students from the Department of Applied English (aged 18-20). They met weekly after an English class and the researcher checked their progress every week. Another 22 students from Hong Kong were all students from the Department of English (aged 19-22). A briefing session lasting 90 minutes was conducted to ensure that all the participants fully understood the purpose of the project and the operation procedure of the online platform. This group of students did not meet weekly, as they dispersed to different classes, but received reminders and technical support from the student helpers as required.

Instruments

In this project, a checklist for emotions, a questionnaire on trust levels, and a questionnaire on the project were implemented. The checklist for emotions was adopted from Kay and Loverock (2008) and Wosnitza and Volet (2005). Kay and Loverock (2008) used four theoretically distinct constructs (anger, anxiety, happiness, and sadness) to assess the emotions of pre-service teachers during computer-based learning. The four emotions were selected after a detailed review of related research and internal reliability and construct validity were statistically proven.It is appropriate to adopt their scales for this study, which aims to assess the emotions of students involved in the online cultural-exchange project. Therefore, this checklist in total includes 12 four-point Likert-type items (1 for none of the time; 2 for some of the time; 3 for most of the time; and 4 for all of the time). Regarding the second part of the analysis of sources of emotions, the checklist was based on Wosnitza and Volet (2005), who investigated the origin, direction, and impact of emotions in social online learning. We added one more open-ended question concerning the methods the subjects utilized to deal with the emotions

The pair-trust questionnaire shown in Table 6, below, was adopted from Bulu and Yildirim (2008) to determine the trust levels of each pair at the end of the study. Bulu and Yildirim investigated university students' trust levels in a four-month online project. The questionnaire had two parts: the first part included ten five-point Likert-type items (5 for strongly agree and 1 for strongly disagree). The second part of the questionnaire included two open-ended questions to gather detailed information from the participants in relation to their levels of pair trust. Finally, four student helpers reflected on the whole process of this project. They self-disclosed their emotional changes and demonstrated personal growth.

Procedures

The project lasted for six weeks, from September to November 2011 (see Table 1, below). The timeline was checked by the two researchers to avoid misalignment of the academic calendars and important examinations.

Table 1: The content of a six-week project of online collaborative learning

Time	Contents
Week 1 (9/26-9/30) **Orientation**	a. Students (Ss) register and learn the process of the study. b. Ss answer pre-questionnaires online. c. Ss briefly introduce themselves and write a short description of their partner's city.
Week 2 (10/3-10/7)	1. Read Articles 1 & 2: Food & Beverage Culture in Hong Kong/Taiwan. 2. Ss write the first response and then complete the online pair discussions. Discussion question: What are the similarities and differences between food and beverage culture in Hong Kong and Kaohsiung?
Week 3 (10/10-10/14)	1. Read Articles 3 & 4: The Top 10 Hong Kong/Taiwan Destinations among

	Foreign Tourists. 2. Ss write the second article and then complete the online pair discussion. Discussion question: What are your favorite night-market snacks and why?
Week 4 (10/17-10/21)	Each pair writes their pair project (a report on a three-day tour of Taiwan and Hong Kong).
Week 5 (10/24-10/28)	Each pair publishes their pair project online.
Week 6 (10/31-11/4)	Ss answer post-questionnaires online.

Students first read the assigned reading articles and then wrote responses online about hospitality culture and then discussed them in their pair on the discussion board. After they finished all the reading selections, each pair was required to complete an online project (Figures 1 and 2).

Figure 1: Sample page of the reading articles

Figure 2: Sample page of blog list and final project

To keep the project going smoothly, two student helpers from Taiwan and two from Hong Kong monitored the process. They sent reminders via email or Facebook to remind the participants to finish the tasks on time and report the results to the researchers. In weeks 3 and 6, students filled in the checklist for emotions. At the end of the project, students answered the questionnaires for pair trust and project evaluation. The student helpers also wrote reflections on the challenges they had encountered during the process, as well as their own personal growth and development.

The collected data were analyzed according to two perspectives: qualitative and quantitative. With regard to qualitative analyses, the primary data source was the transcripts of interaction between students in the blogs. In this study, there were in total 307 messages (151 from Hong Kong and 156 from Taiwan) posted during the research period.

RESULTS AND DISCUSSION

In this section, the emotional changes of the Hong Kong and Taiwan groups in weeks 3 and 6 are initially reported. The sources for the students' emotions are then summarized. Ways to deal with emotions are discussed. Finally, the results of pair trust questionnaire are analyzed in detail.

The emotions students demonstrated were divided into four major categories: happiness, sadness, anxiety, and anger. Happiness includes satisfied, excited and curious states; sadness includes disheartened and dispirited states; anxiety includes anxious, insecure, helpless, and nervous states; and anger includes irritable and frustrated states. The checklist includes 12 four-point Likert-type items (0 for none of the time and 3 for all of the time).

The reliability of the emotions checklist employed in the present study in weeks 3 and 6 are both higher than 0.7 using Cronbach's alpha coefficient of internal consistency. The values reached the satisfactory level (≥0.7), according to Nunnally and Bernstein (1994).

Table 2, below, shows the emotional changes categorized by four constructs expressed by Hong Kong students and Taiwan students in weeks 3 and 6. For most constructs, the Taiwan-based students had a higher mean and standard deviation than the Hong Kong students. Looking closely at the average values of the two groups of students in weeks 3 and 6, Taiwanese students showed stronger feelings (1.83 and 1.72 on average) than their Hong Kong counterparts (1.67 and 1.59). Taiwanese students more frequently chose "most of the time" in the questionnaire than their Hong Kong counterparts and expressed their feelings more strongly.

Table 2: The emotion changes categorized by four constructs

		HK Week 3		Taiwan Week 3		HK Week 6		Taiwan Week 6	
		M	SD	M	SD	M	SD	M	SD
Happiness	1.Satisfied 5. Excited 9. Curious	2.43	.613	2.73	.769	2.55	.575	2.50	.557
Sadness	2. Disheartened 6. Dispirited	1.48	.550	1.53	.617	1.35	.540	1.55	.510
Anxiety	3. Anxious 7. Insecure 10. Helpless 11. Nervous	1.44	.327	1.54	.519	1.29	.329	1.41	.354
Anger	4. Irritable 8. Frustrated 12. Angry	1.32	.524	1.52	.577	1.17	.333	1.42	.417
	Average	1.67	0.5	1.83	0.62	1.59	0.44	1.72	0.46

Concerning the emotional changes in weeks 3 and 6, shown in Figure 3, below, the means decreased. For the Hong Kong group, the happiness category increased and the other three decreased; for the Taiwan group, sadness increased slightly and the rest decreased. It seems that the Hong Kong participants were happier in the sixth week of the project than they were in the third week. The Taiwanese participants, however, reacted in the opposite fashion, as can be seen from the relatively large decrease in the mean of the happiness construct. As the project progressed, the students had more intense experiences of each type of emotion and the group as a whole had more similar comments regarding each of them. However, there is no statistical significance in the differences between the emotional changes of the Hong Kong and Taiwan participants in weeks 3 and 6 seen in the paired sample t-test ($P > .05$).

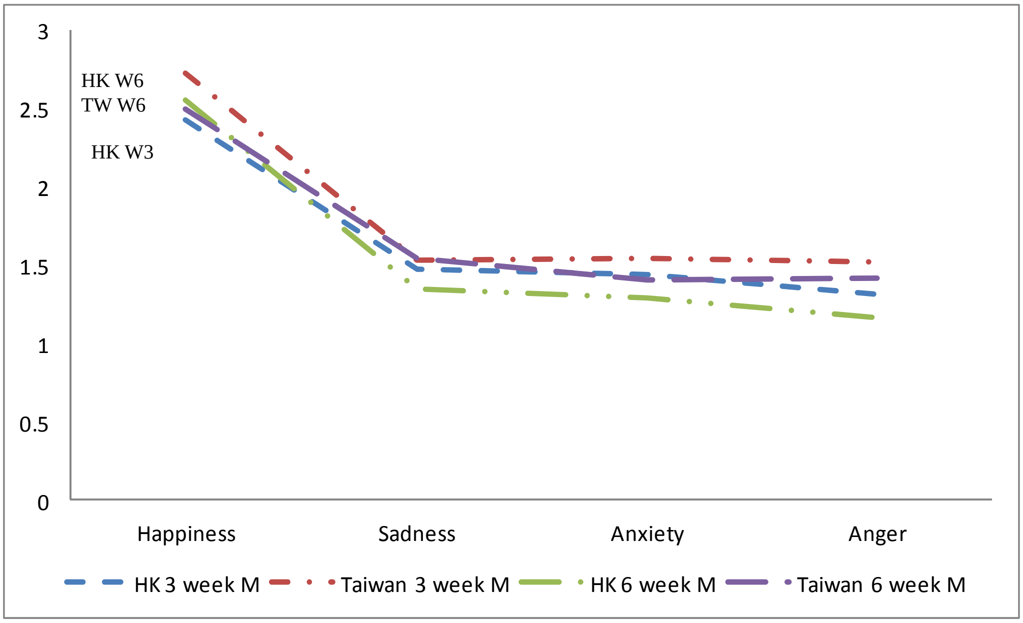

Figure 3: The four constructs of the emotions in weeks 3 and 6

Comparing the emotions of the two groups in the two timelines shown in Table 3, above, both the Hong Kong and Taiwan students generally felt satisfied, excited, and curious (all the *means* 2.2) in week 3, whereas they were sometimes perceived to be dispirited, insecure, and angry (all the *means* 2.0) while the project was in progress. The Taiwan students showed a little more anxiety and nervousness than the Hong Kong students. At the end of the project, in week 6, both of the groups in general remained satisfied, excited and curious (all the *means* 2.2), whereas they were from time to time perceived to be disheartened, irritable, insecure, frustrated, helpless, and angry (all the *means* <2.0) during the concluding week of the project.

There is statistical significance in the differences arising in the results of the independent sample t-test between the Taiwan and Hong Kong groups in their nervousness (P <.01) and anxiety (P <.05). Relatively speaking, Taiwan students felt a little more irritable, dispirited, and angry than their Hong Kong counterparts.

Table 3. The emotions of the Hong Kong and Taiwan groups in weeks 3 and 6

	Groups	M		SD		t (independent sample t-test)		Sig.	
		3rd week	6th week	3rd week	6th week	3rd week	6th week	3rd week	6th week
1. Satisfied	HK	2.50	2.90	.688	.641	-1.070	1.902	.291	.065
	Taiwan	2.75	2.50	.786	.688				
2Disheartened	HK	1.60	1.45	.681	.686	.000	-.244	1.000	.809
	Taiwan	1.60	1.50	.681	.607				
3. Anxious	HK	1.55	1.45	.510	.510	-2.269*	-2.284*	.029	.028
	Taiwan	2.00	1.90	.725	.718				
4. Irritable	HK	1.35	1.20	.587	.410	-1.170	-1.831	.249	.076
	Taiwan	1.60	1.50	.754	.607				
5. Excited	HK	2.20	2.55	.696	.686	-2.015	.489	.051	.628
	Taiwan	2.70	2.45	.865	.605				
6. Dispirited	HK	1.35	1.25	.489	.550	-.531	-1.926	.599	.062
	Taiwan	1.45	1.60	.686	.598				
7. Insecure	HK	1.40	1.30	.503	.571	.825	.309	.414	.759
	Taiwan	1.25	1.25	.639	.444				
8. Frustrated	HK	1.40	1.25	.681	.550	-.737	-1.192	.466	.241

	Taiwan	1.55	1.45	.605	.510				
9. Curious	HK	2.60	2.20	.883	.834	-.497	-1.334	.622	.190
	Taiwan	2.75	2.55	1.020	.826				
10. Helpless	HK	1.60	1.45	.598	.605	-.211	.575	.834	.569
	Taiwan	1.65	1.35	.875	.489				
11. Nervous	HK	1.30	1.10	.470	.308.	-2.055*	-2.994*	.047	.006
	Taiwan	1.70	1.60	733	.681				
12. Angry	HK	1.20	1.05	.523	.224	-1.042	-1.823	.304	.081
	Taiwan	1.40	1.30	.681	.571				

*P<.05

The students' feedback, collected twice, in week 3 and week 6, were examined. Table 4, below, includes three columns: the *sources*, *frequency* and *examples*. The sources refer to where the students thought their emotions came from, and the frequency states the frequency with which each type of emotion was experienced. The right-hand column gives examples of the comments made by participants regarding each source of emotion.

Table 4: The sources of emotions

The sources	Frequency (Week 3/Week 6)	Examples
1. Self	14/14	"I sometimes had two or three projects (including this project) to hand out in the same week."
2. Tasks	9/11	"It takes too much time to complete this project."
3. Performance	10/11	"The summary or the reading response I wrote is not good enough."
4. Contexts	11/11	"The project could last longer, so that we can know more and get more information from partners."
5. Social	14/17	"Sometimes, I didn't receive his/her discussion. I felt he/she wasn't concerned about these missions."
6. Others	11/15	"Worthwhile and educational, but very time-consuming and may be frustrating for students with very little time on their hands."

The sources are divided into six categories: self, tasks, performance, contexts, social, and others (which include technical problems). The data show that every type of emotional source was mentioned. During the third week, the lowest number of cases for any sources was nine (tasks) and the most was 14 (self and social). For the sixth week, the lowest number was 11 (tasks, performance and contexts) and the largest was 17 (social). As the course progressed, it might have been the case that more emotions were involved, as shown in the rise in numbers. The three sources that caused most emotional comment are *self*, *social*, and *others*. Cases where emotion came from the students themselves stayed the same across the two evaluations, whereas social issues and others increased. The examples reveal that some students had problems managing their time with other schoolwork, while some had slight problems communicating with other members of their group. Tasks, performance, and contexts received a similar number of mentions, slightly lower than the other three categories. One possible explanation for this is that, since students volunteered for the project, they understood what they were required to do; however, social interaction, technical problems, and a heavy workload were not necessarily what they would have expected.

Table 5, below, analyses the ways in which students chose to deal with their emotions; in other words, who they turned to for support after experiencing strong emotions. The data reveal that, when it comes to dealing with emotion, most students tried to solve problems themselves. They believed that they had the ability to solve the problems and held themselves responsible for dealing with emotion. Out of the 59 cases recorded, almost half (27) of them saw students dealing with emotion-related issues alone. The second most used resource was peers. The students found suggestions from peers to be useful and discussions to be effective in dealing with emotion. Students also found help from student helpers. The student helpers were confident and committed to the project, and the students appreciated their willingness to help. Some students sought help from their partners. They commented that working as a pair meant helping each other. This resource, however, was least used out of the four noted in the students' comments.

Table 5: Ways to deal with emotions

Ways to deal with emotions	Frequency	Examples
1. Self	27	1. "I have the responsibility to do so." 2. "I could solve all emotional problems by myself."
2. Peers around me	14	1. "Because we all take part in this project, "if I have any confusion or problems, they will suggest to me what I can do to improve my project." 2. "During the discussion with my peers around me, I can get more comments from others."
3. Partner	7	1. "We are teammates, and it will be better if we give a hand to each other." 2. "[Because] they are my peers, [they know] what I'm thinking about."
4. Student helper	11	1. "The student helpers are very kind and they really show their passion for this project. Whenever I encountered any problems, I would consult them, as they always showed confidence in me." 2. "Student helpers are willing to help."

To sum up, the fact that both groups had the highest mean for the happiness construct indicates that, overall, the participants experienced happy emotions for the majority of the project. The category with the second-highest mean average was sadness, followed by anxiety, and, finally, anger. There is no significant difference between the emotions students experienced in undertaking different tasks as the project progressed. As pointed out by Wosnitza and Volet (2005), "The outcome of the emotion-arousal process is influenced by the degree of familiarity and its personal relevance to the individual's agendas" (p. 460).

We may infer from the fact that students from both parties volunteered for this project that they were, therefore, highly interested in this kind of cultural exchange, so the initial and ongoing appraisals of the activities tended to be positive, which supported the process of learning (see, for example, Zembyless, 2008). This also partially explains the success of this project compared with the previous studies (the low interaction, more negative emotions) (Wang 2010; Wang & Ip, 2010). Participants in this project perceived it to be relevant to them and tried to invest time and mental energy in completing the tasks assigned. As for the sources and ways to handle emotion, students in this project experienced a range of self-, task- and technology-directed emotions and otherwise-directed emotions, as discussed in Wosnitza and Volet's (2005) study and tended to handle those emotions by themselves.

Results of pair-trust study

The first part of the pair-trust questionnaire included 10 five-point Likert-type items (5 for strongly agree =SA; 4 for agree =A; 3 for neutral=N; 2 for disagree=D) and 1 for strongly disagree=SD). Only 35 students (15 from the HK group and 20 students from the Taiwan group) answered the questionnaire. The reliability of the questionnaire was 0.7. Table 6, below, describes the degree of trust from the two groups of participants toward their peers, as observed through the questionnaire results.

Table 6：Results of pair-trust study (HK(N=15) & Taiwan(N=20))

	groups	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree	M	Std.	t	Sig.
1. My partner shows a great deal of integrity.	HK	-	-	40.0	53.3	6.7	3.67	.617	-.631	.532
	Taiwan	-	10.0	25.0	35.0	30.0	3.85	.988		
2. I can rely on my partner.	HK	-	6.7	40.0	40.0	13.3	3.60	.828	-.792	.434
	Taiwan	-	15.0	10.0	50.0	25.0	3.85	.988		
3. Overall, the people in the other school are very trustworthy.	HK	-	-	40.0	40.0	20.0	3.80	.775	.295	.770
	Taiwan	5.0	5.0	35.0	25.0	30.0	3.70	1.129		
4. We are usually	HK	-	-	40.0	53.3	6.7	3.67	.617	.060	.953

considerate of each other's feelings in this work pair.	Taiwan	5.0	5.0	20.0	60.0	10.0	3.65	.933		
5. The people in my school are friendly.	HK	-	-	13.3	80.0	6.7	3.93	.458	-.413	.683
	Taiwan	5.0	5.0	15.0	30.0	45.0	4.05	1.146		
6. There is no 'team spirit' in my pair.	HK	26.7	13.3	53.3	6.7	-	2.40	.986	1.001	.324
	Taiwan	25.0	40.0	35.0	-	-	2.10	.788		
7. There is a noticeable lack of confidence for my partner.	HK	20.0	33.3	40.0	6.7	-	2.33	.900	-.219	.828
	Taiwan	20.0	25.0	50.0	5.0	-	2.40	.883		
8. We have confidence in each other in this pair.	HK	-	-	40.0	53.3	6.7	3.67	.617	-.121	.905
	Taiwan	5.0	-	30.0	50.0	15.0	3.70	.923		
9. I feel anxious when working with students from the other place.	HK	20.0	40.0	33.3	6.7	-	2.27	.884	-.694	.492
	Taiwan	20.0	30.0	30.0	20.0	-	2.50	1.051		
10. I feel nervous when getting no response from my partner.	HK	6.7	26.7	40.0	26.7	-	2.87	.915	-.733	.469
	Taiwan	15.0	10.0	35.0	25.0	15.0	3.15	1.268		

Both groups gave positive responses in terms of peer trust for all items. That is, the majority chose "agree" or "strongly agree" for items that reflected positive peer trust and interactions and chose "disagree" or "strongly disagree" for negative items, and the groups had similar mean values for all items. The first five items related to positive features of the students' partners, fellow school members and participants from the other group. Results reveal that 60% of the Hong Kong group and 65% of the Taiwan group agreed or strongly agreed that their partners had great integrity. When asked if they found their partners reliable, barely over half (53%) of the Hong Kong participants agreed or strongly agreed as opposed to 75% of the Taiwan group. For this item, 40% from the Hong Kong group chose "neutral." The Taiwan-based participants may have found their partners more reliable than their Hong Kong counterparts. There was, however, one case in which the majority of one group chose "neutral." When it came to being considerate of each other's feelings, the two groups had "agrees" and "strongly agrees" as the majority of their choices, yielding 60% and 70%, respectively. Eighty-seven percent of the Hong Kong group agreed that other students in their school were friendly as did 75% of the Taiwan group.

Items six and seven concerned negative aspects of the students' relationships with their partners and no one from the two groups chose "strongly agree." The means of these two items were low compared to those of the items above. However, it can be observed that over half (53%) of the Hong Kong students chose "neutral" for item six, not commenting on whether they thought there was team spirit in their pair work. The Taiwan group also had 35% who chose "neutral" for this item, and half of this group chose "neutral" for the next item, not giving positive nor negative opinions as to whether there was a lack of confidence in them from their partners. It may also be noted that 40% of the Hong Kong group chose "neutral" for item seven.

In spite of this, it was evident that members of both groups were confident in their partners. As the results of item eight indicate, although there were still a relatively high percentage (40% for the Hong Kong group and 30% for the Taiwan group) who remained neutral, all others except one member in the Taiwan group chose "agree" or "strongly agree" for this item. Working as a pair, the students generally had confidence in each other. When asked whether they were anxious when working with students from the other place, 60% of the Hong Kong participants disagreed or strongly disagreed, indicating that over half of them were not anxious. Only half of the Taiwan group disagreed in relation to this item, 30% of them were neutral and 20% agreed that they were anxious, as opposed to the low percentage of 6.7% from the other group.

If their partners did not respond to them, some of them felt nervous. Although many students chose "neutral" on this issue (40% of the Hong Kong group and 30% of the Taiwan group), 26.7% from the Hong Kong students and one-quarter of the Taiwan students did feel nervous when getting no response from their partners. In all items except for items six and seven, the Taiwan group had a higher standard deviation, meaning their range of choices was wider than that of the Hong Kong participants. As the mean values were not far apart, no significant differences were found when the t values were calculated.

The above results show that trust has been built up in the course of this project. This lends support to Wang, Sierra, and Folger's (2003) finding that "Trust channels the energy of group members toward reaching goals and serves to motivate group processes and performance" (p. 57). Efforts were made to carefully plan the schedule and provide students with "scaffolding" during the project: 20 pairs out of 22 finished the project. However, when looking closely at Tables 6 and 7, there seems to be a gap between the perception of trust and the actions taken in dealing with emotion. Participants perceived positive peer trust, but did not seek help from peers. That is, participants did not like to seek assistance from the distant party and preferred to rely on themselves, the peers around them and the student helpers. Owing to the asynchronous nature of the interaction in the present study, participants disregarded the possibility of delayed help so as to reduce the potential trouble caused and accelerate the completion of the tasks. Another possible explanation is that, in the context of CMC, participants tended to reduce negative social appraisals (Derks, Fischer, & Bos, 2008) and tried to maintain friendly social interaction and focus on task-oriented communication (Bulu & Yildirim, 2008). More in-depth investigation should be made to reveal more details about the correlation of perceptions of peer trust and the collaboration behaviors in online-learning environments.

CONCLUSION AND IMPLICATIONS

This study examined Hong Kong- and Taiwan-based students' emotions resulting from online interaction and their trust levels in online pair work. The major findings are summarized as follows. In general, the Taiwan students expressed their feelings more strongly than their Hong Kong counterparts. There is a statistical significance in the differences between the Taiwan and Hong Kong groups in the emotions of nervousness and anxiety. The Taiwan students felt slightly more irritable, dispirited and angry than the Hong Kong students during this process. Regarding the two timelines, the Hong Kong students were happier in week 6 than in week 3. The Taiwan participants, however, felt the opposite. Three sources that caused most emotional comments are self; social; and others (for example, technical problems and workload). Most students attempted to solve problems for themselves, then with help from peers, then from students helpers, and finally from their partners. Both groups gave positive responses in terms of peer trust for all items. However, there seemed to be asymmetry between the perception of trust and the actions taken in dealing with emotion.

There are some limitations to this study. First of all, the project only lasted for six weeks, so that the emotions assessed are mainly of a "snapshot" nature, as they were only recorded in weeks 3 and 6. In addition, students only recorded the emotions listed in the checklist and seldom detailed any other emotions they encountered during the process. Finally, given the complicated interaction of the variables involved in computer-mediated communication activities, fully investigating the emotional arousal in a single project is impossible.

In terms of teaching implications, first of all, the Taiwan students demonstrated their emotions more strongly than the Hong Kong group. This may be because students from Taiwan had received fewer opportunities for international contact than their Hong Kong counterparts. Most of the Hong Kong participants in this study had either had one-semester immersion experiences in English-speaking countries or attended summer exchange programs in Asian or European countries. It was not a new experience for them to participate in intercultural communication, and this may have contributed to their ease during the process. More online cultural-exchange courses could be provided to those who are not easily able to visit a foreign country. Secondly, to implement an online cultural-exchange course is not an easy task. Most of the teachers have usually placed too much focus on platform design and material preparation. Several factors should be more carefully considered: for example, matching the schools' schedules; partnership, and commitment between the teachers of the two schools; and the students' willingness and autonomy. Building up peer trust and helping deal with emotional changes are essential to keeping all the participants together and making the course successful.

On the basis of the findings, some suggestions for future research may be made. Much existing research stresses that the affective aspects must be properly acknowledged in order to explore the students' emotions, which are aroused by participating in online language activities, and the impact of emotions on learning outcomes. Moreover, the lack of emotional disclosure may result from personal characteristics or culture background. In fact, the expression of negative emotions is not always a bad phenomenon. As Derks, Fischer, and Bos (2008) pointed out, the reasons why students do or do not disclose their emotion and how this influences their learning is another area worthy of research. Finally, just as students need scaffolding in learning, it behooves researchers to consider exploring the emotions teachers encounter in dealing with the frustration and challenges resulting from maintaining online learning progress. What are the emotions aroused in the process when teachers apply ICT in their teaching? How do they deal with these emotions? How do these emotions influence teachers' use of ICT? It is essential to support teachers who are willing to adopt ICT in language learning. The more support the teachers receive, the more strength they have to sustain innovation in ICT teaching strategies.

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EVALUATING THE IMPACTS OF ICT USE: A MULTI-LEVEL ANALYSIS WITH HIERARCHICAL LINEAR MODELING

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ABSTRACT
The purpose of this study is to evaluate the impacts of ICT use on achievements by considering not only ICT use, but also the process and background variables that influence ICT use at both the student- and school-level. This study was conducted using data from the 2010 Survey of Seoul Education Longitudinal Research. A Hierarchical Linear Modeling (HLM) analysis was employed to control the student and school characteristics. The study results show that the use of ICT explained a significant portion in the overall variance in mathematic achievement at the elementary school level, at the middle school level, and at the high school level, respectively. Information communication and transactions, a component of ICT literacy, has negative impacts on mathematic achievement, and ICT self-efficacy is more likely to result in academic achievement than other background and processing variables.

INTRODUCTION
Information and Communication Technology (ICT) is widely used in education for collection, management, and analysis. ICT in education includes a variety of tools, such as computers, CD-Roms, projection TVs, word processors, image graphic software, email, and Internet-based communication technology. ICT use can influence teaching and learning styles by changing the emphasis from a teacher-centered to a learner-centered style and provides opportunities to improve information-reasoning skills, communication skills, higher thinking skills, creativity, and problem solving (Shaikh & Khoja, 2011; Yusuf & Afolabi, 2010).

Despite the potential advantages of ICT use, the impacts of ICT on learning outcomes have not shown consistent results (Aristovnik, 2012; Shaikh, & Khoja, 2011). One main reason for this may be explained by a methodological limitation (Cox & Marshall, 2007). Previous studies did not differentiate the pure effects of ICT use from the effects of other variables. A variety of factors could affect the relationship between ICT use and achievement; analyzing the impacts of ICT use requires studying the single contribution of ICT use in classrooms. However, previous studies were limited in that they did not differentiate the impacts of the ICT use variables from other variables related to ICT use processes or backgrounds. Given that ICT is used for different purposes, it is necessary to examine which variables are significant. Furthermore, previous studies did not consider the difference levels among ICT-related variables. Variables that directly or indirectly affect ICT use can be categorized into two levels: student-level and school level. Variables at the student-level include students' capabilities to use ICT, gender, parents' education levels, and private tutoring expenditures. On the other hand, variables at the school-level include teachers' education levels, attitudes toward education reform, and principal's leadership. To clarify the effects of ICT use, it is necessary to examine how these variables affect achievement and which variables are significant. Finally, to further examine the effects of ICT use at school, it is also necessary to examine how ICT is being used at different grade levels, namely elementary, middle, and high school.

The hierarchical linear modeling (HLM) analysis provided a methodologically advanced approach for this issue. ICT use-related variables are likely to be hierarchical data structures because student ICT use is influenced by the characteristics and atmosphere of classes, which are influenced by the school's characteristics. An analysis of data that considers this multi-level structure enables us to identify which variables have significant effects. Thus, the purpose of this study was to evaluate the exclusive impacts of ICT use on mathematic achievements by conducting a hierarchical linear modeling (HLM) analysis that considered variables at both the student- and school- levels. The research questions generated were as follows:

1.How much impact does the use of ICT have on mathematic achievements at the elementary, middle, and high school levels? Specifically, which of the ICT use variables are significantly related to mathematic achievements?

2.How much impact do the background and process variables have on mathematic achievements at the elementary, middle, and high school levels? Specifically, which of those factors have a significant relationship with mathematic achievements?

3.According to the different school levels, are there any differences in the impacts of ICT use and the related background and process variables on mathematic achievements?

The Impacts of ICT Use on Learning Achievement

The Effectiveness of ICT Use

Since Kulik (1999)'s meta analysis that reported the positive effects of ICT use, many studies have been conducted to examine the impacts of ICT use. Fuchs and Wosesman (2004) reported a positive relationship between ICT use and academic achievement based on analysis of data from Programmed for International Student Assessment (PISA). With the rapid application of new technology in education, ICT allows students to explore information from nonlinear sequences, cross-explore new information, improve understanding with the aid of visualization tools, and study at any time and at any place. However, despite the positive dimensions, some studies criticize ICT use, arguing that it does not play a critical role in improving students' academic achievements. According to Leuven (2004), there is no clear evidence showing that ICT use positively affects students' learning outcomes. Correlations between ICT use and academic achievement become significantly lower when students' backgrounds and instruction process-related variables are considered.

ICT Use Variables

One of the important variables that influence ICT effectiveness is how often teachers and students use ICT in classrooms. The impacts of ICT technology use are mostly measured by the frequency of use in classrooms or at home. Given the increased media use in classrooms, it is also important to analyze the ICT teaching and learning support system. Another variable to be considered is whether students possess the essential capabilities required for ICT technologies (Newhouse, 2002), known as ICT literacy. These include the ability to search for necessary information, to attain information by accessing the appropriate places, and to solve problems by processing and utilizing information effectively with proper ethics (Kim et al., 2003). It includes the four main components of information collection, information processing, information communication, and information use ethics.

Background and process variables

There have been debates about whether ICT use could have positive impacts on student achievements. Because various variables influence ICT use, the impacts of ICT should be examined, not only considering the ICT use variables that are directly related to students' learning outcomes, but also taking into account the background and process variables that may indirectly influence achievement. Given that ICT use in classrooms is influenced by student characteristics and school support, the background and process variables can be categorized into different levels, namely the student-level and the school-level (Kang et al., 2009; Kim et al., 2010; Selim, 2007; Youssef & Dahmani, 2008).

Student-level. Student-level variables include student background and student process factors. For the former, research has analyzed parents' social-economic status, rapport with parents, and parents' expectation for education (Kim, Song, & Huh, 2010). In this study, we also factored in ICT literacy, parents' education levels, private tutoring expenditures, and parents' educational support. The factors for the second variable, the student process, included elements related to students' learning processes: self-efficacy, motivation, self-regulated skill including learning strategies, and study time (Kim et al., 2010). We also included student attitude and studying time.

School-level. School-level variables consist of the school background and school process factors. The average teacher's education level and income for each school were used as the school background variables in this study. Social-economic background, school location, and school type were not included in this study because the data were collected from a specific location, Seoul city, Korea. School process includes a variety of variables that are related to school management in delivering ICT. Teachers' efforts to improve education and the principal's leadership were included in this study because they emphasize the efforts to improve the quality of education through ICT utilization (Hermans, et al., 2008).

METHODS

Data

This study used data collected from a 2011 Seoul Education Longitudinal Study. Survey data were collected from 5200 fourth grade students at 108 elementary schools, 4600 first grade students at 74 middle schools, and

6600 first grade students at 83 high schools. Due to missing data, an analysis was conducted using 5009 elementary students, 4544 middle school students, and 5240 high school students. Data were also collected from 1738 teachers who taught fourth grade at various elementary schools, seventh grade at various middle schools, and tenth grade at various high schools.

Research Models

The HLM approach was employed to examine the distinctive impacts of ICT use. ICT use-related variables were categorized into two levels: student-level as level 1 (ICT use, student background variables, and student process variables) and school-level as level 2 (ICT use, school background, and school process variables). The ICT use variables were entered first, followed by the background and process variables. Table 1 shows the research models.

Table 1: Research Models

Model	Input variables
Basic model	Mathematic achievements (dependent variables)
Research model 1	ICT use variables (students, school)
Research model 2	Research model 1 + student background, student processes, school background, school processes

Grand-mean centering was conducted to clearly interpret the interception for all variables, except the gender variables, in each model. The equations for level 1 and level 2 in the research model 2 were as follows:

Level 1 Equation

$$\begin{aligned} Y_{ij} = {} & \beta_{0j} + \beta_{1j} \times (Frequency\ :information\ collection) + \beta_{2j} \times (Frequency\ :information\ processing) \\ & + \beta_{3j} \times (Frequency\ :information\ communication) + \beta_{4j} \times (Literacy\ :information\ collection) \\ & + \beta_{5j} \times (Literacy\ :information\ processing) + \beta_{6j} \times (Literacy\ :information\ communication) \\ & + \beta_{7j} \times (EBS\ viewing\ hours) + \beta_{8j} \times (gender) + \beta_{9j} \times (parents\ education) + \beta_{10j} \times (tutoring\ expenditure) \\ & + \beta_{11j} \times (learning\ attitude) + \beta_{12j} \times (study\ time) + \beta_{13j} \times (self\ efficacy) + r_{ij}, \end{aligned}$$

$$r_{ij} \sim N(0, \sigma^2)$$

Level 2 Equation

$$\begin{aligned} \beta_{0j} = {} & \gamma_{00} + \gamma_{01} \times (online\ support) + \gamma_{02} \times (ICT\ use) + \gamma_{03} \times (EBS\ use\ frequency) \\ & + \gamma_{04} \times (average\ teacher\ education\ level) + \gamma_{05} \times (family\ income) + \gamma_{06} \times (improve\ teaching) \\ & + \gamma_{07} \times (principal's\ leadership) + \gamma_{08} \times (teachers'\ creative\ teaching\ style) + u_{0j}, \end{aligned}$$

$$u_{0j} \sim N(0, \tau_{00}),$$

$$\beta_{qi} = \gamma_{q0} \quad (q = 1,2,...,13)$$

Survey instrument

ICT use frequency and ICT literacy skills were adapted from the computer literacy survey at the OECD Programme for International Student Assessment (Park et al., 2010). ICT literacy included three categories: a) information collection (program search, CD creation, file transfer, Internet search, file downloading), b) information processing and creation (editing digital and graphic images, spreadsheet use, creation of power point presentation, multimedia, and web pages) and c) information communication (online chatting, file attachment).

Learning attitude refers to abilities related to study methods used in the learning process. The six items included are related to perceptions about student abilities to elaborate, organize, map, and employ effective study methods, to reflect their study processes, and to self-evaluate. According to Park et al. (2010), the validity and reliability of the survey instrument were validated (alpha = .83). *Self-efficacy* was measured using six items of three sub constructs (alpha = .86): intrinsic motivation toward learning, self-efficacy, and autonomous learning (Park et al., 2010). *Weekly study time* was measured by summing the regular class time, the afterschool participation time, the private tutoring time, and the self-study time for mathematics.

Online teaching and learning support were examined by calculating the use of education-related web sites. The monthly numbers for using online learning materials and video materials were also examined.

Average family income was collected, and *Average teacher education level* was measured. *Teachers' education improvement efforts* were measured by summing the annual participation numbers for class demonstrations, peer tutors teaching observations, teaching improvement committees, teaching consulting clinic services, and teacher community participation. *Teachers' creative teaching effort* was measured with two items that asked teachers' perception about the teaching environment, whether it was a good atmosphere for student creativity or an unpleasant atmosphere. *Principal leadership* was measured using three items that examined teachers' perceptions about whether principals were willing to share the school's visions with the teacher, allow teachers to participate in decision making processes, and properly conduct teacher evaluations.
Mathematic achievement was measured using data from the 2010 National Test Scores.

RESULTS
The explanations of ICT effect on mathematic achievements for elementary schools, middle schools, and high schools are presented in Tables 2, 3, and 4, respectively.

Table 2: The impacts of ICT on mathematics achievements at elementary schools

	Fixed effects	Basic model	Research model 1	Research model 2
	Initial value	73.15 (0.61)*	73.56 (0.58)*	77.33 (0.65)*
Student level ICT				
ICT Use Frequency	Information collection		-0.72 (0.20)*	0.07 (0.33)
	Information processing		0.31 (0.16)	-0.84 (0.26)*
	Information communication		-0.94 (0.21)*	-0.66 (0.34)
ICT Literacy	Information collection		1.20 (0.18)*	1.00 (0.35)*
	Information processing		-0.21 (0.23)	-0.27 (0.37)
	Information communication		0.14 (0.22)	0.11 (0.35)*
Student (Student background)				
	EBS viewing hours			-0.71 (0.20)
	Gender			-1.59 (0.96)
	Parent education level			0.88 (0.16)*
	Private tutoring expenditure			1.41 (0.62)*
	Parent education support			0.03 (0.12)
Student (Student process)				
	Learning attitude			1.44 (0.16)*
	Hourly average study time			0.10 (0.12)
	Self-directed learning attitude			-0.05 (0.06)
School (ICT Use)				
	Online teaching-learning support system use		-0.11 (0.12)	-0.16 (0.10)
	Computer Internet use		0.17 (0.22)	-0.03 (0.14)
School (School background)				
	EBS use frequency			1.19 (0.35)*
	Average teacher education level			-2.28 (0.80)*
	Average family income			8.10 (1.86)*
School(School process)				
	Teaching improvement efforts			-0.01 (0.07)
	Principals leadership			-0.12 (0.13)
	Teachers creative teaching efforts			0.21 (0.28)
Random effect(Per.)				
Student level		316.26 (90.88)	305.03 (91.64)	227.85 (98.91)
School level		31.73 (9.12)	27.84 (8.36)	2.52 (1.09)
Additional explanation per.(%)				

Student level	3.55	25.30
School level	12.26	90.95

* *p*<.05

Table 3: The impacts of ICT on mathematics achievements at middle schools

	Fixed effects	Basic model	Research model 1	Research model 2
	Initial value	55.34 (1.04)*	55.53 (0.99)*	60.80 (0.84)*
Student level ICT				
ICT Use Frequency	Information collection		-0.88 (0.20)*	-0.44 (0.38)
	Information processing		0.19 (0.14)	-0.56 (0.18)*
	Information communication		-2.21 (0.27)*	-1.51 (0.49)*
ICT Literacy	Information collection		0.23 (0.19)	0.06 (0.34)
	Information processing		0.52 (0.16)*	0.30 (0.21)
	Information communication		1.45 (0.31)*	1.30 (0.56)*
Student (Student background)				
	EBS viewing hours			-0.90 (0.26)*
	Gender			-0.63 (1.34)
	Parent education level			1.21 (0.26)*
	Private tutoring expenditure			3.68 (0.97)*
	Parent education support			0.07 (0.15)
Student (Student process)				
	Learning attitude			1.17 (0.22)*
	Hourly average study time			0.65 (0.13)*
	Self-directed learning attitude			0.14 (0.10)
School (ICT Use)				
	Online teaching-learning support system use		0.03 (0.32)	0.20 (0.23)
	Computer Internet use		0.46 (0.39)	0.32 (0.26)
School (School background)				
	EBS use			-0.27 (0.28)
	Average teacher education level			-0.35 (1.35)
	Average family income			7.88 (2.01)*
School(School process)				
	Teaching improvement efforts			0.60 (0.23)*
	Principals leadership			0.80 (0.17)*
	Teachers creative teaching efforts			-1.64 (0.38)*
Random effect(Per.)				
Student level		484.0 (88.77 4)	458.01 (89.32)	359.49 (99.91)
School level		61.25 (11.23)	54.78 (10.68)	0.32 (0.09)
Additional explanation per.(%)				
Student level			5.38	21.51
School level			10.56	99.42

* *p*<.05

Table 4: The impacts of ICT on mathematics achievements at high schools

	Fixed effects	Basic model	Research model 1	Research model 2
	Initial value	49.96 (1.74)*	50.08 (1.56)*	52.10 (1.05)*
Student level ICT				
ICT Use Frequency	Information collection		-1.18 (0.26)*	-0.33 (0.42)
	Information processing		0.76 (0.13)*	0.30 (0.22)
	Information communication		-2.58 (0.26)*	-2.10 (0.40)*
ICT Literacy	Information collection		-0.06 (0.22)	0.19 (0.44)
	Information processing		0.40 (0.13)*	0.04 (0.21)
	Information communication		1.74 (0.40)*	1.03 (0.73)
Student (Student background)				
	EBS viewing hours			-0.99 (0.25)*
	Gender (Girl			2.11 (1.43)
	Parent education level			1.06 (0.24)*
	Private tutoring expenditure			2.38 (0.93)*
	Parent education support			-0.11 (0.13)
Student (Student process)				
	Learning attitude			1.33 (0.17)*
	Hourly average study time			0.49 (0.14)*
	Self-directed learning attitude			0.24 (0.10)*
School (ICT Use)				
	Online teaching-learning support system use		-1.27 (0.78)	0.04 (0.50)
	Computer Internet use		0.66 (0.78)	-0.36 (0.33)
School (School background)				
	EBS use			-0.99 (0.92)
	Average teacher education level			3.53 (1.75)*
	Average family income			23.20 (4.10)*
School(School process)				
	Teaching improvement efforts			0.58 (0.36)*
	Principals leadership			0.23 (0.41)
	Teachers creative teaching efforts			-0.24 (0.80)
Random effect(Per.)				
Student level		489.78 (66.44)	471.03 (69.96)	393.09 (92.06)
School level		247.41 (33.56)	202.25 (30.04)	33.90 (7.94)
Additional explanation per.(%)				
Student level			3.83	16.55
School level			18.25	83.24

* $p<.05$

The impact of ICT use on achievements

The impacts of ICT use and students ICT literacy skills on achievements were measured by the portion of variance that could be explained by ICT use among the overall achievement variance. The results showed that ICT use explained 3.55 % at the elementary school level, 5.38% at the middle school level, and 3.83% at the high school level.

At the elementary school level, the basic model analysis results showed that the student level variance accounted for 90.88 % and the school level variance accounted for 9.12%. As shown in Table 2, when ICT use variables were included, research model 2 explained 3.55 % more variance at the student level and 12.56 % more at the school level than did the basic model. At the middle school level, the basic model analysis results showed that the student level variance accounted for 88.77% and a school-level variance accounted for 11.23%.

As shown in Table 3, when the ICT use variables were taken into account, research model 2 explained 5.38 % more variance at the student-level than did the basic model. Research Model 2 explained 10.56% more at the school-level than did the basic model.

Finally, as shown in Table 4 for high schools, the basic model analysis results showed that a student-level variance accounted for 66.44% and a school-level variance accounted for 33.56%. With the ICT use variables, research model 2 explained 3.83 % more variance at the student-level and 18.25% more at the school-level than did the basic model. This seems to indicate that the influence of ICT use is three times higher at the middle school level. Thus, the impact of ICU use on mathematic achievements in high schools appears to be greater than at the middle school or elementary school level. When student-level and school-level were considered together, the ICT use variables explained 4.34% of the variance at the elementary school level, 5.96% at the middle school level, and 8.67% at the high school level.

ICT use variables and achievements

In the elementary schools, the ICT use frequency for information processing and ICT literacy skills for information collection and communication had significant impacts on mathematic achievements at the student-level. The better were ICT literacy skills for information collection and communication, the higher were the academic achievements. When students experienced less frequent information processing, they tended to earn higher academic achievements. There was no impact of ICT use at the school-level.

In the middle schools, ICT use frequencies for information processing and communication and ICT literacy skills in information communication had significant impacts on mathematic achievements at the student-level. When students had higher ICT literacy skills for information communication, they tended to earn higher scores regarding academic achievements. When students experienced less frequent information processing and information communication, they tended to earn higher academic achievements. Again, there was no impact of ICT use at the school-level.

In the high schools, as shown at Table 4, the frequent use of ICT for information communication had a significant impact on mathematic achievements at the student-level. ICT literacy skills, however, did not have any significant impact. The less the students used ICT for information communication, the higher were the academic achievements. When the students had greater ICT literacy skills, even though the impacts were not statistically significant, they seemed to have higher academic achievements.

The impacts of background and process variables on achievements

Our research model 1 analysis results showed that ICT use variables explained 12.26% of the variance in mathematic achievements at the elementary school level, 10.56% at the middle school level, and 18.25% at the high school level. As shown at Table 2, when background and process variables are included, as in research model 2, the variance of math variables was 25.30 % greater at the student-level and 90.95% greater at the school-level in elementary schools. As shown in Table 3, when model 2 was applied, the other variables explained a 21.51 % greater variance at the student-level and 99.42% greater at the school-level in middle school. Furthermore, when the variables of student process, student background, school process, and school background were taken into account, the math variance was 16.55 % greater at the student-level and 83.24% greater at the school-level in the high schools (Table 4). When the student-level and school-level variances were collectively taken into account, the additional independent variables explained 30.79 % more variance at the elementary school level, 29.83% more at the middle school level, and 36.58% more at the high school level.

Background and process variables and achievements

A variety of background and process variables at both the student-level and school-level seemed to influence mathematic achievements. Our analysis results showed that elementary school students tended to show high academic achievements when they had higher ICT literacy skills in information collection and information communication, more private tutoring tuition, a more positive learning attitude, more e-learning materials at schools, and higher family income (Table 2). On the other hand, they tended to earn lower academic achievements when they used more ICT for information processing and when their teachers had more education.
Next, middle school students tended to show high academic achievements when they less frequently used ICT for information processing and communication, had higher ICT literacy skills in information communication, spent less hours studying e-learning materials from EBS, had parents with higher education levels, had more

private tutoring tuition, had a more positive learning attitude, had higher family incomes, had leadership from the principal, and had less creative teaching efforts (Table 3).
Lastly, high school students tended to earn higher academic achievements when they used less ICT for information communication, spent fewer hours studying e-learning materials, had a more positive learning attitude, had more weekly study hours, had higher self-directed learning attitudes, had teachers with higher education levels, had higher family incomes, and had more teacher efforts to improve teaching (Table 4).
In addition, four variables were significant for the achievements at all school levels: 1) parent education level, 2) private tutoring expenditure, 3) learning attitude, and 4) family income. In addition, teachers' efforts for education improvement were also significant as a school-process variable in both middle and high schools. Principal's leadership was only significant at the middle school level.

DISCUSSION
ICT is being widely used in all school-levels because it enables students to engage in self-directed learning by providing individualized content, overcoming some limitations of traditional teaching methods. This study conducted an HLM analysis to rigorously examine the exclusive impacts of ICT use on mathematic achievements.

This study examined the exclusive impacts of ICT by identifying the variance explained by ICT use among overall achievements. The exclusive explained variance of ICT on mathematic achievements was 4.34% at the elementary school level, 5.96% for the middle school level, and 8.68% at the high school level. A previous study on school impacts reported that the explained variance of ICT use was 29% at the middle school level and 36% at the high school level when combining all variables both at the student-level and school-level (Kim et al., 2010). However, the previous study is limited in that it did not separate ICT use from other background and process variables. In fact, Kim et al. (2010) incorporated ICT use variables into either weekly study time variables in the student-level or resources in the school-level; thus, it was not possible to differentiate their distinctive effects. The present study shows that ICT use has distinctive impacts on achievement. In addition, when measuring the ICT effectiveness at two-levels, the explained variance of ICT use on achievement in terms of school-level was higher than for the student-level. This implies that school-level support is more important than students' ICT-related characteristics when using ICT. School-level support is essential in increasing ICT learning impacts, such as teachers' efforts to improve education and principals' leadership.

The results showed that the use of ICT technologies for communication had negative impacts on achievement. This implies that using excessive email, chatting, and blogs can decrease mathematic achievements, and thus, these ICT technologies should be used carefully in education. In terms of ICT literacy, students' abilities in information processing have significant impact on achievements. Students need to develop a higher cognitive ability to analyze and process information rather than an ability to merely collect and communicate information. Future ICT literacy education should emphasize information analysis and information processing.

Interestingly, ICT self-efficacy explained more portions in the overall variance of mathematic achievement than did the frequency of ICT use. These results are consistent with a previous study in the impacts of ICT use, which demonstrated that ICT use itself did not affect academic achievement at schools (Aristovnik, 2012; Cox & Marshall, 2007; Shaikh, & Khoja, 2011). The ICT use itself is not a proximal variable that affect student performance such as their abilities or teaching-learning materials (Wittwer & Senkbeil, 2008). Thus, future ICT literacy education should take into account the incorporation of affective elements that help students to increase their self-confidence with suitable teaching and learning strategies.

Lastly, ICT explains more of the overall variance in achievement in high schools than in middle- or elementary schools. High school students might use more ICT, such as e-learning or online-tutoring and, as a result, benefit more from using ICT than middle school or elementary school students. Given that ICT is used differently according to school-levels, different educational policies are needed to suitably increase the effectiveness of ICT at each school level.

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EXAMINING WEB 2.0 TOOLS USAGE OF SCIENCE TEACHER CANDIDATES

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ABSTRACT
Using technology in a science teaching is so important. Only the person, who can use these tools in expert level, can use these tools in their teaching activities. In this research it is aimed firstly identifying science teacher candidates web 2.0 tools usage experience level and factors affecting experience level. In this research survey method was adapted. To gather research data a survey was developed. Survey contains seven sections concerning demographic data, blog, wiki, image sharing, document sharing, social network site and instant messaging usage. After reviewing literature survey developed and survey was given CEIT and science education experts to review. After expert examination survey, finalized survey administrated 289 science teacher candidates and obtained data analyzed.Research findings show that science teacher candidates experience regarding each tool fairly equal and their experience do not differ notable level by gender, computer experience or internet experience.
Keywords: Web 2.0 tools, science teacher candidates, technology, education

INTRODUCTION
Nowadays generations who are students at the schools from pre-k to universities have grown up with technology (Prensky, 2001). New generation learners are nested with technology and they use technological devices efficiently and effectively in their daily lives. Youths, who live in the developed nations, use ICT tools especially internet frequently (Kolikant, 2010). New generation prefer computer and internet firstly as research tool. Jones, Ramanau, Cross & Healing (2010) state that %70,1 of the youths feel that their computer access is sufficient and %55,6 have broadband internet connection. As can be understand from the research, most of the youths have computer and internet connection and they use these tools intensively. New generation is thought can use technological tools especially digital ones effectively than older generations (Lei, 2009). Schools offer their students more computer and internet to use and they offer without fee (Gui, Argentin, 2011). Using technology in schools is inevitable. New generation choices concerning learning and using ICT are different and they use more ICT in their learning process (Valtonen, Dillon, Hacklin &Vaisanen, 2010).The most important indicator of the transformation to new society is increasing usage of ICT, ICT usage shapes all of the societies institution (Székely & Nagy, 2011). While society turn to information society, technology is also affected and lives a transformation. For example web technologies transform to Web 2.0. Web 2.0 refers to new interfaces, which promote collaboration and user provided content (Székely& Nagy, 2011). By web transformation, today's students become more frequent internet user.

Web 1.0 sites promote that diffusion of knowledge, which are produced by experts, but web 2.0 support user contribution to knowledge and content. By transition of web, web site lives transformation from knowledge storage to information link site (Mason & Rennie, 2007). Web 2.0 applications require and support users to contribute to site, by the way users can develop content (Cifuentes, Sharp, Bulu, Benz & Stough, 2010).There many web 2.0 definitions and each of the definitions emphasize different features but generally the definitions put forth these attributes, collaboration, active involvement to content, producing knowledge and sharing ideas and information via web (Grosseck, 2009). Web 2.0 term is a broad term and it refers to new usage of WWW and it includes the tools which user can contribute, not to refer any change in technical aspects of WWW (Liu, Liu, Bao, Ju& Wang, 2010; Oliver,2007).Web 2.0 promote user-generated content, collaboration, producing and sharing new knowledge and interaction between site users (Chen, Yen & Hwang, 2012; Kitsantas & Dabbagh, 2011;Aharony, 2009). Web 2.0 associated with application like wiki, blog, podcasts, image sharing, document sharing social network sites and RSS feeds (Aharony, 2009;Ras & Rech, 2009). Online interaction become important and common (Wu, Wang, Liu, Hu & Hwang, 2012). Web 2.0 tools support online interaction. Most of the web 2.0 applications are free to user, users can access via internet, users who have basic computer skills can use this applications and share their ideas (Cain & Fox, 2009; Coutinho&Mota, 2011)The benefits of user-generated content are fairly obvious (Mason & Rennie, 2007, p:199):

- 1. Users have the tools to actively engage in the construction of their experience, rather than merely absorb content passively.
- 2. Content will be continually refreshed by the users rather than require expensive expert input.
- 3. Many of the new tools support collaborative work, thereby allowing users to develop the skills of working in teams.

- 4. Shared community spaces and inter-group communications are a massive part of what excites young people and therefore should contribute to users' persistence and motivation to learn.

When we examine MEB (2005), objectives of science and technology teaching is educating individual as science and technology literate. As separate disciplines science and technology have strong relationship. Science teachers use technology in their teaching activities as necessity. Teachers teach students who are member of new generation and these students grown up with technology, so teachers must be experts in using technological devices (Martin, Sexton and Franklin, 2009).

In this context, it is aimed firstly identifying science teacher candidates' web 2.0 tools usage experience level and factors affecting experience level. Using technology in a science teaching is so important. Only the person, who can use these tools in expert level, can use these tools in their teaching activities.

METHOD

In this research survey method was adapted. To gather research data a survey was developed. Survey contains seven sections concerning demographic data, blog, wiki, image sharing, document sharing, social network site and instant messaging usage. After reviewing literature survey developed and survey was given CEIT and science education experts to review. After expert examination survey, finalized survey administrated 289 science teacher candidates and obtained data analyzed.

Findings

Table 1 Science teacher candidates' demographic data

		Frequency	Percentage
Gender	Male	82	28,4
	Female	207	71,6
Class	1	69	23,9
	2	83	28,7
	3	68	23,5
	4	69	23,9
Internet connection place	Where they reside	202	69,9
	School	59	20,4
	Internet café	27	9,3
e-mail ownership	Yes	274	94,8
	No	4	1,4
	More than 1	11	3,8
Social network account ownership	Yes	252	87,2
	No	37	12,8
Blog account ownership	Yes	58	20,1
	No	227	78,5
Micro blogging account ownership	Yes	25	8,7
	No	249	86,2

Table 1 shows participants demographic data. as can be seen in table 1 %28,4 of the participant are male and %71,6 of the participants are female. Distribution of the participants by class is can also be seen in table 1 and participants distributed equally among four classes. Most of the participants can connect to internet where they reside and little portion or the participants use internet café to connect internet. Almost all of the participants have at least one e-mail address, just %1,4 of the participants do not have e-mail address. While %87,2 of the participants have social networking site account, just %20,1 of the participants have blog account and just %8,7 of the participants have micro blogging site account.

Table 2 Science teacher candidates' computer and internet usage experience statistics

	Computer usage	Internet usage
Mean	8,08	6,80
Median	8,00	7,00
Variance	2,83	2,67
Minimum	1	1
Maximum	16	16

Statistics related participants' computer and internet usage experience can be seen in table 2. science teacher candidates have 8,08 years compute usage experience and 6,80 years internet usage experience. Based on statistics it can be said that science teacher candidates are experienced user concerning computer and internet usage.

Table 3 Science teacher candidates' Web 2.0 tools usage experience statistics

	Blog	Wiki	Image Sharing	Document Sharing	SocialNetwork	InstantMessaging
Mean	1,8872	1,4514	2,7082	2,5156	3,7346	3,3979
Median	1,5000	1,0000	3,0000	3,0000	3,8000	4,0000
Variance	,964	,693	1,053	1,224	1,072	,800
Minimum	1,00	1,00	1,00	1,00	1,20	1,00
Maximum	4,00	4,00	4,00	4,00	4,00	4,00

Table 3 summarizes participants' web 2.0 tools usage experience level. Questionnaire contains 26 question concerning six different web 2.0 tools. To understand science teacher candidates ' expertise level based on science teacher candidates ' responses, expertise score of each tool were calculated. As can be seen in table 2, science teacher candidates ' highest average expertise score is social networking site usage and lowest average expertise score is wiki usage. Most of the science teacher candidates use social networking tools, reason why they have highest average score in social networking site usage should be this reason. On the other hand most of the science teacher candidates use instant messaging program to communicate with their relatives and friend, because of that their average instant messaging score higher than other tools. Writing blog is not a common habit among Turkish society, because of that it can be taught that science teacher candidates got second lowest average score from blog expertise questions. While most of the science teacher candidates read wiki article almost all of the wiki users are passive user they just read, because of that their wiki expertise score is lower than other tools.

Table 4 Science teacher candidates' Web 2.0 tools usage expertise level differences by gender

	Gender	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Blog	Male	80	20,67	1,02	1,890	133,239	,061
	Female	200	18,18	,92			
Wiki	Male	81	15,53	,77	,726	281	,469
	Female	202	14,83	,71			
Image Sharing	Male	81	29,26	1,00	2,099	281	,037
	Female	202	26,41	1,04			
Document Sharing	Male	82	27,62	1,06	2,077	283	,039
	Female	203	24,68	1,09			
Social Network	Male	78	37,90	1,03	,415	272	,678
	Female	196	37,30	1,08			
Instant Messaging	Male	81	32,56	,88	-1,750	283	,081
	Female	204	34,39	,76			

An independent-samples t-test was conducted to compare web 2.0 tools usage expertise level by participants' gender and results are displayed in table 4. According to the results there was a significance difference in expertise level of image sharing site usage by male participants (M=29,26, SD=1,00) and female participants (M=26,41, SD=1,04); $t_{(281)}$=2,099, p=0.037. There was a significance difference in expertise level of image document sharing site usage by male participants (M=27,62, SD=1,06) and female participants (M=24,68, SD=1.09); $t_{(283)}$=2,077, p=0.039. There was not a significance difference in blog, wiki, social network and instant message usage expertise level by gender.

Table 5 Science teacher candidates' Web 2.0 tools usage expertise level differences by internet connection site

		Sum of Squares	df	Mean Square	F	Sig.
Blog	Between Groups	4,015	2	2,007	2,193	,114
	Within Groups	252,686	276	,916		
	Total	256,700	278			
Wiki	Between Groups	2,102	2	1,051	1,978	,140
	Within Groups	148,205	279	,531		
	Total	150,307	281			
Image Sharing	Between Groups	,558	2	,279	,259	,772
	Within Groups	300,439	279	1,077		
	Total	300,997	281			
Document Sharing	Between Groups	1,187	2	,593	,501	,607
	Within Groups	333,105	281	1,185		
	Total	334,291	283			
Social Network	Between Groups	3,582	2	1,791	1,593	,205
	Within Groups	303,509	270	1,124		
	Total	307,091	272			
Instant Messaging	Between Groups	,934	2	,467	,733	,481
	Within Groups	179,102	281	,637		
	Total	180,036	283			

To understand is there any differences in web 2.0 tools usage expertise level by internet connection site One Way Anova test was run and results summarized in table 5. Other tools usage expertise level there is no significance difference by internet connection site.

Table 6 Science teacher candidates' Web 2.0 tools usage expertise level differences by computer usage experience

		N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Blog	Inexperienced	160	17,63	,90	-2,497	232,191	,013
	Experienced	118	20,57	1,02			
Wiki	Inexperienced	158	14,65	,69	-,793	279	,429
	Experienced	123	15,35	,77			
Image Sharing	Inexperienced	157	26,62	1,02	-1,023	279	,307
	Experienced	124	27,90	1,06			
Document Sharing	Inexperienced	161	24,60	1,08	-1,564	281	,119
	Experienced	122	26,64	1,10			
Social Network	Inexperienced	153	36,25	1,08	-2,109	270	,036
	Experienced	119	38,98	1,02			
Instant Messaging	Inexperienced	161	33,31	,80	-1,382	281	,168
	Experienced	122	34,63	,79			

An independent-samples t-test was conducted to compare web 2.0 tools usage expertise level by participants' computer usage experience in table 6. According to the results there was a significance difference in expertise level of blog usage by experienced user (M=20,57, SD=1,02) and inexperienced participants (M=17,63, SD=0,90); $t_{(232,191)}$=-2,491, p=0.013. There was a significance difference in expertise level of social network site usage by level by experienced user (M=38,98, SD=1,02) and inexperienced participants (M=36,25, SD=1,08); $t_{(270)}$=-2,109, p=0.036. Other four web 2.0 tools usage expertise level there is no significance difference by computer usage experience.

Table 7 Science teacher candidates' Web 2.0 tools usage expertise level differences by internet usage experience

		N	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Blog	Inexperienced	134	16,74	,87	-3,593	270,724	,000
	Experienced	141	20,81	1,01			
Wiki	Inexperienced	133	14,40	,70	-1,125	276	,262
	Experienced	145	15,38	,75			
Image Sharing	Inexperienced	132	25,61	1,06	-2,430	276	,016
	Experienced	146	28,63	1,01			
Document Sharing	Inexperienced	134	24,48	1,10	-1,581	278	,115
	Experienced	146	26,54	1,09			
Social Network	Inexperienced	126	35,83	1,14	-2,450	267	,015
	Experienced	143	38,99	,98			
Instant Messaging	Inexperienced	136	33,47	,82	-,867	278	,387
	Experienced	144	34,31	,78			

An independent-samples t-test was conducted to compare web 2.0 tools usage expertise level by participants' internet usage experience in table 7. According to the results there was a significance difference in expertise level of blog usage by experienced user (M=20,81, SD=1,01) and inexperienced participants (M=16,74, SD=0,87); $t_{(270,724)}$=-3,593, p=0,000. There was a significance difference in expertise level of image sharing site usage by experienced user (M=28,63, SD=1,01) and inexperienced participants (M=25,61, SD=1,06); $t_{(276)}$=-2,430, p=0,016. There was a significance difference in expertise level of social network site usage by experienced user (M=38,99, SD=0,98) and inexperienced participants (M=35,83, SD=1,14); $t_{(267)}$=-2,450, p=0,015. Other three web 2.0 tools usage expertise level there is no significance difference by computer usage experience.

RESULTS

According to findings science teacher candidates average computer usage experience is 8,08 years and internet usage experience is 6,80 years. In their research Brown & Czerniewicz, (2010) state research group, which can be names as millennial generation, have more than 6 years computer usage experience. Research findings are consistent with their results. In another research which has science teacher candidates as research group, Lei (2009) state that %96,4 of the research group started to use computer before sixth grade. Research findings are also consistent with Lei (2009). This results is proof of research group is digital native. Furthermore almost all of the participants have e-mail and social network account. On the other hand science teacher candidates who have blog and micro-blog account are less.

When we look ate web 2.0 usage experience, science teacher candidates have the most experience in using social network site and after social network sites they have experience concerning instant messaging. They have least experience in wiki and blog usage. To understand experience and demographic attributes some statistical analysis were done. And by gender science teacher candidates experience differ in just two tools: image sharing and document sharing. By computer usage experience science teacher candidates experience differ in social networking site and blog usage and by internet usage experience science teacher candidates experience differ in social networking site, blog and image sharing usage

In a research concerning social network usage, Jones, Ramanau, Cross & Healing (2010) state that research group visit social network sites daily basis. And Kayri & Çakır (2010) state that %31 of the participants visit social network site everyday. Friedla &Vercic (2011) state that the most popular activity concerning internet is visiting social network sites and second popular is watching video online. This research findings is consistent with this research, because science teacher candidates have the most experience in social network usage and after social network site they have experience in instant messaging programs.In their research Kennedy, Dalgarno, Gray, Judd, Waycott, Bennett, Maton, Krause, Bishop, Chang & Churchward (2007) state that %80 of the participants never contributed a wiki and %50 of the participants read or write a blog. Research findings are also consistent with their results.

Research findings show that science teacher candidates experience regarding each tool fairly equal and their experience do not differ notable level by gender, computer experience or internet experience. Experience concerning the tools which science teacher candidates use in their daily lives is fairly higher than the tools they do not use in their daily lives. Their experience level can promote by assignment and teaching activities which require using different web 2.0 tools in their teaching experience. Mazman & Koçak Usluel (2011) state that participants social network usage differ by gender.

Wiki, blog and other web2.0 tools are cooperative learning tools for the science classroom. Tilfarlioglu (2011) state that Web 2.0 applications serve as a good learning tool. Hakverdi-Can & Dana (2012) state that students' use of technology in their science classroom is highly correlated with the frequency of their science teachers' use of computer applications/tools. Faculty should provide example activities concerning web 2.0 tools in their class to ensure that science teacher candidates will use these tools effectively.

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EXPLORING COLLEGE STUDENTS' ATTITUDES AND SELF-EFFICACY OF MOBILE LEARNING

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ABSTRACT
Previous studies have indicated that computers and the internet play very important roles in students' acceptance and use of new information technology. In recent years, with the rapid development of mobile technology, mobile learning (m-learning) has becoming another popular topic. However, little is known about the students' attitudes and self-efficacy with the use of a mobile device in language learning. The purpose of this study was to investigate the attitudes and self-efficacy of using mobile learning devices for college students in a language class by employing task-based instruction. The sample group of the study comprised 58 second-year students at a technical university in central Taiwan who used mobile devices for m-learning in an English class to complete assigned tasks under the guidance of the instructor. Results showed that most students agreed that their motivation for English learning was enhanced and most of them had positive attitudes towards m-learning. Implications for future research and the practice of m-learning are discussed.
Keywords: computer self-efficacy, m-learning, language learning, task-based approach

INTRODUCTION
The growth of mobile technologies, like mobile phones, smart phones, personal digital assistants (PDA), and Tablet PCs have attracted the attention of the educators and researchers (Mcconatha, Praul & Lynch, 2008; Motiwalla, 2007; Thornton & Houser, 2002; Patten, Sa´nchez & Tangney, 2006) to consider its pedagogical implications. Seppala and Alamaki (2003) pointed out that the instruction via mobile devices would play an important role in the educational realm, given that 98% of the university students possessed cell phones. The educational use of the mobile devices was referred to as mobile learning (m-learning) with the focus on facilitating and extending the reach of the teaching and learning, such as the knowledge construction, the information collection and exchange, the collaborative learning (Hine, Rentoul, & Specht, 2004), independent learning (Bull & Reid, 2004) and lifelong learning (Attewell & Savill-Smith, 2004). Huang, Jeng, and Huang (2009), for example, adopted a mobile blogging system as a means for generating collaboratively interactive and learning opportunities for geographically dispersed persons and groups. Vavoula et al. (2009) used mobile phones for inquiry-based learning to allow learners to gather information during school visits to museums.

Mobile learning has been acknowledged as a useful approach in language skills training, particularly for English as Foreign Language (EFL) students (e.g., Chen & Huang, 2010; Chang, Chen, & Hsu, 2011; Hwang & Chang, 2011; Lee, 2009; Sandberg, Maris, & Geus, 2011). Due to the spontaneous, informal, contextual, portable, ubiquitous, pervasive, and personal features of the mobile learning, students were provided with more access and greater exposure to abundant authentic learning contexts (O'Malley et al, 2003). The authentic learning contexts via mobile learning in turn have positive effects on second language acquisition (Gulati, 2008; Judd, Kennedy, & Cropper, 2010; Kreijins, Kirschner, & Jochems, 2003; Mompean, 2010). The authentic learning contexts help students bridge the gap between formal and informal learning experiences (Kolb, 2006; Wagner &Wilson, 2005). In other words, the authentic tasks in real word situations allow students to connect the contents of the textbooks with real world materials to achieve better comprehension and learning outcomes (Kolb, 2006). Wagner and Wilson (2005) also highlighted that students can better transfer the acquired language skills into the real life situations if they have developed the language skills in authentic contexts. In addition, students demonstrated high learning motivation when they became engaged in the authentic learning tasks.

Related empirical studies have manifested the effectiveness of mobile learning upon the language teaching and learning. For example, Attewell (2005) designed a mobile learning project to motivate students to learn a foreign language. She found that 82% of the students improved their reading comprehension and spelling skills via mobile learning, and 62% of the students expressed their continual use of mobile devices to learn the language. Basoglu and Akdemir (2010) recruited 60 university students to examine the effectiveness of the mobile devices and conventional flashcards upon English vocabulary learning. The findings showed that students displayed better academic performance in the learning vocabulary and had positive attitudes toward learning English vocabulary via mobile learning.

Many factors may negatively influence the effectiveness of mobile learning upon language instruction which result in a lower percentage of the students' learning participation in mobile learning (Gulati, 2008; Isman &

Celikli, 2009; Judd, Kennedy, & Cropper, 2010; Kreijins, Kirschner, & Jochems, 2003; Mompean, 2010). Students' computer self-efficacy and attitudes were the core factors which determined the success of the students' participation in mobile learning (Isman & Celikli, 2009), as previous studies pointed out that people with high computer self-efficacy were more actively engaged in computer related activities (Davis et al., 1989; Delcourt & Kinzie, 1993; Hill , Smith & Mann, 1987). Computer self-efficacy (CSE) is defined as the ''judgment of one's capability to use a computer'' (Compeau & Higgins, 1995, p. 192). In other words, the CSE refers to the belief that one possesses in their competence for using computers (Topkaya, 2010). The attitude toward computers was often regarded as an essential component of the CSE (Barbeite & Weiss, 2004; Compeau & Higgins, 1995; Hsu, Wand & Chiu, 2009; Kao & Tsai, 2009; Brock & Sulsky, 1994; Busch, 1995; Harrison & Rainer, 1992; Hassan, 2003; Potosky, 2002). Previous studies also revealed that the CSE was influenced by the psychological factors, including computer anxiety and the perceptions toward computers as helpful and self-directed tools (Brock & Sulsky, 1994; Barbeite & Weiss, 2004; Kao & Tsai, 2009). In studying the relationship between the CSE and the computer anxiety, Compeau and Higgins (1995) found that people with lower CSE were more frustrated and anxious in operating and using computers for problem solving. Some researchers also associated the individual social-cultural backgrounds such as genders, ages, or years of computer usage with the CSE and the attitudes toward computers (e.g., Gattiker & Hlavka, 1992; Harvey & Wilson, 1985; Venkatesh & Morris, 2000). However, comparatively scant studies on mobile learning have probed the nature of the CSE and its relationship with the students' attitudes toward the use of mobile learning for language instruction.

PURPOSE OF THE STUDY

The purpose of this study is to use a Mobile Attitude Survey (MAS) and a Mobile Self-efficacy Survey (MSS) to investigate the relationships between the students' CSE and their attitudes toward mobile-learning. In addition, some other variables including gender and internet experience were analyzed as well. Three research questions were addressed in this study:

1. What are the students' attitudes towards the use of the mobile device for m-learning?
2. What is the students' self-efficacy towards the use of the mobile device for m-learning?
3. Is there any gender difference in students' attitudes and the self-efficacy in m-learning?

RESEARCH METHOD

Participants

The sample of the study comprised 58 second-year college students (48 males and 10 females), who had minimal experience of using mobile devices for m-learning. The students were from a department at a college of engineering. The 58 students had prior training for 2 weeks before the mobile learning implementation. The students' English proficiency was determined by their English test score from the entrance examination at a pre-intermediate level.

Research setting

The participants took the Advanced English course at a technical university in central Taiwan. The researcher used *Academic Connections* as the reading material for the course. Inside the textbook, the instructor chose two main topics for students to read and perform tasks from: marketing and green chemistry. The activities lasted for six weeks, and included in-class instruction and m-learning activities. After the reading, the researcher assigned the students different tasks for in-class online discussion. For example, information gaps with the Green chemistry issues, which included problem solving skills and which encouraged students to negotiate meanings and carry out conversations. Five situational scenarios based on these two units were created for the students to undertake problem-solving discussion tasks in an m-learning environment. All of the students utilized their mobile phones after class for searching information, posting, answering questions, and filming related materials.

Data collection and analysis

In order to investigate the students' attitudes and self-efficacy toward the m-learning, the researcher adopted two instruments: an m-learning attitude survey and an m-learning self-efficacy survey. The m-learning attitude survey was adapted from Tsai, Tsai, & Hwang's (2010) PDA attitude scale, with some additional modifications being implemented by the researcher. The m-learning self-efficacy survey implemented in this study was derived from Tsai and Tsai's (2003) Internet self-efficacy survey. Some items were modified in order to fulfill the requirements of mobile-learning. The researcher also interviewed 20 volunteer students (15 males and 5 females). Each interview lasted for 30 minutes and semi-structured questions were used. The interviews were recorded and later transcribed for the data analysis. The guidelines of thematic analysis (Braun & Clarke, 2006) were adopted to analyze the interview data. First, different coding units, such as students' computer efficacy and attitude toward m-learning, were coded into the major categories. Next, stronger units were grouped based on their comments and feedback on their m-learning experience. Last, the researcher described the meanings of each unit and summarized the major statements made by the students for further explanations and inferences.

RESULTS

RQ1:What are the students' attitudes towards the use of mobile devices for m-learning?

In order to understand the students' attitudes and self-efficacy toward m-learning, two instruments were administrated: the m-learning attitude survey and the m-learning self-efficacy survey. Table 1 presented the results reporting students' attitudes towards m-learning. The results indicated that most of the students expressed interest in using mobile devices to engage in intensive learning and have online discussions anytime and anywhere (Mean=4.16, SD=0.42). The m-learning supported the students in attaining more ideas, increasing learning motivations, promoting imaginative work, and working independently and collaboratively. Only one negative opinion of m-learning was designed in the m-learning attitude survey. Question 5 in Table 1 showed that students were uncomfortable with the use of mobile devices (Mean=4.62, SD=0.40).

In the interviews (Table 2), many students indicated that the use of the mobile device along with the task-based assignments really enhanced their motivation and they had much more fun in English learning. They believed that it saved a lot of their time since they could still engage in the tasks without time and space constraints. They agreed that English learning would take place anytime and anywhere with the mobile devices.

Table 1 The students' attitudes towards m-learning

	Item	Mean	SD
1.	In the m-learning environment, a mobile device can help me to attain more ideas.	4.82	0.54
2.	In the m-learning environment, a mobile device is helpful for my learning.	4.36	0.22
3.	In the m-learning environment, a mobile device can enhance my desire to learn.	4.70	0.38
4.	In the m-learning environment, a mobile device can allow me to do more interesting and imaginative work.	3.78	0.72
5.	In the m-learning environment, a mobile device makes me feel uncomfortable.	4.62	0.40
6.	In the m-learning environment, I feel bored using a mobile device.	2.12	0.42
7.	In the m-learning environment, I am not good at using a mobile device.	3.90	0.36
8.	In the m-learning environment, I hope to have a regular time to use a mobile device.	4.02	0.34
9.	In the m-learning environment, I hope to apply mobile devices in various learning activities.	4.66	0.50
10.	In the m-learning environment, I can use a mobile device independently without other's help.	4.68	0.32
Overall		4.16	0.42

Table 2: The students' statements in the interviews for attitudes towards m-learning

Statements	Frequency (N=20)
It is quite fun to use a mobile device for English learning.	20
I hope I can use mobile devices for learning in other classes too.	15
I love to use mobile devices to multi-task.	14
It is time-saving for m-learning because I can learn without space and time constraints.	12
I love to get access to my mobile devices and learning takes place naturally.	11
I did not like English before. Now I would use my smart phone for English learning.	9
Reading too much on the mobile made my eyes sore.	8

RQ2: What is the students' self-efficacy towards the use of mobile devices for m-learning?

Table 3 shows that the students have high self-efficacy towards m-learning. Students had no problem with the use of the functionalities in the mobile devices such as downloading online materials, as well as reading and entering information.

Table 3 The students' self-efficacy of the m-learning

	Item	Mean	SD
1.	In the m-learning environment, I can download a figure from the internet using a mobile device.	4.52	0.22
2.	In the m-learning environment, I can key in a website address to enter the site using a mobile device.	4.78	0.18
3.	In the m-learning environment, I can check a hyperlink to enter another website using a mobile device.	4.68	0.14
4.	In the m-learning environment, I can read the content on the screen using a mobile device. .	4.80	0.16
5.	In the m-learning environment, I can enter words into a document using a mobile device.	4.25	0.22

The students indicated that they could effectively use the functionalities of the mobile devices (Table 4). They could use the mobile device to support their discussion with peers such as posting question and providing feedback immediately. With the mobile device, they attempted to relate to the reading materials by taking pictures and filming the related situations to share with their peers. They provided authentic pictures and scenarios for their peers to visualize the ideas presented in the reading. The students tried to extend the formal learning from the textbooks to informal learning in their daily life.

Table 4: The students' statements in the interviews for self-efficacy of m-learning

Statements	Frequency (N=20)
I could use the mobile device to discuss with my peers about the reading materials.	20
I could log into the discussion forums via the mobile device.	15
I know how to post questions about the reading via the mobile device.	14
I know how to respond to pees' questions via the mobile device, which made the learning more interactive.	12
I can take pictures with my phone to show the related information about the assigned tasks.	12
When it comes to typing, it's rather difficult. There is no keyboard to type with and the screen is too small. It was inconvenient to write messages to answer peers' questions on mobile devices	10
I could use the mobile device to film some clips and share with my peers about what we have learned in class.	9

RQ3: Is there any gender difference in students' attitudes and self-efficacy in m-learning?
From Table 5, it was clear that there were no significant differences between male and female attitudes and self-efficacy in m-learning. But, there were slight differences between male and female students' attitudes from their interview data. Table 6 shows that male students were much more accustomed to the use of the mobile device for English learning in and outside the class than female students. By contrast, the female students perceived the mobile device as an entertainment facility.

Table 5 Gender comparisons on mobile learning attitudes and mobile self-efficacy

	male (n=15)	female (n=5)	1-tailed *t-test*
Mobile attitude survey (MAS)	4.24 (0.39)	4.08 (0.44)	0.183
Mobile self-efficacy survey (MSS)	4.71 (0.13)	4.50 (0.24)	0.002

P<0.01

Table 6: The male and female students' statements in the interviews for mobile learning attitudes and self-efficacy

Statements	Frequency (Males=15)
The mobile phone is like a toy to me. I love to use it for our tasks.	12
I would attend to the new message on my mobile every hour	10
It is very cool to use mobile phones for English learning. I shared some learning materials with my family members too.	9
Statements	**Frequency (Females=5)**
I did not like to do the assignments on the mobile phones.	5
My phone is not as fancy as others so I did not find it easy to do the tasks.	3
Mobile devices are only for entertainment. I do not think it is ideal for English learning.	2

DISCUSSION AND CONSLUSION

The major contribution of this study was to identify students' attitudes and self-efficacy towards m-learning as well as to report the college students' perceived viewpoints after the implementation of using mobile devices in their English learning. Different tasks and situated scenarios were designed based on the reading materials to support students' mobile learning by employing a task-based approach. The results indicated that students demonstrated positive attitudes toward m-learning. Students considered that m-learning offered them more chances to acquire more information and supported collaborative and ubiquitous learning. Students often expected to receive messages from peers via mobile devices after they shared their opinions in the online discussion forums. The nature of mobile devices made the learning ubiquitous. The results echoed the previous studies in that the mobile learning project can increase students' learning participations in the learning tasks (Attewell, 2005; Basoglu & Akdemir, 2010). In addition, this study found that students are competent enough in using mobile devices to read the assigned texts, post questions, read and provide feedback to peers. Students also took environmental pictures and filmed authentic scenarios related to what they had learned in textbooks. They then shared their pictures and films via the mobile devices. In other words, students possess high CSE for mobile devices and thus they would relate the authentic material with the learned material. This study also attempted to prove the relationship between students' self-efficacy and attitudes within genders. However, based on the survey results that were revealed there is no major difference in students' self-efficacy and attitudes between male and female students. From the interview, the male students showed a great interest in using mobile devices to engage in learning those assigned tasks, but female students indicated they tended to use them for entertainment purposes only.

This study offered additional support in that the students' computer self-efficacy and attitudes were core factors which affected the success of mobile learning. This study also provides an analysis for the students' perceptions of their attitude and self-efficacy of mobile learning. The results showed that gender was not a pivotal factor which influenced the self-efficacy and attitudes toward m-learning but they might perceive the purposes of m-learning slightly differently.

This research was limited by focusing on the learning method of only the task-based learning. It is only through continuous evaluation and fine-tuning of the new technology (i.e., mobile phones, pads, and laptop computers) with the learning practice (i.e., lesson planning, IT support, and learning activity planning), that an educational innovation like a mobile forum will reach its full potential in transforming educational practice.

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EXPLORING THE FACTORS THAT INFLUENCE CONTINUANCE INTENTION TO ATTEND ONE-TO-SOME ONLINE COURSES VIA VIDEOCONFERENCING SOFTWARE

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ABSTRACT
Although videoconferencing software and equipment have been widely used in enterprises and education in recent year, few past studies experimentally examined the factors influencing users' continuous intention to attend one-to-some online courses via videoconferencing software in distance learning. In order to provide researchers with a better understanding of the determinants, this study developed a theoretical model based on social cognitive theory. Thirty university students were invited to attend a ten-week videoconferencing course and filled out an academic questionnaire after the courses. The results of the survey indicated that social environmental factors (normative belief and subjective norms) and personal factors (affect and performance outcome expectations) can significantly influence users' continuous intention. In particular, social environmental factors had the strongest direct and indirect effects. Furthermore, it is found that continuous intention significantly impacted students' learning effectiveness.

INTRODUCTION

With the development of World Wide Web services and the decreasing of the cost of high speed Internet, video capture and display technology, personal videoconferencing systems have become popular and affordable to general public. Through a desktop or laptop, a webcam, a videoconferencing software and Internet connectivity, Internet users can easily have a meeting or discussion with their friends online. In addition, some free videoconferencing programs, such as Skype or MSN Messenger, are used increasingly in education to bring teachers and students separated geographically together (Eroz-Tugˇa & Sadler, 2009). For example, eBay.com provides a premium service on a website, Skype Prime Directory, for their users to talk to an advisor on a voice or voice call using Skype (http://directory.skype.com/en/skypeprime). These programs are constantly evolving and can provide high quality of video and a few simple tools for users to interact.

Although the free videoconferencing programs have been used by a lot of Internet users and can be easily used to hold a meeting online, some of them only can provide one-to-one video conversations. They cannot be used to on an online one-to-some videoconferencing in education. Recently, a few some-to-some online videoconferencing programs are developed, such as CUworld and Camfrog Video Chat. These programs are more suitable for teachers to instruct some students simultaneously to save time cost. However, past researchers indicated that these programs are not as user-friendly as the free one-to-one videoconferencing programs (Eroz-Tugˇa & Sadler, 2009). Users may have more negative feelings towards theses programs while using them. Moreover, even though the online group videoconferences hold the advantages of saving teachers' instruction time cost and students' transportation cost, they in educational settings still have challenges (Gillies, 2008). Online videoconferencing needs stable high speed Internet and requires that users have to be online at a set time–different from some e-courses, which allow users to attend online courses wherever and whenever they wish (Bates, 2005, p. 180). Therefore, in order to exploit this technology to improve students' learning, what factors affecting users' continuance intention to attend one-to-some online classes via videoconferencing software merit further investigation.

Users' behaviors would be influenced by individual factors or environment situations. According to Social cognitive theory (SCT), behavior, environmental situations, and individual cognitive factors are affected by each other (Bandura, 1986). Education-related studies have used this theory to explain the adoption behavior of e-learning systems recently (Chu, 2010; Wu, Tennyson, & Hsia, 2010). Accordingly, SCT is adopted to interpret users' intention to attend online videoconferencing in this research. This study proposed a research model to investigate the main factors influencing attendance intention in an online videoconferencing environment. The proposed model is empirically validated, and the relationships among the variables will be examined as well.

Theoretical background and research hypotheses

SCT is widely accepted for validating individual behaviors. Many different types of research have applied it to develop a theoretical model to explain individuals' online behavior (M. Hsu, Ju, Yen, & Chang, 2007; Huang & Liaw, 2005; Tsai & Tsai, 2010). According to SCT, users' behaviors are affected by both individual cognitive factors and environmental factors (Wood & Bandura, 1989). Cognitive factors can be in the form of personal cognition, affect and biological events. Environmental factors refer to the social or physical environments which can influence individuals' behaviors.

Regarding cognitive factors, SCT advances two sets of expectations as the major cognitive force leading behavior: (1) outcome expectations; and (2) expectation related to self-efficacy. SCT advocates that both expectations basically determine user behavior. Individuals tend to undertake the behaviors that they believe will result in a better outcome. Self-efficacy is defined as "People's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). Furthermore, the theory indicated that self-efficacy influences outcome expectations and outcome expectations also affect user behavior. In terms of environmental factors, past studies and research shows that the learning environment affects learners' behavior (Piccoli, Ahmad, & Ives, 2001; Wu et al., 2010). In the e-learning environment, the physical environments will include system functionality and content feature while the social environments can be learning climate or subjective norms (Wu et al., 2010). In particular, Subjective norms, as proposed by the Theory of Reasoned Action (TRA), can be defined as perceived social pressure – such as peer pressure or superior pressure – to perform or not perform a behavior (Fishbein & Ajzen, 1975).

Past research also indicated personal factors (self-efficacy and outcome expectations) and environmental factors (normative beliefs) will affect learning online community behaviors (Joe & Lin, 2008). It is found that outcome expectations and normative beliefs are the key factors directly influence the behavior while self-efficacy indirectly influences the behaviors through outcome expectations. Therefore, they are considered as important determinants in the research model. Furthermore, in online videoconferencing environment, the efficacy of the interactions among users will mainly depend on the interactivity functions. Interactivity could enhance online users' engagements and would increase the appeal of online services (Dubelaar, Leong, & Alpert, 2003; Ghose & Dou, 1998). By adding interactivity to an online platform, the designers could improve users' positive attitudes, such as affect and satisfaction (Lu, Lin, Hsiao, & Cheng, 2010). Consequently, Interactivity and affect are also considered as major factors in the model.

In the research model, it is proposed that affect, performance outcome expectations, and subjective norms are three major determinants of users' intention to attend online courses via videoconferencing platform, mainly based on SCT (Bandura, 1986). In addition, it is proposed that videoconferencing platform interactivity (human-system interactivity and human-human interactivity) will influence affect. Based on the earlier discussion, affect, performance outcome expectations, and learning self-efficacy belong to personal factors, whereas videoconferencing platform interactivity, normative belief, and subjective norms are attributed to environmental factors. The research model tested in this study is shown in Figure 1. The definitions of the constructs and the rationales for the proposed hypotheses are explained in the following sections.

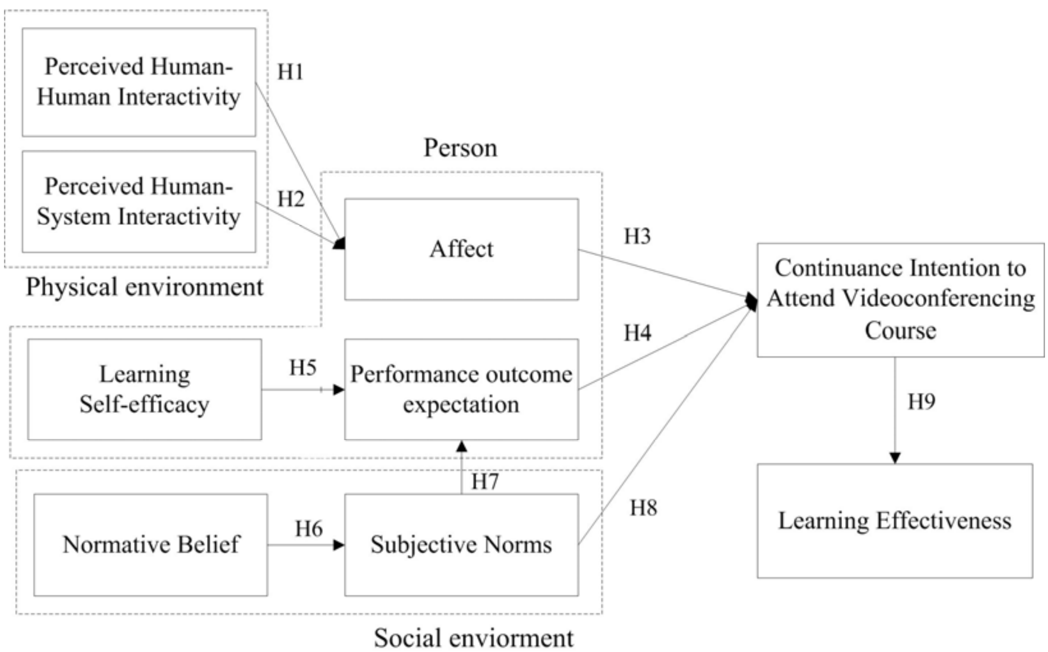

Figure 1. Research model

Interactivity

Past studies have demonstrated that interactivity could enhance users' engagements and users' positive attitudes toward a system or a website (Dubelaar et al., 2003; Ghose & Dou, 1998; Teoh & Neo, 2007). The element of interaction is one of the most important factors relating to e-learning (Moore, 2001). Much attention has been drawn to study the different types of interactivity in an online environment. Based on previous studies (Bouhnik & Marcus, 2006; Ha & James, 1998; Lee, 2005), the interactivity of a videoconferencing software can be categorized into two major types of interactions: (1) human - system interaction (HSI); (2) human - human interaction (HHI).

HSI is described as the degree to which users believe that they can easily use the videoconferencing system and acquire course-related information via interacting with the functions of the videoconferencing system, such as searching for the timetable or descriptions of the online course, looking up classmates or the recordings of the online course, and managing personal contacts. HHI is conceptualized as the degree to which users believe that they can easily communicate or exchange thinking with teachers or classmates via interacting with the functions of the videoconferencing system, such as text chat, interactive white board, and audio/video functions. Both HSI and HHI can help instructors and learners overcome psychological and communication gaps in the e-learning environment. Bouhnik and Marcus (2006) also demonstrated that increasing the interactions is an important factor in bridging the gaps between the instructors and learners.

Moreover, past studies showed that interaction among students and teachers is an important factor in the success of online courses (Picciano, 2002; Swan, 2001). For example, Swan's (2001) research result showed that the more interaction they thought they had with the instructor and their classmates, the more satisfied the students were, and the more they thought they leaned from the course. Picciano (2002) found that the amount of discussion which actually took place in an online course is related to the students' perceived learning. Therefore, if students can have more HSI and HHI via videoconferencing software, they would have more positive attitude toward the online videoconferencing. Consequently, the following hypotheses are proposed.

Hypothesis 1: The degree of affect is positively influenced by the degree of HSI.
Hypothesis 2: The degree of affect is positively influenced by the degree of HHI.

Affect

Affect (or liking), which is a kind of positive attitude, refers to liking or enjoying working on a specific activity. Attitudes are central to behavioral theory, as they are used to understand and predict behavior (Compeau & Higgins, 1995; Compeau, Higgins, & Huff, 1999; Fishbein & Ajzen, 1975). Based on behavioral theories (e.g., TRA, Technology Acceptance Model (TAM), Theory of Reasoned Action (TPB)), attitudes will influence users' intention to adopt technology. Moreover, recent research also showed that attitude would influence users' behaviors on the Internet (C. Hsu & Lu, 2007; Huang & Liaw, 2005).

In the education studies, researchers found that positive attitude, such as satisfaction and affect, influence users' adoption of web course tools or intention toward e-learning system as well (Lee, 2010; Ngai, Poon, & Chan, 2007; Park, 2009; Jan et al., 2012). For example, Park (2009) indicated that attitude would influence university students' behavioral intention to use e-learning. Lee (2010) demonstrated that satisfaction had strong effect on students' continuance intention. These findings led us to assume that students with higher affect on the videoconferencing software will have more continuance intention to attend videoconferencing course. Thus, the hypothesis is proposed:

Hypothesis 3: The degree of continuance intention is positively influenced by the degree of affect.

Performance outcome expectations

Outcome expectations are considered to be a main influence on users' behavior in the SCT model. SCT defined outcome expectations as the perceived consequences of performing a behavior. They are a strong force to guide individuals' perception and behavior. The influence of outcome expectations on a person can be positive or negative. Positive outcome expectations will establish self-satisfaction, pride and self-worth, while negative outcome expectations could lead to self-dissatisfaction and self-devaluation (Bandura, 1997).

According to past empirical evidence, outcome expectations are categorized into personal expectations and performance-related expectations (Compeau & Higgins, 1995; Compeau et al., 1999). Personal outcome expectations refer to the expectations of change in image or status or to the expectations of rewards. Performance-related outcomes relate to those associated with improvements in job performance associated with a specific behavior (Compeau et al., 1999). In this study, performance expectations are defined as the degree to which a learner believes that attending videoconferencing courses will help him/her to attain gains in learning performance. Past research noted that performance-related outcomes have a relatively strong influence on the learning satisfaction with e-learning system or the usage of system (Compeau et al., 1999; Lee, 2010; Wu et al., 2010). Similarly, if learners believe that attending videoconferencing courses will result in positive benefits, they will have more intention to continuously use videoconferencing software to learn. Consequently, the following hypotheses are proposed.

Hypothesis 4: The degree of continuance intention is positively influenced by the degree of performance outcome expectations.

Learning self-efficacy

According to SCT, self-efficacy is one of the main cognitive variables affecting human behavior. If people feel that they have an ability to perform an action which can lead to positive results, they will be more willing to try. The greater the confidence individuals have about their ability to execute outcomes, the greater the probability of achieving their goal (Bandura, 1986) (Bandura, 1986). In addition, prior research shown that self-efficacy could improve initiative and lead to improved performance or outcome expectations (Compeau et al., 1999; Lee, 2010; Wu et al., 2010). In this study, learning self-efficacy is defined as the belief that a person has the capabilities to efficiently perform certain learning tasks which a course required. Accordingly, the following hypothesis is proposed:

Hypothesis 5: The degree of performance outcome expectations is positively influenced by the degree of learning self-efficacy.

Subjective norms

Subjective norms were introduced as an important antecedent variable of intentions by Fishbein and Ajzen (1975) in the TRA. As defined by Fishbein and Ajzen (1975), subjective norms describe “the degree to which an individual believes the people who are important to him/her expect him/her to perform the behavior in question”, which are influenced by an individual’s normative belief. The normative belief refers to an individual’s perception about the particular behavior, which is affected by the opinions or beliefs of significant others (classmates, teachers, or friends). Subjective norms can be regarded as social normative pressures or encouragement. Compeau and Higgins (1995) also argued that the encouragement of others who are important to people can be expected to influence outcome expectations. If others encourage videoconferencing courses, the individual’s assessment of the likely outcome of the attending behavior will be affected.

Additionally, in most cases, subjective norm is directly and significantly related to a person’s intention to use information systems. Their influence on the usage of e-learning systems is direct and significant as well (Lee, 2010; Park, 2009). This means that social influence or social pressures play an important role in users’ continuance intention to adopt e-learning systems. In addition, Hong et al. (2011) found that subjective norm will correlate with students’ intention to play interactive moral online game, which help students explore and establish appropriate moral values. Similarly, in the videoconferencing courses, the expectations of students’ classmates, friends, or teachers will affect their willingness to continuously attend the courses. Therefore, the following hypotheses are proposed:

Hypothesis 6: The degree of subjective norms is positively influenced by the degree of normative belief.
Hypothesis 7: The degree of personal outcome expectations is positively influenced by the degree of subjective norms.
Hypothesis 8: The degree of continuance intention is positively influenced by the degree of subjective norms.

Intention to persist

Although e-learning has been promoted to various levels of users, a few users still lack continuance intention to use such systems (Chiu, Sun, Sun, & Ju, 2007). Actual success of e-learning systems need users’ continued usage. Through continued usage of e-learning systems, students’ learning effectiveness can be improved. Past studies demonstrated that intention to use e-learning systems was positively related to e-learning effectiveness (Law, Lee, & Yu, 2010; Liaw, 2008). Students’ learning effectiveness can be enhanced if they are willing to use e-learning systems to assist their learning. Consequently, the hypothesis is proposed:

Hypothesis 9: The degree of learning effectiveness is positively influenced by the degree of continuance intention.

RESEARCH METHOD

Participants

Thirty university students aged between 18 and 22 from a suburban university in Kaohsiung, Taiwan participated in the study. They were invited to attend ten-week online English learning courses (one-hour lesson per week) via a videoconferencing software, Joinnet. Joinnet is client software, connecting to multimedia meeting and messaging servers, for video conferencing, white-board presentation, synchronized web browsing, desktop, and application sharing. The students' English abilities have been tested by a TOEIC (Test of English for International Communication) test to make sure that their English abilities are in the same level. In the first lesson, the students first used the software and were taught how to use it. They were separated into six groups and attended the same online courses which were taught by the same teacher. There were five students in each course. Students can see their classmates' and the teacher's videos and talk each other synchronically via the software. The teacher taught the courses through electronic white board, video conferencing, and instant messaging functions of the software. In addition, the students attended a pre-test of English grammar before the online courses and a post-test after the ten-week courses. The multiple choice questions in the pre-test and post-test papers are developed by two English teachers. The questions and items in two test papers are very similar and evaluate the same English grammar knowledge. Moreover, they needed to fill out the questionnaire of this study after finishing the courses.

Instrument development

The questionnaire contained 19 self-reported items related to eight research constructs. In order to ensure content validity, items selected for the constructs were largely adapted from prior research. All the questionnaire items used a five-point Likert-type scale, ranging from (1) strongly disagree to (5) strongly agree. The scale items for learning self-efficacy were taken from Joo et al. (2000) with the wording slightly modified to fit the requirements of this study. Items for personal outcome expectations and affect were adapted from Compeau and Higgins (1999). Furthermore, normative beliefs and subjective norms were measured using the instruments of Venkatesh and Brown (2001) and Venkatesh and Morris (2000) respectively with modified wording to suit the context of videoconferencing. Perceived human-human Interactivity and human-system Interactivity were measured by six items developed from the study of Lu et al. (2010). The items to measure continuance intention to attend videoconferencing course were developed from past research (Hsu and Lin, 2008). Finally, learning effectiveness was measured by the difference in scores between the pre-test and post-test.

A pre-test were undertaken to validate the instrument. The pre-test involved four respondents who were experts in the field of e-learning. Respondents were asked to comment on the length of the instrument, the format, and wording of the scales. Eventually, comments from them led to a few minor modifications of the wording and the item sequence.

Data analysis

Partial least squares (PLS) analysis is used to conduct the proposed model and hypothesis testing. As in structural equation modeling (SEM), the PLS approach allows researchers to assess measurement model parameters and structural path coefficients simultaneously. Different from covariance-based SEM, PLS focuses on maximizing the variance of the dependent variables explained by the independent ones in place of reproducing the empirical covariance matrix (Haenlein & Kaplan, 2004). Additionally, PLS makes minimal demands in terms of sample size to validate a model compared to SEM. In our model, because all items are viewed as effects, not causes, of latent variables, they are modeled as reflective indicators. The sample size of PLS requires ten times the largest number of independent variables impacting a dependent variable or the largest number of formative indicators (Chin, 1998). In this study, the largest number of independent variables estimated for a dependent variable is three. Therefore, our sample size of 30 meets the requirement for the PLS estimation procedures.

Construct validity

Construct validity, including convergent and discriminant validity, is widely used to validate research constructs. Convergent validity can be assessed by examining composite reliability and average variance extracted from the measures (Hair, Anderson, Tatham, & Black, 1998). Many studies have used 0.7 as threshold reliability of the measures. Table 1 shows that all measures displayed high factor loadings, which are greater than 0.7, on their respective constructs. As shown in Table III, our composite reliability values range from 0.920 to 0.991, exceeding the threshold of 0.7 (Nunnally & Bernstein, 1994). Table 2 also shows that the average variances extracted from the constructs ranged from between 0.8 to 0.986, which are above the acceptability value 0.5 (Fornell & Larcker, 1981). Hence, the results demonstrate that the measurement items were reasonably convergent on their respective constructs.

As recommended by Fornell and Larcker (1981), the result in Table 3 confirms the discriminant validity: the square root of the average variance extracted for each construct exceeded the squared correlation between any pair of distinct constructs. The smallest square root of average variance extracted from the constructs (0.894) is apparently greater than the largest correlation between constructs (0.759). Consequently, the measurement model demonstrated adequate reliability, convergent validity and discriminant validity.

Table 1. Descriptive Statistics

Construct/ Indicators	Mean	Std. Dev	Loading
Affect (AFF)			
AFF1	3.90	0.80	0.92
AFF2	3.77	0.77	0.94
Perceived Human-Human Interactivity (HHI)			
HHI1	4.00	0.79	0.80
HHI2	4.13	0.73	0.96
HHI3	4.10	0.71	0.97
Perceived Human-System Interactivity (HSI)			
HSI1	3.90	0.89	0.82
HSI2	3.70	0.84	0.95
HSI3	3.90	0.80	0.91
Continuance Intention (INT)			
INT1	3.70	0.65	0.97
INT2	3.80	0.76	0.96
Normative Belief (NB)			
Norm1	3.77	0.68	0.95
Norm2	3.63	0.72	0.97
Norm3	3.60	0.72	0.96
Performance outcome expectation (POE)			
POE1	3.63	0.77	0.99
POE2	3.60	0.77	0.99
Learning Self-efficacy (LS)			
LS1	3.13	0.97	0.94
LS2	2.90	1.13	0.91
Subjective Norms (SN)			
SN1	3.57	0.68	0.99
SN2	3.60	0.68	0.99
Learning Effectiveness			
LE	7.50	6.04	1.00

Table 2. Analysis of convergent validity

Construct	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
AFF	0.850	0.930	0.868
HHI	0.908	0.939	0.837
HIS	0.879	0.923	0.800
INT	0.918	0.961	0.924
POE	0.986	0.993	0.986
SE	0.827	0.920	0.852
SN	0.982	0.991	0.982
NB	0.956	0.973	0.919

Table 3. Analysis of discriminant validity

	AFF	HHI	HIS	INT	POE	SE	SN	NB
AFF	0.932							
HHI	0.433	0.915						
HIS	0.567	0.282	0.894					
INT	0.525	0.465	0.027	0.961				
POE	0.403	0.347	0.260	0.542	0.993			
SE	0.081	0.223	-0.135	0.342	0.376	0.923		
SN	0.512	0.485	-0.073	0.755	0.554	0.362	0.991	
NB	0.552	0.508	0.301	0.537	0.534	0.216	0.759	0.959

Note:
a) The diagonal elements show the square root of the average variance extracted.
b) The off diagonal elements show the correlations between constructs.

Structure model
This study employed PLS to test the research model with respect to proposed hypotheses testing. Consistent with recommendations (Chin, 1998), bootstrapping method was performed to determine the statistical significance of each path coefficient using t-tests. The results of the analysis are presented in Figure 2, and the standardized path coefficients and t-tests results are between constructs. The test results from the complete data sample supported the influence of HHI and HSI (physical environment) on the affect, supporting H1 and H2. As expected, H3 and H4 were supported in factors about person, but performance outcome expectations have stronger effect on the intention to attend videoconferencing courses. In addition, learning self-efficacy significantly influence performance outcome expectations, supporting H5. In social environment, normative belief had strong effect on subjective norms, and performance outcome expectations and the intention were significantly influenced by subjective norms. Hence, H6, H7 and H8 were supported. Moreover, the results show that the attendance intention positively affect learning effectiveness (students' grades), supporting H9. Overall, the research model explained 61.1 percent of the variance in intention of attending videoconferencing courses.

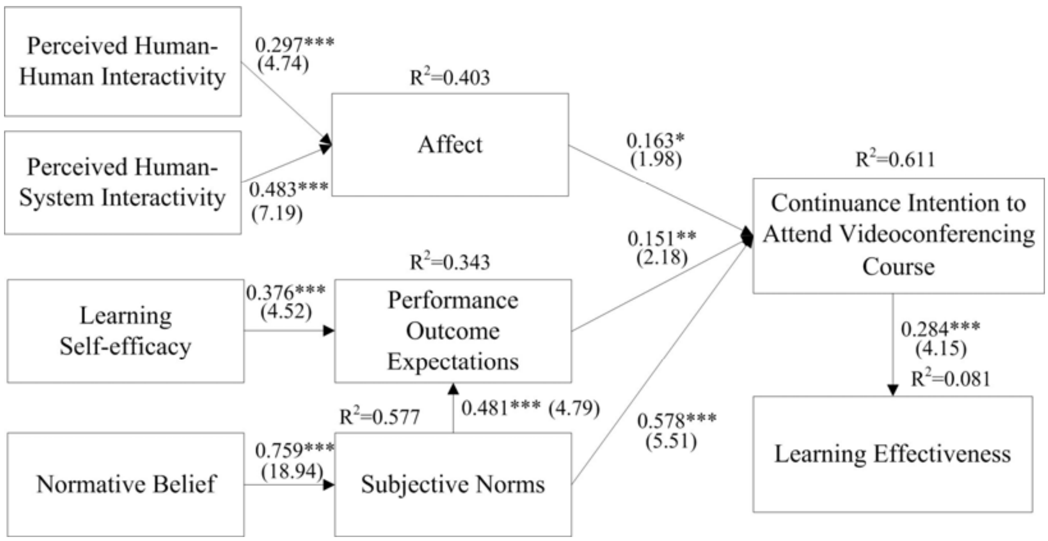

Figure 2. Analysis results

DISCUSSION
The research presented in this paper investigated the impact of person, physical and social environment factors on the intention to attend videoconferencing courses. It is found that all of the hypotheses were supported. The findings are discussed below.

First, among personal factors, affect and personal outcome expectations appear to be a significant determinant of continuance intention to attend videoconferencing courses. Compare with personal outcome expectations (β=0.151), affect seems to have more influence (β=0.163) on the intention. Consistent with past studies and our hypotheses, the results demonstrate that students (users) who have more positive attitude toward the videoconferencing software will have more intention to attend the courses. It means that the features of a videoconferencing software should cause users' affect in order to increase their continuous usage intention. Moreover, it was found that learning self-efficacy influence the intention indirectly through personal outcome expectations. Students with higher learning self-efficacy will have more personal outcome expectations and be more possible to continuously attend the courses. Therefore, teachers could provide students in need with educational programs that help improve their learning self-efficacy.

Second, the results show that HHI and HSI (physical environment factors) are important determinants of affect. In particular, HSI influence affect more significantly. It demonstrates that ease of using the videoconferencing system and acquiring course-related information via interacting with the features of the videoconferencing system is essential. The features can assist users in managing their learning records and course information in videoconferencing courses. Furthermore, it was found that ease of communicating with others via the features of HHI can enhance users' affect. For example, the functions of electronic white board and instant message allow users to communicate easily with each other via one-to-one, one-to-many, even many-to-many communication and then will improve affect. Consequently, because interactivity in videoconferencing courses mainly depends on the functions, software designers should continuously improve the efficiency and effectiveness of HHI and HSI.

Third, social environment factors (normative belief and subjective norms) directly and indirectly impact personal outcome expectations and continuous attending intention. Subjective norms had strongest direct effect (0.578) on the intention, and the indirect effect of normative belief is strongest (0.759X(0.578+(0.481X0.151))=0.494). This highlights the critical role of normative belief and subjective norms in the attending intention. The results indicate that social environment factors seem to be the most influential determinants in videoconferencing courses. In the school environment, normative belief and subjective norms mainly come from teachers and classmates. Therefore, in order to increase the usage intention, teachers' and classmates' believes about the videoconferencing courses are very critical.

Finally, it was found that the intention would positively influence students' grades. It means that videoconferencing courses can improve students' learning intention and learning effectiveness although only 8.1 percent of the variance in students' grades was explained. Therefore, videoconferencing courses can be a good learning solution to save students' time for commute.

This study suffers from several limitations. First, the questionnaire survey was conducted using a self-reporting scale to measure most of the research variables, and thus may be subject to a method bias. Second, our research participants were the university students in Taiwan; thus further research is needed to generalize our findings. Third, because of the limitation of teaching resources, only 30 students were invited to attend the courses. The model can be further examined by inviting more different students in the future. Finally, because only 8.1 percent of the variance in students' grades was explained, it means that other more influential determinants may exist. Further research can explore other factors affecting students' learning effectiveness in videoconferencing courses in the future.

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FACTORS AFFECTING THE TRANSFORMATIONAL LEADERSHIP ROLE OF PRINCIPALS IN IMPLEMENTING ICT IN SCHOOLS

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ABSTRACT
Leadership is an important factor in the effective implementation of technology in schools. This study examines the transformational leadership role of principals to determine whether transformational leadership role of principals in ICT implementation in schools is influenced by the computer competence, level of computer use, and professional development activities of principals. This paper, based on responses from 320 principals in Iran, reports that computer use and professional development activities (on the dimension of ICT and leadership) influence the transformational leadership role of principals in implementing ICT in schools. In addition, the study results show that computer competence has a positive relationship with the level of computer use by secondary school principals and it indirectly influences the transformational leadership role of principals in implementing ICT in schools. It is suggested that ongoing professional development opportunities on dimension of leadership and technology should be provided for principals to increase their levels of proficiency in computer use which will help future research understand the importance of the use of technology in education and to learn to model the transformational leadership components of charisma (idealized influence), inspirational motivation, intellectual stimulation and individualized consideration in their schools.
Keywords: Information and communication technology (ICT), technology leadership, transformational leadership, computer use, school principal, computer competence, professional development, structural equation modeling

INTRODUCTION

Information and communication technologies (ICTs) play an important role in enhancing education quality (Betz, 2000; Tong & Trinidad, 2005). These technologies will be integrated and implemented effectively in schools if school leaders, particularly the principals, support them; learn and use them in their instructional and administrative tasks; support their teachers in the process of change; and provide sufficient development opportunities for themselves and their staff (Afshari et al., 2010). In fact, school principals as change facilitators carry the responsibility of initiating and implementing school change through the use of ICT and can facilitate complex decisions to integrate it into learning, teaching, and school administration (Schiller, 2003). Anderson and Dexter (2005) conducted a study to examine principals' technology-related leadership characteristics in 800 schools in the USA and found that "although technology infrastructure is important, technology leadership is even more necessary for effective utilization of technology in schools" (p. 49). Moreover, other researchers like Schiller (2003) and Dawon and Rakes (2003) support that leadership is an important issue in effective technology use in schools. Therefore, it is quite important to examine principals' leadership ways of implementing educational technologies in schools.

According to Betz (2000), transformational leadership behaviors of principals play an essential role in the implementation of large-scale innovation in education. "This form of leadership is necessary to drive principals to the higher levels of concern and motivation needed for educational improvement" (Crawford, 2005, p. 8). According to Schepers, Wetzels, & de Ruyter (2005), transformational leadership is one of the best styles of leadership that can significantly determine the extent to which technology becomes integrated in school. As transformational leaders, principals play a critical role in the successful implementation of school initiatives and they act as role models to those whom they lead (Dawon & Rakes, 2003). Therefore, it is important to identify the factors that impact the transformational leadership role of principals in implementing ICT in schools.
"As leaders of school development, including integrated use of ICT, principals need to have a personal proficiency in computer use" (Schiller, 2003, p. 172). They should realize the importance of the new technologies in education and improve their knowledge and skills in the use of computer and other technologies.

However, although technology leadership responsibilities may have been assigned formally to principals, most of them do not have background or suitable training to feel confident in dealing with technology (Stuart et al., 2009). Previous research suggests that ICT competence and using computer are important factors that influence role of principals in implementing ICT in schools (Stuart et al., 2009). However, despite the importance of computer utilization in education and the role of the principals in supporting technology integration, there has been little research on the use of ICT by principals, their computer competencies, and their transformational leadership role in implementing ICT in schools. The current study addresses this pressing need and seeks to identify the relationships between school principals' computer competencies, levels of computer use, professional development activities, and transformational leadership role in implementing ICT in schools.

In the next section, the literature on the transformational leadership role of principals in implanting ICT in schools; principals' computer competencies; and computer use will be reviewed. Next, the research model, hypotheses, methodology, and survey will be illustrated. Then, findings, discussion, limitations, conclusions, and implications for school administrators are presented.

Transformational leadership and ICT

With the development of information technology and innovation, schools need more transformational leaders. "Transformational leadership occurs when one or more persons engage with others in such a way that leaders and followers raise one another to higher levels of motivation and morality" (Geijsel et al., 2003, p.230). According to Geijsel et al. (2003), transformational leadership has four specific dimensions:

(1) Idealized influence. This dimension entails putting followers' needs first, being role models for followers, doing the right thing, demonstrating high moral standards, and avoiding the use of power unnecessarily or for personal gain.
(2) Inspirational motivation. This factor describes the ways by which leaders motivate and inspire those around them, including practices aimed at creating attractive visions of future states, boosting follower goals, and inspiring enthusiasm and optimism.
(3) Intellectual stimulation. This process is aimed at developing followers' capacities to higher levels and the practices of this process stimulate effort to become more innovative and creative.
(4) Individualized consideration. This dimension implies paying close attention to the needs and interests of the organization's members.

This type of leadership has been indicated as one of the most significant factors influencing and promoting the integration of educational technology in schools (Yee, 2000). Schepers et al. (2005) carried out a study on leadership styles in terms of acceptance of technology and found that there is a significant relationship between transformational leadership and perceived usefulness of the technology. This shows that "encouraging new ways of thinking and enabling subordinates to analyze problems from many different viewpoints will indirectly yield a better individual technology acceptance level within the organization" (Schepers et al., 2005, p. 505). Yee (2000) suggested that principals as transformational leaders must be prepared to serve as the role model and hands-on user of technology. They should use ICT and understand the potential of ICT use in the teaching and learning process. "If principals do not use technology on a consistent basis, then they should not expect the faculty to use technology regularly. Modeling the use of technology provides an effective method for exposing teachers to new strategies and demonstrating to the staff that it is acceptable to take risks and make mistakes, without the fear of retribution" (Afshari et al., 2010, p. 11).

According to Bass and Riggio (2006), transformational leadership can be learned" (p.27). Principals can learn the techniques through training and obtain the qualities they need to become transformational leaders. Dvir, Eden, Avolio, & Shamir (2002) conducted an experimental research to review the efficiency of leadership training in two organizations. Their findings indicated significant difference between two cases in transformational leadership resulting from the training. Therefore, leadership training should be a priority in management training and development in organizations.

Computer competence, ICT use and ICT implementation

"In the information and technology age, school principals must possess computing capabilities" (Felton, 2006, p.14). They should use technology and understand how it can be used effectively in learning, teaching, and school administration. In Australia, Schiller (2003) conducted a quantitative study on 369 principals to assess the level of their use of computers and their perceived competencies in using various elements of ICT. The study showed that 93.5 percent of principals utilized computers at school and home. The study also revealed that the main use of computers was in word processing, sending and receiving e-mails, and accessing the worldwide web whereas construction of spreadsheets, databases, and presentations was much less common. In light of these findings, this study highlighted that principals need to be provided with ongoing professional development opportunities to boost their levels of proficiency in computer use (Schiller, 2003).

Stuart et al. (2009) explored the association between ICT competence of school leaders and the intention to master the ICT. Their findings indicated that the principals who perceived themselves as technology leaders have high levels of ICT competence and that they use ICT frequently in their administrative and instructional tasks. In fact, competence in operating a computer and in utilizing software helps school principals to be effective technology leaders (Stuart et al., 2009). Therefore, principals as technology leaders should be fluent in the basics of word processing, spreadsheets, and presentation software (Attaran & VanLaar, 2001). They should also know how to use the Internet to communicate with their staff and the broad community (Attaran & VanLaar, 2001). It is important that principals understand and learn how to utilize new technologies in education. If leaders use technology and realize the advantages of its use in education, then technology use in school is more likely.

Anderson and Dexter (2005) suggested that professional development opportunities should be provided for principals to promote their levels of ICT use and to increase their productivities. In fact, effective training programs help the principals to know and utilize computers for accessing and finding information and new knowledge. Furthermore, it helps them to develop processes for effective decision making and problem solving which eventually result in better accountability. The computer technology proved to be able to markedly improve the role of principals in the educational process. Therefore, it is very important for principals to know how to use new and existing technologies.

THE STUDY

The Theory of Planned Behavior (TPB) provides a theoretical basis for this investigation. This theory, which was suggested by Ajzen (1991), is an extension of the theory of reasoned action and is one of the most predictive persuasion theories. It has been applied successfully to studies of the relations among attitudes, beliefs, behavioral intentions, and behaviors (Schmidt, 2011). Moreover, many studies related to ICT have used the TPB as a framework (e.g., Stuart et al. (2009) and Albirini (2006)). The TPB is deemed to be a practical theoretical framework for the current study because of its success in explaining and predicting a variety of human behaviors besides that empirical data support its effectiveness (Sallimah & Albion, 2004).

In light of the above discussion about computer competence, ICT use, the transformational leadership role of principals in implementing ICT in schools and the TPB, hypotheses have been developed to guide the present study which posits that the transformational leadership role of principals in implementing ICT in schools is linked to the principals' perceptions of their computer competencies (Stuart et al., 2009; Bassellier, Benbasat, & Reich, 2003), levels of computer use (Scheper et al., 2005), and professional development activities on the dimension of ICT and leadership (Schiller, 2003; Stuart et al, 2009; Yee, 2000). According to Stuart et al. (2009), principals who have high levels of ICT competence are successful in implementing ICT and integrating it in schools. In fact, without knowledge of the computer technology and possession of the necessary skills to utilize it, principals may have high levels of uncertainty that will influence their opinions and beliefs about the innovation (Rogers (2003) cited in Afshari et al. (2010)). Furthermore, Schepers et al. (2005) stated that transformational leaders who have enough competence in operating a computer and utilizing software use technology more in their administrative and instructional tasks than the leaders who do not have enough competence. These leaders play a critical role in the successful implementation of school initiatives and act as role models.

Leaders need to model the use of technology to show how it can positively impact the school environment. In order to improve principals' levels of proficiency in computer use, professional development programs should be provided for them. Such training helps principals to learn how to use computers efficiently to access and find information and new knowledge (Felton, 2006). As well, leaders should adopt transformational leadership skills and develop those skills through training. Leaders who train on dimensions of leadership and technology are much more successful in implementing the ICT and integrating it into learning and teaching.

Based on these findings, the following hypotheses were established:

Hypothesis 1: Professional development in terms of leadership and technology will positively influence the transformational leadership role of principals in implementing ICT in schools.

Hypothesis 2: The ICT-related professional development will positively influence the principals' levels of computer competence.

Hypothesis 3: Principals' computer competencies will positively influence the transformational leadership role of principals in implementing ICT in schools.

Hypothesis 4: Principals' levels of computer competence will positively influence the extent of computer use by secondary school principals.

Hypothesis 5: High levels of computer use by secondary school principals will positively influence the transformational leadership role of principals in implementing ICT in schools.

METHODOLOGY

Research Design

A structural equation modeling (SEM) approach was used in this study to develop a model that shows the relationships among four variables: transformational leadership, computer competence, computer use, and professional development. Also, a quantitative method was utilized to collect data on the population of secondary school principals in Tehran, Iran. According to Tehran's Department of Education, there are 1,312 secondary schools in this area.

Data Collection

To carry out this study, first, approval was acquired from the Ministry of Education. In addition, a meeting was arranged with the research department of Tehran's Ministry of Education to discuss the proposed study. In this meeting, a questionnaire and a letter of introduction were submitted to the superintendent in the research department for review. The researcher then got permission to attend the principals' meeting in each educational area of the Ministry of Education. Totally, three hundred and fifty packages, each comprising a cover letter; the questionnaire; and a stamped addressed return envelope, were randomly distributed among secondary school principals during these sessions. At the beginning of the data collection session, trained enumerators met with the principals to introduce the study and explain its purpose and potential usefulness to the participants. Those who wished to participate were assured about confidentiality of their responses. Further, the enumerators provided those participants with briefing on how to fill the questionnaire. The enumerators checked the questionnaire for completeness immediately upon return. School principals who could not completely fill their questionnaires were given three weeks to return the completed questionnaires by mail. Totally, three hundred and fifty questionnaire copies were distributed among secondary school principals and 320 completed forms were returned, corresponding to a response rate of 91.4%.

Instruments

A questionnaire was used to obtain the required data for this study. The questionnaire was divided into two parts. Part A measured the transformational leadership role of principals in implementing ICT in schools. Factors that were related to this role were measured in part B (computer competence, ICT use, and professional development). Principals' perceptions of their transformational leadership styles were measured by the Multifactor Leadership Questionnaire 5x (MLQ5x) which was developed by Bass and Avolio (2000). The MLQ5x measures three dimensions of leadership (the transformational, transactional, and laissez-faire leadership dimensions). The transactional and laissez-faire leadership dimensions were not examined in this study. Laissez faire leadership is distinguished with complete abdication or avoidance of leadership (Rubin, Munz, & Bommer, 2006). In fact, laissez-faire leadership is extremely passive where leaders avoid decision-making and supervisory responsibilities (Bass & Riggio, 2006). Regarding the transactional leadership, Pounder (2003) stated that the transactional leaders are remarkably less exciting in effective leadership than the transformational leaders. In line with this, Scheperset al. (2005) reported that transactional leadership is not an effective style in implementing technology in schools. A transformational leadership approach is much likely to be more effective in handling barriers to change than a transactional leadership approach that focuses on technical problem solving to the neglect of people and organizational issues (Beatty & Lee, 1992). In this study, the principals' transformational leadership styles were assessed by 20 items measured on a five-point Likert scale from 0 (not at all) to 4 (frequently, if not always).

On the other side, the level of computer use is operationally defined in this study as the self-reported use of computers and their software for administrative and instructional purposes. According to this questionnaire, four domains of computer use, namely, Internet use; hardware and software use; instructional use; and administrative use were measured. The level of computer use was quantified by the total score on 22 items using a five-point Likert scale. Each item was rated by respondents from 1 (Never use) to 5 (Use daily). The responses to all 22 items were analyzed using frequency distribution analysis to determine the extent to which principals use the computer for instructional and administrative purposes.

The Computer Competence Scale was used to measure the beliefs of secondary school principals about their computer knowledge and skills. This scale was developed by Flowers and Algozzine in 2000 (Flowers and Algozzine, 2000). Computer competence was determined by the total score on 25 items on a four-point scale, ranging from no competence (1), through little (2) and moderate competence (3), to much competence (4). The mean score of the responses was calculated to determine each respondent's perceived level of computer competence. Principals' perceptions of their past professional development activities regarding ICT and leadership were assessed by two items. On the other hand, this study took into consideration the possibility of effects and differences associated with six other factors: gender, age, administrative experience, type of school, type of formal computer course, and education and hence these six items were included in the instrument.

Two indispensable characteristics of measurement that must be considered in establishing the appropriateness and usefulness of an instrument are reliability and validity. Although these instruments were valid, face and content validities of these instruments were evaluated by a panel of experts. Besides this, the convergent and discriminant validities of these instruments were assessed by using the Analysis of Moment Structures software (AMOS). Moreover, the internal consistencies of these instruments were assessed using the Software Package for Social Sciences (SPSS) v.18. The Cronbach's alpha coefficients for these scales were 0.96, 0.81, and 0.92 for the computer competence, transformational leadership style, and level of computer use, respectively.

Data analysis and results

AMOS 18.0 was used to analyze the collected data. The usual steps for doing SEM were followed. Before the data were analyzed they were screened for missing values and outliers. The frequency of every variable was explored. All errors found were corrected . However, a preliminary analysis of the amount of missing data indicated that 58 surveys contained missing values. The mean substitution imputation method was used to avoid reduction in the sample size and loss of statistical power.

Descriptive Summary of Principals' Characteristics

The findings indicated that 51.6% (n = 165) of the respondents were males and 48.4% (n = 155) were females. In terms of age, more than half of the respondents (50.3%; n = 161) were within the 45-54 age range. The participants' responses on their administrative experiences showed that 44.7% (n = 143) of them had 21 or more years of experience, 23.1% (n = 74) of them had 16 to 20 years of experience, 21.6% (n = 69) had 11 to 15 years of experience, and only 10.6% (n = 34) had 6 to 10 years of experience. More than half of the respondents (53.1%; n = 170) were working in private schools while 46.9% (n = 150) were working in public schools. In terms of education, 60.3% (n = 193) of the respondents held bachelor's degrees and 37.2% (n = 119) had masters' degrees. Only 2.5% (n = 8) had doctoral degrees. On the other hand, 76.3% (n = 244) of the participants reported that they had computer training and about 68.8% (n = 220) stated that they attended training courses related to leadership and to technology leadership. In terms of the type of training, more than half (52.8%) of the principals participating in the study reported that they received their training through in-service training.

Descriptive statistics of the items in the measure

The descriptive statistics for each instrument item are shown in Table 1. The mean score of computer training and leadership training are 1.24 and 1.31, respectively. This shows that the majority of principals had received training related to computer applications and leadership. Regarding the computer competence scale, the mean score of the participants' responses on Word processing (3.54) was the highest among the eight subscales, indicating much competence in this skill.

Table 1: Descriptive statistics of the items in the measure

Variable	Item	Mean	Standard Deviation	Skewness	Kurtosis
Professional Development	Computer training	1.24	0.426	1.23	-0.48
	Leadership training	1.31	0.464	0.81	-1.35
Computer Competence	Set up, maintenance, and troubleshooting of equipment	2.89	0.825	-0.38	-0.7
	Word processing	3.54	0.59	-1.16	0.268
	Spreadsheets & Database	2.39	0.845	0.07	-0.74
	Networking	3.07	0.802	-0.76	-0.03
	Telecommunication	3.12	0.85	-0.67	-0.36
	Media communication	2.66	0.841	-0.28	-0.51
	Internet use	3.568	0.84	-0.5	-0.13
	Hardware and software use	3.302	0.716	-0.12	-0.44

Computer Use	Instructional use	3.404	0.95	-0.5	-0.42
	Administrative use	3.466	0.877	-0.53	-0.25
Transformational Leadership	Idealized influence (attributed)	2.99	0.67	-0.38	-0.27
	Idealized influence (behavior)	2.88	0.71	-0.4	-0.44
	Intellectual stimulation	2.69	0.8	-0.41	-0.43
	Inspirational motivation	2.74	0.76	-0.42	-0.43
	Individualized considerations	2.58	0.69	-0.41	-0.43

On the contrary, the spreadsheets and database domain had the lowest mean score (2.39), indicating little competence in these skills. In addition, principals taking part in the study stated that they have moderate competence in using telecommunication (M = 3.12); networking (M = 3.07); and media communication (M = 2.66). Furthermore, all mean scores for computer use are above the midpoint of 3.00, with a range of 3.30–3.57. The standard deviations range from 0.71 to 0.88. Overall, the principals' perceptions of their levels of computer use are moderate with an overall mean score of 3.44 (SD = 0.82).

As can be seen in Table 1, all of the five dimensions of transformational leadership had much similar mean ratings (2.69–2.99). The standard deviations associated with the five transformational leadership dimensions are somewhat similar, ranging from 0.67-0.80. This indicates low variation in the perceptions of respondents. Regarding normality of the data, Kline (2005) stated that the magnitudes of the skewness and kurtosis indices should not exceed 3 and 10, respectively. Findings of this study indicated that both the skewness and kurtosis indices have acceptable ranges. Therefore, the data in this study are considered as normal for the purposes of SEM.

Test of the measurement model

To assess the reliability and validity of the measures, a confirmatory factor analysis was carried out. The results of the measurement model are presented in Table 2.

Table 2: Results for the measurement model

Latent Variable	Manifest Variable	Factor Loading (>0.50)*	CR (t-Value)	SRW	R^2	AVE (≥0.5)	Construct Reliability (CR)
Professional Development	Leadership Training	0.7		0.7	0.546	0.515	0.95
	Computer Training	0.74	13.653	0.74	0.556		
Computer Competence	Computer Competence1	0.76	16.919***	0.76	0.575	0.676	0.91
	Computer Competence2	0.78	17.595***	0.776	0.602		
	Computer Competence3	0.66	13.846***	0.665	0.442		
	Computer Competence4	0.92	24.453***	0.92	0.846		
	Computer Competence5	0.90	23.165***	0.897	0.804		
	Computer Competence6	0.88		0.877	0.768		
Computer Use	Computer Use1	0.83		0.83	0.687	0.77	0.81
	Computer Use2	0.89	20.22***	0.892	0.796		
	Computer Use3	0.87	19.467***	0.871	0.759		
	Computer Use4	0.91	20.925***	0.911	0.83		
Transformational Leadership	Transformational Leadership1	0.78		0.78	0.609	0.6	0.88
	Transformational Leadership2	0.75	13.838***	0.751	0.564		
	Transformational Leadership3	0.71	12.93***	0.708	0.502		
	Transformational	0.85	15.947***	0.851	0.724		

Leadership4				
Transformational Leadership5	0.76	14.022***	0.760	0.583

SRW: Standardized Regression Weight.
Average variance extracted= AVE= $(\Sigma\lambda^2)$ /n
Construct reliability = CR= $(\Sigma\lambda)^2 / (\Sigma\lambda)^2 + (\Sigma\delta)$

All factor loadings are above 0.70, ranging from 0.70 to 0.92. In addition, factor analysis showed that four factors are extractable and that these factors explain 78% of the total variance in the data. All the standardized regression weights are above 0.70, except for computer competence (spreadsheet and database subscale). However, the weight of this item was above 0.66 and the associated t values were significant ($P < 0.001$). The values of the coefficient of determination (R^2) of all items ranged from 0.442 to 0.846, indicating that 44.2% to 84.6% of the variations in these items were explained by their predictors. The convergent validity values of these instruments were calculated as well. The convergent validity refers to a set of variables that are presumed to measure a construct (Kline, 2005). It can be tested using the average variance extracted (AVE) and the factor loading. According to Hair et al. (2006), average variance extracted and factor loading values greater than, or equal to, 0.5 indicate a high convergent validity. The AVE ranged from 0.515 to 0.77. Moreover, construct reliability was measured. As shown in Table 2, the construct reliabilities ranged from 0.81 to 0.95, thus exceeding the minimum acceptable level of 0.7 (Chin, 1998). It is concluded therefore that the measures have adequate reliabilities and convergent validities.

All and above, this study assessed the discriminant validity. Discriminant validity refers to the extent to which a construct is truly distinct from other constructs (Hair et al., 2006). In order to test for discriminant validity, we compared AVE for two factors against R^2 between the two factors. Discriminant validity is acceptable if the AVE for each construct is greater than its shared variance with any other construct (Farrell, 2010). According to Table 3, the AVE was greater than R^2 between the two factors which indicate that all variables meet the requirements of discriminant validity.

Table 3: Square of correlation between constructs

	Professional Development	**Computer Competence**	**Computer Use**	**Transformational Leadership**
Professional Development	1			
Computer Competence	0.504	1		
Computer Use	0.409	0.562	1	
Transformational Leadership	0.467	0.448	0.423	1

As suggested by Hair et al. (2006), a variety of indices such as the $\chi 2$ statistic, comparative fit index (CFI), Tucker-Lewis index (TLI), Goodness-of-Fit index (GFI), and the root mean-squared error of approximation (RMSEA) were used in this study to obtain a comprehensive evaluation of model fit. The foregoing fit indices represent three categories of model fit indices: absolute, parsimonious, and incremental fit indices (Teo & Noyes, 2009). The levels of acceptable fit and the obtained values for the aforementioned fit indices for the proposed model are summarized in Table 4. Based on these criteria, we conclude that the measurement model has a good fit to the data.

Table4: Fit indices for the measurement model

Model fit indices	Values	Recommended guidelines	References
$\chi 2$	339.47	Non-significant	Klem (2000), Kline (2005), McDonald and Ho (2002)
CFI	0.939	≥0.9	Klem (2000), McDonald and Ho (2002)
TLI	0.925	≥0.9	Klem (2000), McDonald and Ho (2002)
GFI	0.946	≥0.9	Klem (2000), McDonald and Ho (2002)
NFI	0.916	≥0.9	Klem (2000), McDonald and Ho (2002)
RMSEA	0.071	<0.08	McDonald and Ho (2002)

Test of the Structural Model

Several indices were employed to test the structural model. Findings indicated a good model fit ($\chi2$= 341.545, P< 0.001, GFI=0.91, AGFI=0.96, CFI=0.939, NFI=0.916, TLI=0.925, and RMSEA=0.078). The results of the hypothesis test and the path coefficients of the proposed research model are shown in Figure 1. The findings indicated that four out of the five hypotheses were supported by the data. All the hypotheses, except for H_3, were significant indicating that there is the significant relationship between professional development activities (on dimensions of leadership and technology) and transformational leadership role of principals in implementing ICT in schools; ICT-related professional development (computer training) and the principals' computer competence; principals' computer competence and their level of computer use; and the level of computer use by secondary school principals and their transformational leadership role in implementing ICT in schools.

Three endogenous variables were tested in the research model. The transformational leadership role of principals in implementing ICT in schools was predicted by professional development with respect to the dimensions of leadership and technology; computer competence and level of computer use. The prediction model has an R^2 of 0.78, implying that 78% of variance in the transformational leadership role of principals in implementing ICT in schools was explained by professional development activities of principals, principals' computer competence, and principal's level of computer use. Individually, the ICT-related professional development (computer training) explained 45% of the variance in computer competence. On the other hand, 57% of the variance in the level of computer use by secondary school principals was explained by their computer competence (Table 5).

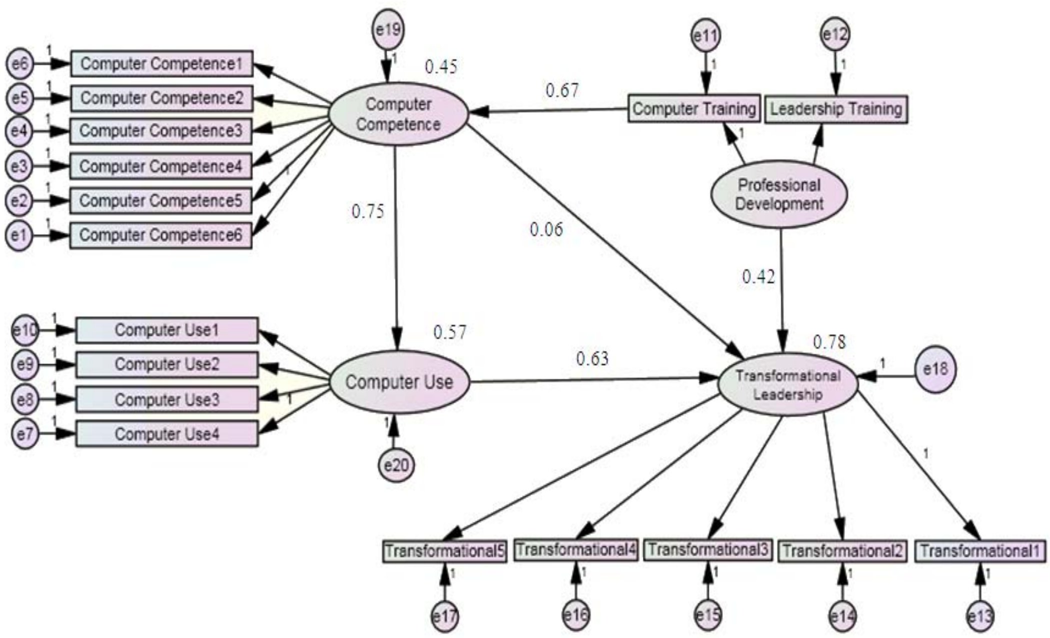

Figure 1: Structural model

Table5: Results of hypothesis testing

Hypotheses	Path	Path coefficient	t-value	Result
H_1	Professional Development & Transformational Leadership	0.42	4.6	supported
H_2	ICT-related Professional Development & Computer Competence	0.67	14.04	supported
H_3	Computer Competence & Transformational Leadership	0.06	0.789	Not supported
H_4	Computer Competence & Computer Use	0.75	15.011	supported
H_5	Computer Use & Transformational Leadership	0.63	8.324	supported

Total, direct, and indirect effects

In this study, the direct and indirect effects, and the standardized total effects were assessed to determine the extent to which each exogenous variable has an effect on the endogenous variables. The direct effect is the effect of an independent variable (exogenous) on a dependent variable (endogenous) whereas the indirect effect expresses the effect of an independent variable on a dependent variable through mediating variable(s). The total effect for a variable represents the sum of the direct and indirect effects (Schreiber et al., 2006).

Table 6: Direct, indirect, and total effects of the research model

Endogenous variables	Exogenous variables	Standardized estimates		
		Direct	Indirect	Total
Computer Competence (R^2=0.45)	Computer Training	0.671	0.000	0.671
Computer Use (R^2=0.75)	Computer Competence	0.755	0.000	0.755
Transformational Leadership (R^2=0.78)	Computer Competence	0.063	0.47	0.536
	Computer Use	0.627	0.000	0.627
	Professional Development	0.422	0.17	0.589

According to Cohen (1988), the d values of 0.2, 0.5, and 0.8 represent small, medium, and large effect sizes, respectively. Table 6 shows the direct, indirect, and total effects of the research model. The results indicate that professional development (in terms of the dimensions of leadership and technology) has a medium effect on the transformational leadership role of principals in implementing ICT in schools (d = 0.589). Additionally, the ICT-related professional development (computer training) has a medium effect on computer competence (d = 0.671). Furthermore, computer competence has a large effect on the level of computer use by secondary school principals (d = 0.755) and a medium effect on the transformational leadership role of principals in implementing ICT in schools (d = 0.536). This is followed by the level of computer use by secondary school principals which has a medium effect on the transformational leadership role of principals in implementing ICT in schools (d = 0.627).

Model Comparison

The research model was tested with and without the effect of computer competence on the transformational leadership role of principals in implementing ICT in schools. According to Table 8, the CFI and RAMSEA indicate a better-fitting model once the direct effect of computer competence on the transformational leadership role is not taken into consideration. In addition, each of Δ χ2 and ΔCFI were used as indices to difference in fit. However, use of Δχ2 has been criticized due to its sensitivity to sample size (Brannick, 1995; Cheung & Rensvold, 2002; Kelloway (1995) cited in Lievens & Anseel (2004)). The ΔCFI does not have these problems (Cheung & Rensvold, 2002). Cheung and Rensvold (2002) suggested that a ΔCFI value greater than 0.01 shows a significant drop in fit. Findings of this study show a significant drop in fit between Model 1 and Model 2 (ΔCFI = 0.012). Therefore, it can be concluded that model 1 has a significantly better fit to the research data than model 2.

Table 7: Model Comparison

Model	χ2	df	CFI	RMSEA	Δ χ2	Δdf	ΔCFI
1) Research model without the direct effect of computer competence on the transformational leadership	342.2	100	0.927	0.075	0.61	1	0.012
2) Research model with the direct effect of computer competence on the transformational leadership	341.5	99	0.939	0.078			

DISCUSSION

This study explored the relationships between variables related to the transformational leadership role of principals in implementing ICT in schools. All hypotheses, except the third one, were supported. This study indicated that computer competence was not a significant predictor of the transformational leadership role of principals in implementing ICT in schools. This result implies that school principals who have knowledge and skill only about some aspect of ICT may not have intention to inspire and encourage teachers to become committed to using technology in their learning and teaching process. Moreover, they may not have intention to be involved in ICT projects and management of the school's ICT. This result is consistent with that of Stuart et al.'s (2009) study.

In addition, findings of this study indicate that there is a significant relationship between principals' computer competence and their levels of computer use. This result is in compliance with the findings of Schiller (2003) and Stuart et al. (2009). In fact, principals who are competent in a computer application will be able to identify when it is advantageous to use the application in their instructional and administrative tasks. When principals have this expertise, there is a relative advantage in using computers. Additionally, because of their expertise, principals may feel that computer use is compatible with their existing values about instruction. Once the principal's level of computer use is above the intermediate level, the perceived complexity of using computers diminishes. This may explain the tendency to use computers according to Rogers' theory.

Furthermore, the study results showed that ICT-related professional development activities (computer training) are positively related to the principal's computer competence. In fact, school principals who had participated in professional development activities reported higher computer competence than those who had not. This may be explained by that these principals felt more confident in applying these skills and were intending to head beyond knowing to doing (Stuart et al., 2009). Furthermore, outcomes of this the study reveal that the sample principals have moderate competence in using computers (M = 2.94). They have less competence in database, spreadsheet, and presentation/multimedia software; the Internet; and information seeking than other technology competencies. Each of these applications had less than 50% of the respondents at the proficient level or above. It seems that ICT-related professional development or formal courses can help principals to develop their competencies in using computers and software. Without these capabilities, principals can do little to improve their efficiencies. Hence, it is suggested that school managers provide formal computer courses that feature the latest hardware and software to improve computer proficiency among school principals. This training can help principals to effectively use technology in their work.

Another key finding is that the level of computer use by principals has a significant relationship with their transformational leadership role in implementing ICT in schools. From the effect sizes, computer use had the largest effect on the transformational leadership. Moreover, the study results indicated that the principals who utilize technology in their administrative and instructional tasks act as strong role models for the effective use of technology in support of learning and teaching. Such leaders can transmit a vision or sense of mission for comprehensive integration of technology. They can foster an environment and culture conducive to realization of that vision and can create enthusiasm in followers for applying technology in their teaching.

According to Bass and Riggio (2006), principals as transformational leaders should pay attention to the personal needs of their staff and be active listeners. Study results showed that principals used computers to communicate with staff and members of the wider school community. In fact, effective principals are good communicators. Technology allows principals to communicate highly efficiently and effectively with their staff. In this way, a personal and friendly relationship between principals and all members of a school community will be created. These relationships convey a sense of caring and appreciation (McEwan, 2003). Harris (2004) sees caring as a way of showing respect for teachers and students and believes that this process involves challenging people to grow personally and professionally. Thus, principals should get engaged in these behaviors to keep their relationships positive and growing (Whitaker, 2003). According to Bamberger and Meshoulam (2000), the training and development of transformational leaders is the most viable route for organizations to pursue. Findings of this study spotlight that professional development (in relation to the dimensions of leadership and technology) is positively related to the transformational leadership role of principals in implementing ICT in schools. Hence, the current study confirms the importance of professional development in enhancing principal's transformational leadership behaviours in implementing ICT in schools. This finding is consistent with those of Dvir et al. (2002) and Kelloway and Barling's (2000).

In other respect, this study highlights that a representative sample of Iranian secondary school principals fairly often provided some elements of transformational leadership. Bass and Avolio (2003) suggested that ideal ratings for the transformational variables should be greater than three. This benchmark shows that principals who have a mean score greater than three are very powerful in achieving the best outcomes. However, the principals surveyed in this research did not meet this benchmark.

Based on literature review, the level of transformational leadership in developed countries is higher than that in developing ones. Actually, in developed countries such as the USA, educational master degrees are mandatory. School principals must pass the Principals' Qualification Program (PQP) before being appointed as principals (Bush & Jackson, 2002). Unfortunately, in most developing countries like Iran training is not a requirement for appointment of principals and there is an assumption that good teachers can become effective managers and leaders without any need for specific preparation. This may be a reason why the principals surveyed by this research did not meet the optimal level for transformational leaders.

LIMITATIONS

This study had several limitations which may influence generalizability of the results. The current inquiry was part of a cross-sectional research to explore factors affecting the transformational leadership role of principals in implementing ICT in schools. The data used in this study were obtained from secondary school principals in the province of Tehran in Iran and may not be generalizeable to principals in other types of institutions and other countries. Another limitation is that participants in this study completed a self-reported instrument. Thereupon, it was quite possible that principals overrated or underrated their levels of proficiency. These ratings may not be reflective of the true proficiency levels of the principals.

CONCLUSION

This study raised some issues about the implementation of ICT in schools. Findings of this study indicate that factors such as computer use, professional development activities (with respect to the dimension of ICT and leadership) influence the leadership role of principals in implementing ICT in schools. Interestingly, computer competence had no significant direct relationship with the transformational leadership role of principals in implementing ICT in schools. This study compared the performances of the research model with and without inclusion of the direct effect of computer competence on the transformational leadership role of principals in implementing ICT in schools and found that the model excluding direct effect of computer competence on transformational leadership had a significantly better fit to the research data than the model including this effect. All and above, the study outcomes underline that the level of computer competence indirectly influences the transformational leadership role of principals ($d = 0.47$). Furthermore, this study showed that principal's level of computer competence has a positive correlation with his/her level of computer use. Principals with higher skills and knowledge exhibited higher levels of computer use. Actually, without the knowledge of computer technology, principals may have a high level of uncertainty that influences their opinions and beliefs about the innovation. Therefore, Iranian principals with limited knowledge and background in computer-based information systems cannot use the computer efficiently and they encourage their schools to ride the wave of technology.

We believe that this study can be useful for decision makers and providers of professional development programs to devise training programs for principals that will quarantine that principals a) understand the importance of transformational leadership behaviors in implementing ICT in schools; b) use technology to communicate efficiently with staff, parents, and the community; (c) use technology directly to collect and analyze data and other information that can improve decision-making and other management functions; (d) understand how current and available technologies can be integrated effectively into all aspects of the learning and teaching process; and (e) use technology appropriately in leading and communicating about school programs and activities .

As well, Iranian principals should be active learners in this fast-moving arena. They should never stop learning and honing their skills. Rather, they must maintain personal plans for self-improvement and continuous learning (Bennis, 1990). The principals should develop their styles of leadership and be familiar with current research and best practices. Furthermore, they should use new technologies and model their use to improve the environment in which educators function. If Iranian principals want to take the initiative and implement school change through use of the ICT, they must be eager to model the transformational components of charisma (idealized influence), inspirational motivation, intellectual stimulation, and individualized consideration in their schools. As charismatic leaders, these principals must talk about values and beliefs, emphasize the sense of mission, and promote the good of the group (Bass & Riggio, 2006). As part of inspirational motivation, a principal must create a vision and encourage others to assimilate this vision by providing them with the feeling of being part of something bigger than themselves. Principals should provide intellectual stimulation by challenging teachers to reconsider, and rethink about, assumptions about their work (Leithwood, 1994). Finally, school principals should personalize interactions with staff and concern themselves with the individual's need for achievement. According to Bass and Riggio (2006), transformational leadership can be taught. Therefore, decision makers may redesign programs, such as leadership studies, in order to teach the components of transformational leadership to future administrators.

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FACTORS INFLUENCING WOMEN'S ATTITUDES TOWARDS COMPUTERS IN A COMPUTER LITERACY TRAINING PROGRAM

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ABSTRACT
In the "Digital Divide" research, adult women have generally been found to be the weakest group when compared with others. There is thus a need to provide this particular group with computer literacy training, and to give them opportunities to learn about using computers. In such training, women not only need to learn computer skills, but also a positive attitude. This study gathered qualitative and quantitative data from 175 women who attended computer literacy training, to analyze their attitudes towards computers and to identify differences in their attitudes. The data were collected from questionnaires, interviews and class observations. It was found that only women with lower educational levels had feelings of high anxiety prior to the training. However, other characteristics influenced their attitudes during the training, including age, education, nationality, and PC ownership. Factors influencing the differences in their attitudes were the difficulties of data input, physiological limitations, cultural differences, computer access and learning opportunities. Suggestions for future computer training programs for adult women are proposed.
Keywords: attitudes towards computers, digital divide, gender issues, computer literacy training, adult learning

INTRODUCTION

Due to improvements in information and communications technology (ICT), computers and the Internet have become useful tools in our daily life and work. However, there are still those who do not know how to use computers or the Internet, a situation referred to as the "digital divide," and the issue of gender has always been the topic of most concern in the discussion of this divide. The declaration of the 4th World Conference on Women in Beijing in 1995 appealed to governments and non-profit organizations to take action to strengthen women's skills, knowledge and access abilities in the area of information technology. However, according to "The World's Women 2010" report, the United Nations Department of Economic and Social Affairs indicated that the gender digital divide still exists, not only in the less developed countries with lower Internet access rates, but also in the developed countries with high access rates.

Of the 55 reported countries, the gender digital divide gap in 28 countries exceeded 5%, and the rates of males using the Internet, excluding Cuba, were higher than those of females. When further comparing the rates among different age categories, the digital divide for older females was the most serious. In a study of 27 EU countries (Eurostat, 2010), 55-74-year-old women's utility rate of the Internet fell 10% below that of men. The same situation can be found in Taiwan. Since the beginning of the widespread use of and education in information technology in Taiwan, the computer usage rate of 12-40-year-old Taiwanese has risen to above 90%, and gender differences are not obvious. However, as the middle-aged and elderly have not had the same chances to learn about information technology, the rate drops as age rises, and women are obviously falling behind men in these age groups (Research, Development and Evaluation Commission, RDEC, 2010). For instance, females aged 51-60 lag behind males by 2.3% (69% vs. 71.3%), and the difference widens to 9.2% among those aged 61 and older (11.5% vs. 18.4%). To encourage adult women to learn computer skills and to reduce the gender digital divide, in 1995 Microsoft, in association with a number of non-profit organizations, initiated the "Women Up Project" to provide women who lacked computer skills with 24 hours of free computer literacy training in basic information technology skills. This project received the recognition of the government in 2007 when the Council for Economic Planning and Development (CEPD), Executive Yuan, invested in expanding the program into the Bridging Digital Divide for Women Project. Since then it has helped almost 20,000 women in Taiwan to learn basic computer skills each year.

According to Simonson, Maurer, Montag-Toradi, and Whitaker (1987), expanding or sustaining a positive, anxiety free attitude or value structure about computers is considered pivotal for computer literacy. Because of the rapid and continuous development of computers, skills and knowledge are important for the computer literate person, but a positive attitude toward computing is also considered to be necessary (Simonson et al., 1987). In addition, there is a traditional stereotype that women do not have good computer skills, and that their attitudes toward computing tend to be negative. The findings of many researchers have also echoed this (e.g., Alzaidiyeen, Abdullah, & Al-Shabatat, 2011; Dinçyürek, Arsan, & Cağlar, 2011; Işman & Celikli, 2009; Massoud, 1991; Liu, Lin, Chen, & Peng, 2012; Ocak & Akdemir, 2008; Topkaya, 2010). Therefore, any future projects that are offered should not just focus on computer skills learning, but should also pay attention to improvements in attitudes toward computing. The purpose of this study is to explore the differences in the attitudes of the women beginning to learn computer skills and the factors contributing to these differences, and to provide reference suggestions for the future design of these kinds of training programs.

LITERATURE REVIEW

In the Digital Divide research, older adult users have been found to lag behind others in ICT and Internet use. In addition, some researchers have found that older adults experience greater anxiety than younger adults (Laguna & Babcock, 1997), or have less confidence (Dyck & Smither, 1994). However, some studies have found that the differences between the two groups are not conspicuous (Broady, Chan, & Caputi, 2010; Massoud, 1991). Broady et al. (2010) found that giving older adults the proper encouragement, clear explanations of the personal benefits and an appropriate time schedule can help them to learn to use computers in an effective way.

It is generally considered that the higher education people have, the better their computer skills will be, the more positive attitudes they will have, and the less anxiety they will experience (Chou & Shieh, 2011). However, some researchers have found that computer learning attitudes are not related to learners' education levels (e.g., Laguna & Babcock, 1997; Hashim & Mustapha, 2004).

Working women have more chances to use computers than housewives. Hilbert (2011) states that working women tend to use computers more actively, no matter whether in the working environment, at home, or in public places. Nakatani and Miyamoto's (2006) findings concur, as they found that housewives experience anxiety about learning to use computers because they rarely have the opportunity to use one. To break this negative cycle, helping housewives to gain more confidence and enjoyment in a positive learning environment could be expected to lead them to an active learning attitude and a positive cycle.

The ratio of foreign spouses in Taiwan (i.e., the ratio of migrant partners to total married couples) has been increasing since 1990, peaking at 31.9% in 2003. In 2009, the number of foreign spouses had reached 429,000, 93.3% of whom were females (Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C., 2011). According to the RDEC (2010) research, the rate of Internet connection in foreign spouse households was 11.1% lower than in those of non-foreign spouses. In addition, their awareness of availability of information was 12% lower than that of non-foreign spouses. According to Massoud (1991), people of different cultural backgrounds have different computer learning attitudes, so race/ethnicity is likely to be one of the factors influencing attitudes towards computer learning. For example, Marcoulides (1991) found that there are no differences between American and Chinese students in terms of the factors affecting their computer anxiety. On the other hand, Brosnan and Lee's study (1998) found that United Kingdom nationals had less computer anxiety and more positive computer learning attitudes than Hong Kong nationals because of cultural gender differences, even though the educational backgrounds and technological advances of the two groups of subjects were comparable.

Computer ownership has always been one of the indexes in the research of the Digital Divide, and also a factor considered in computer learning attitude research. If users own a computer, they are more likely to use it regularly, which will change their computer attitudes (Ogunkola, 2008). In addition, computer owners tend to have less anxiety, better confidence, more interest, and self-identification (Pamuk & Peker, 2009). However, another study has shown that owning a computer has no influence on users' computer attitudes (Deniz, 2007).

Research has indicated that proper computer training programs and Internet access experience can efficiently improve older adults' computer attitudes. In one study, there was an obvious decrease in older adults' computer anxiety after being taught Internet Basics and Searching for Health Information Online (Xie & Bugg, 2009). Kubeck (1999) also compared the progress between older adults and younger adults after they had learned to use a computer. Although the study found that the older adults had more difficulty in learning and understanding, after the experience of learning they tended to be more interested in learning than the younger adults, and made more progress. McInerney, McInerney and Sinclair (1994) compared the computer attitudes of college students who did and did not own a computer before and after taking computer courses. They found that while there were no differences between the two groups before they took the courses, those who owned computers had significantly more positive attitudes after the courses.

Regarding the computer attitudes of adult women, middle-aged and elderly women in Taiwan usually have negative computer attitudes, as indicated by the research of Lin, Tang and Kuo (2007). Even though they might know that computer skills are very important, they do not have confidence to use computers and are afraid of breaking them. They also tend to feel that ICT is boring. Having unhappy computer experiences is also an important factor that increases their negative computer attitudes. For example, family members might not support them when they are learning, but rather make them feel anxious and helpless. Some of them are afraid of asking questions in computer courses, so they not only regress, but actually lose interest. On the other hand, Lin et al. (2007) pointed out that women would feel more comfortable if novices learned together, and a great experience could improve their positive computer attitudes. In a case study of a community mothers' computer course reported by Shieh, Chang and Liu (2011), the instructor's patience, repeated step-by-step demonstrations, detailed notes presented with screen-image snapshots, stand-by tutors and a friendly learning environment efficiently reduced the women's anxiety.

To summarize, while there have been a number of studies on computer attitudes, very few have especially focused on adult women and on the differences in their computer attitudes. Therefore, this study combined qualitative and quantitative research to study adult women's computer attitudes during computer literacy training in an attempt to answer the following questions:

1. What is the impact of the computer literacy training on the adult women's attitudes toward computers?
2. What characteristics and factors are associated with the change in the women's attitudes?

METHODOLOGY

Participants

The participants in this study were 204 women living in Chiayi City, Taiwan. They were enrolled in a digital divide project which was launched by the Council for Economic Planning and Development (CEPD) in Taiwan, aimed at reducing the digital divide for women. According to the RDEC (2010) report, females in Chiayi City are about eight percent less likely than males to use computers and to have Internet access. The examined program offered five training course sessions for adult women, each catering for about 40 participants. During the eight-week program, the women went to class once a week for three hours either at the weekend or in the evening between November 2009 and June 2010.

Some researchers have mentioned that as it is easy for adult novices to make mistakes when learning to use computers, they need more assistance than others (e.g., Czaja, 1997; Jones & Bayen, 1998). Jones and Bayen (1998) also suggested that there should be a sufficient number of instructors or teaching assistants to answer students' questions or give them appropriate help in class. Accordingly, a total of 24 college students were hired as teaching assistants in the current classes. Five of them were assigned to assist each class. All the sessions were taught by the same instructor.

Course design

Unit Design. Table 1 shows the teaching syllabus with unit descriptions. The course aimed at teaching the learners basic knowledge and hands-on skills about Windows and the Internet, including the steps involved in applying for a Windows Live account to experience a virtual identity in the cyber world. The last unit was to learn about online transactions through Internet auctions.

Table 1. Unit schedule and description

Week	*Unit*	*Description*
1,2,3	Basic computer knowledge and skills	Knowing computer components (host, input device and output device), basic Windows skills, data entry and Internet surfing (IE).
4,5	Computers and communication	Instant messenger (MSN) and email (Hotmail)
6,7	Internet publishing	Blogs (Windows Space) and online albums (Windows Album)
8	Online transactions	Internet Auctions (Hibid)

Materials Design. Using the multimedia-based worked examples rule to design the teaching materials, the units were divided into segments, each shown as a worked example (Hsu, Chang, & Yu, 2012; van Gerven, Paas, van Merriënboer, Hendriks, & Schmidt, 2003). The teaching materials were presented using Power Point, from which the participants could follow the steps based on the screen-shot images, as suggested by Shieh et al. (2011). Signals were used to highlight words and pictures, and the use of a simple background, cutting down on unnecessary embellishment, helped to avoid visual overload. Each student was given a two-slides-per-page handout in each class.

Presentation Design. The teaching location was a computer lab, where each student worked on their own computer. Each worked example segment comprised three steps: (1) the lecturer used the broadcast teaching system to broadcast the material to the students, explaining the content of the lesson, the purpose of learning, its application, and operational tips; (2) the lecturer demonstrated and explained the operation steps; and (3) the students practiced by themselves with five tutors standing by. Allowing students to do the same things right away and repeatedly after providing a worked example is an efficient method of improving their skills (Trafton & Reiser, 1993).

Instrument

The Computer Attitude Scale, initially designed for Taiwanese older adults by Lin (2007) with reference to Loyd and Loyd (1985), but slightly modified by Shieh et al. (2011), was adopted in the research. The 17-item scale is categorized into 4 sub-scales: anxiety (item1-item4), confidence (item5-item9), liking (item10-item13) and perceived usefulness (item14-item17). The scale is based on a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). Lin claimed that the overall scale has a high reliability (Cronbach's $\alpha = 0.904$) and that the four sub-scales are all above 0.7. The current study used the pre-test data for the factor analysis and found that the confidence subscale distributed to different components. After deleting the confidence subscale and items 12, 16, and 17 due to not having loaded proper factors, the scale converged with the anxiety, liking and usefulness subscales. The Cronbach's Alpha Reliability Coefficients of the overall scale ($\alpha = 0.626$), the anxiety subscale ($\alpha = 0.773$), the liking subscale ($\alpha = 0.613$) and the usefulness subscale ($\alpha = 0.706$) were all higher than 0.6, the lowest suggested reliability coefficient value (Hair, Black, Babin, & Anderson, 2010).

Data collection and data analysis

The participants completed the Computer Attitude Scale in the first and the last class to allow for a better understanding of the changes in their computer attitudes as a result of taking the course. After eliminating the invalid questionnaires, there were 175 women who completed both. The participants' personal information was also gathered, including age, education level, work, nationality and PC ownership. In addition, ten class observations, two in each session, were conducted to acquire the dynamic interactivity of the classes. At the end of the training, 15 out of the 24 teaching assistants, identified as TA1 to TA15, took part in individual face-to-face interviews. A semi-structured interview protocol was used to attain their personal feedback about the training and about the women's in-class learning situation. Each interview lasted for approximately 20 minutes. Finally, follow-up telephone interviews of 20 randomly selected women from the program, identified as W1 to W20, were carried out to collect their learning experiences, including their opinions of the course arrangement, usefulness of the course content, interaction with the assistants, and frequency of computer usage after the training. Each interview lasted approximately 15 minutes. All interviews were audio-recorded.

SPSS 19 statistical software was used to analyze the questionnaire data. T-tests, Spearman's rho correlations, one-way ANOVA, and posthoc LSD tests were adopted to identify differences in the women's attitudes before and after the course. The interview data were transcribed verbatim, and the Atlas-ti software was used to conduct the coding, text retrieval, and node categorization.

RESULTS

According to the survey results, the mean age of the participants was 49.86 years (SD=9.856) with 88% older than 40. More than half of the participants (55%, n=97) had graduated from senior high school; more than half (54%, n=94) were not working. Ninety-four percent (n=164) of the participants were Taiwanese, as opposed to 6% non-Taiwanese. Ninety percent of the participants had a computer at home (n=157). More detailed information is shown in the associated tables below.

The impact of the computer literacy training on the adult women's attitudes

Table 2 presents a comparison of the women's computer attitudes before and after the training. Overall, their attitudes improved (t = 6.102, $p < 0.001$), their anxiety decreased (t = 7.982, $p < 0.001$), and their interest in computers increased (t = 2.607, $p < 0.05$). Although their perception of usefulness of computers remained highly positive (M = 4.010, SD = 0.645), it decreased slightly compared with before the training (M = 4.126, SD = 0.612; t = -2.398, $p < 0.05$).

Table 2. Mean scores of the participants' attitudes toward computers

Subscale	Mean(SD) (n=175)		*t*-value	*p*-value
	Before class	After class		
Anxiety	2.741(0.752)	3.198(0.733)	7.982	0.000***
Liking	3.464(0.632)	3.591(0.616)	2.607	0.010*
Usefulness	4.126(0.612)	4.010(0.645)	-2.398	0.018*
Overall	3.354(0.404)	3.521(0.474)	6.102	0.000***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

According to class observations, most of the women looked nervous but excited about coming to the computer training course. The interview data revealed that their anxiety about using computers was simply because they did not want to "break" them, including breaking the mouse, the keyboard, and the computer itself. However, after 2-3 weeks of hands-on practice, their fears dissipated as they learned that computers are not so easily broken. Some women (e.g., W9 and W14) reported in the interview that they also felt more confident and more comfortable when people talked about computers. Their increase in interest was reflected in their statements about their relationships with their children. W5 and W15 were excited about being able to communicate on MSN with their children and/or friends who lived out of town or abroad. W16 stated that she was able to use both email and MSN to talk with her child, which she considered an accomplishment. Several women mentioned that they learned to upload their photos and articles to Internet albums, blogs, and/or Facebook. W14 disclosed that after the data entry lesson she made a menu for her restaurant by herself, while W19 said that she created a company advertising presentation using Power Point. To W8, the most useful achievement was reportedly learning how to use a USB Flash Drive.

The various topics of the lessons, however, did not seem to have satisfied all of the learners, which reflected on the decrease in their perceptions of the usefulness of computers. W20, aged in the 30-40-year-old category, mentioned that she did not learn as much as she initially expected, though she acknowledged that she did gain more knowledge about the topics covered in the course. The class observation data revealed that the participants' comprehension about using computers varied significantly; some were able to follow the instructor's demonstrations on their first try, while most others needed multiple demonstrations before understanding. However, all were rather engaged in following the instructor's commands. The instructor also appeared very patient and slow-paced in presenting the lessons. According to TA1, more of the 30-40-year-old women preferred to learn about online auctions, whereas the older women enjoyed chatting on MSN more. Similarly, TA12 reported that not all of the women wanted to learn about blogs, as scheduled in the syllabus. She said some asked her to teach them about Facebook and how to apply for a Facebook account instead.

Overall, the women who were interviewed commented that the computer lessons were quite helpful for them. Among the lessons, the most useful items taught were email, surfing the Internet, and MSN. Most also commented that the instructor did a good job due to his patient demonstrations and explanations. Although seven out of the 20 women interviewed stated that they did not have many chances to use a computer in their daily life after the training program, thirteen said that their increased computer skills enriched their routine life. Most were also interested in attending this sort of program again to acquire more practice and more advanced skills.

Factors associated with the women's attitudes toward computers

Table 3 shows the results of paired samples t-tests comparing the women's computer attitudes before and after the training for each of the characteristic categories. It was found that almost all categories, except age below 40, no PC and non-Taiwanese, showed a decrease in the level of their anxiety ($p < 0.05$). There were five categories of participants who increased their liking of computers: aged below 40 (t = 2.423, $p < 0.05$), senior high school education (t = 2.902, $p < 0.01$), working (t = 2.847, $p < 0.01$), own PC (t = 2.365, $p < 0.05$) and Taiwanese (t = 2.447, $p < 0.05$). Three categories however, aged over 59 (t = -2.152, $p < 0.05$), no PC (t = -2.586, $p < 0.05$) and Taiwanese (t = -2.290, $p < 0.05$), had lower perceptions of usefulness after the course.

Table 3. Paired samples t-tests for women's computer attitudes before and after the training for each characteristic category

Characteristics	N	*t*-value(*p*-value) Anxiety	Liking	Usefulness
Age				
<40	21	1.587(0.128)	2.423(0.025)*	1.113(0.279)
40-49	74	4.879(0.000)***	1.213(0.229)	-1.258(0.212)
50-59	54	5.332(0.000)***	1.051(0.298)	-1.630(0.109)
>59	26	3.634(0.001)**	1.386(0.178)	-2.152(0.041)*
Education				
Elementary school and below	14	3.351(0.005)**	1.054(0.311)	-1.067(0.305)
Junior high school	30	3.254(0.003)**	0.174(0.863)	-0.887(0.382)
Senior high school	97	5.514(0.000)***	2.902(0.005)**	-1.529(0.130)
Junior college and above	34	3.516(0.001)**	0.453(0.654)	-1.383(0.176)
Working status				
Working	81	5.598(0.000)***	2.847(0.006)**	-1.365(0.176)
Not working	94	5.667(0.000)***	1.073(0.286)	-1.968(0.052)
PC Ownership				
Own PC	157	8.455(0.000)***	2.365(0.019)*	-1.524(0.130)
No PC	18	0.216(0.831)	1.083(0.294)	-2.586(0.019)*
Nationality				
Taiwanese	164	8.180(0.000)***	2.447(0.015)*	-2.290(0.023)*
Non-Taiwanese	11	0.134(0.896)	0.872(0.404)	-0.678(0.513)

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Correlations between characteristics and computer attitudes before the course, after the course, and the before/after differences in attitudes are presented in Table 4, using Spearman's rho correlations. Before the course only education level and anxiety were significantly related (r_s = 0.194, $p < 0.05$). After the course, age and usefulness (r_s = -0.221, $p < 0.01$) were shown to have a significant relationship. Education and anxiety (r_s = 0.150, $p < 0.05$) and Liking (r_s = -0.158, $p < 0.05$), and PC ownership with anxiety (r_s = -0.159, $p < 0.05$) were all shown to be significant. Differences between before and after the course found that age and usefulness were significantly related (r_s = -0.162, $p < 0.05$), as were nationality and anxiety (r_s = -0.152, $p < 0.05$). PC ownership with anxiety (r_s = -0.191, $p < 0.05$) and usefulness (r_s = -0.151, $p < 0.05$) both had significant relationships.

Table 4. Spearman's rho correlations between characteristics and computer attitudes before the course, after the course, and the before/after differences in attitudes

Subscale	Spearman's rho Correlations (r_s value) Age	Education	Working Status	PC Ownership	Nationality
Before class(A)					
Anxiety	-0.101	0.194*	0.023	0.044	0.002
Liking	0.009	-0.138	0.020	-0.078	0.008
Usefulness	-0.094	0.081	0.031	0.027	0.053
After class(B)					
Anxiety	0.008	0.150*	0.026	-0.159*	-0.148
Liking	-0.010	-0.158*	-0.067	-0.041	-0.018
Usefulness	-0.221**	0.092	-0.011	-0.144	-0.006
Differences(B-A)					
Anxiety	0.125	-0.070	-0.021	-0.191*	-0.152*
Liking	-0.027	-0.040	-0.092	0.041	0.017
Usefulness	-0.162*	0.070	-0.061	-0.151*	-0.036

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Based on the results listed in Table 4, the between-groups comparisons were conducted. Those containing only two categories of variables, such as PC ownership and nationality, were examined using independent sample t-tests, whereas those containing more than two categories, such as age and education, were tested using one-way-ANOVA. The t-tests revealed that the difference in the anxiety level of the Taiwanese women before and after the course decreased more than that of the non-Taiwanese women (t = 1.981, $p < 0.05$). As for PC ownership, there were significant differences in anxiety (t = 2.107, $p < 0.05$) after the course. Those who owned a computer showed a greater reduction in their level of anxiety (t = 2.523, $p < 0.05$) than those who did not. In addition, their perceptions of usefulness (t = 2.597, $p < 0.05$) also decreased less than those who did not own a computer.

The results of one-way ANOVA indicate that age and perception of usefulness after the course had a significant difference ($F(3,171) = 3.665$, $p < 0.05$), while for education level and before-class anxiety, differences existed between the groups ($F(3,171) = 3.035$, $p < 0.05$). The post hoc LSD test was adopted to further examine the differences of these significant categories. As
Table 5 discloses, the anxiety of the elementary school and below group was higher than that of the senior high school ($p < 0.05$) and junior college and above groups ($p < 0.01$) before the course. Table 6 indicates that after the course the younger than 40 group had more positive perceptions of usefulness than the 50-59-year-old group ($p < 0.05$), and was also more positive than the over 59-year-old group ($p < 0.01$), while the 40-49 group was more positive than the over 59-year-old group ($p < 0.05$).

Table 5. Post Hoc LSD test for differences between education groups on anxiety before the training

Dependent Variable	(I) Education	(J) Education	MD (I-J)	Std. Error	*p*-value
Anxiety (before training)	Elementary school and below	Junior high school	-0.424	0.239	0.078
		Senior high school	-0.445	0.211	0.037*
		Junior college and above	-0.700	0.235	0.003**
	Junior high school	Senior high school	-0.021	0.154	0.892
		Junior college and above	-0.275	0.185	0.138
	Senior high school	Junior college and above	-0.254	0.147	0.086

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 6. Post Hoc LSD test for differences between age groups on usefulness after the training

Dependent Variable	(I) Age	(J) Age	MD (I-J)	Std. Error	*p*-value
Usefulness (after training)	<40	40-49	0.181	0.156	0.246
		50-59	0.383	0.162	0.019*
		>59	0.516	0.185	0.006**
	40-49	50-59	0.202	0.113	0.075
		>59	0.334	0.144	0.021*
	50-59	>59	0.132	0.151	0.381

Notes: *p<0.05, **p<0.01, ***p<0.001

As mentioned in Table 4, there were no obvious differences between women who were working and those who were not. Before training there were also no significant differences between age and computer attitudes. Table 6**,** however, reveals that their attitude of usefulness changed after the training. The younger women obviously had higher perceived usefulness than the older ones. The problems that the older women mentioned in the interviews were physiological degeneration and the difficulty of Chinese input. Both 66 year-old W7 and 59 year-old W6 mentioned that they gave up learning because of their bad eyesight. W7 and 54 year-old W8 met the difficulties of Chinese input. TA5 had noticed that older women tended not to be good at either Chinese or English input skills. “Typing is really slow for me, and I need glasses to look at the monitor, so I don’t use it anymore” said W7. However, W9 (34 years old) thought it was really helpful for her as she now knows how to use Internet albums and blogs.

Anxiety was found to be related to women’s education level. Before the training, the elementary school and below group’s anxiety was higher than that of the senior high school and above groups. After the training, anxiety decreased for all levels and there were no big differences between them. Consistently, W5, who had an elementary school level of education, stated in the interview, "I didn't study much during my childhood, but I feel happy I can still learn something." Another fact that influences women's anxiety is nationality, which showed no significant differences before training, but after training, the Taiwanese women's anxiety reduced more significantly than that of the non-Taiwanese women. It is possible that as the course was designed for Taiwanese learners, the non-Taiwanese learners did not benefit as much in the aspect of reducing anxious feelings. In addition, the cultural and language differences might have also accounted for a portion of the difficulty. For example, the phonetic input method, a commonly used method, was used to type Chinese characters in the course, whereas the learners from Mainland China were only familiar with the spelling system to input characters. In the computer communication lesson, MSN was used to teach the learners instant communication skills, but learners from China were more accustomed to using QQ. "They wanted to use QQ rather than MSN, and there's a problem to teach them data input" said TA1.

PC ownership influenced the women's anxiety levels and their feelings of usefulness. There were no differences before the training between those who had a computer and those who did not. However, the feelings of anxiety and usefulness of the women without computers were obviously lower than for those who owned a computer after the training. Four of the TAs said in the interview that they noticed that the PC owner group would practice at home and would ask their family if they had problems. For example, TA3 confirmed that some of the women she taught would ask their children if they forgot something. The TAs felt that the handouts could help the learners because they could take notes so they could practice at home by themselves. Several women (e.g., W13, W14, and W15) reportedly practiced at home using their handouts if they did not have sufficient time in class to do it. However, for those who did not have a computer at home, TA10 commented, "They would keep asking about the problem again and again" in class.

Based on the classroom observations, there was only limited interaction between the women. However, they gave feedback that they received a great deal of help from their TAs, such as, "The TA's help was really useful" and "We didn't feel pressure because the TA was friendly." In the training, one TA was provided for every six or so women, but it is hoped that this ratio could be improved, so that the TAs could help fix any problems immediately. "Even though the TA was nice, it would be better if two students shared one TA" said W18. The TAs reportedly also felt that they learned a great deal from the tutoring experiences, particularly in the aspect of increasing their patience. "I should be very patient because they often asked me the same question again and again. I had to help them review and practice many times. I became very patient and now have more interaction with my own family. In the past, my mom would ask me questions sometimes, but I didn't help her. After this program, I have a better relationship with my mom and she also thinks it is good for me." This shows the effect of Intergenerational Learning, as it provides a chance to let younger people help older people to learn about computers and to learn and grow together.

CONCLUSION AND SUGGESTIONS

Based on the study findings, we found that the women's computer attitudes were influenced by their computer training, including reducing anxiety and their perceptions of usefulness, and increasing liking. In the discussion of changing women's computer attitudes, some researchers (e.g., Hilbert, 2011; Nakatani & Miyamoto, 2006) argue that working women have better attitudes, but this was not supported in the current study. The factors that influenced the attitudes of our participants were age, education level, nationality, and PC ownership. Before the training, only lower education level women had higher anxiety. Most of the influences took effect after the computer training. After the training, younger women and those who owned a computer increased their perceptions of usefulness of computers; non-Taiwanese women increased their anxiety, while women who owned computers reduced their anxiety. This indicates that the experience of learning about computers can influence women's computer attitudes in various ways. Therefore, we should include computer learning experience as a factor in the future research, and focus on the needs of different groups of women. To decrease their learning difficulties, the following suggestions are provided.

1. Wong, Chai and Gao (2011) pointed out that non-alphabetic languages such as Chinese are more complicated to key in, including switching modes and phonetic vs. character selection, etc. The results of this study reveal that older women and women with lower education levels tend not to be good at phonetics and Chinese data input, so these became their biggest challenges and they needed extra help. For those who have difficulties in data input, using different types of input approaches is suggested, such as writing characters directly on a writing pad or keying in the phonetics of the desired characters.
2. Older women also need to be aware of the problem of physiological degeneration, especially the inconvenience caused by bad eyesight. For these women, it is suggested that TAs could assist individual learners according to their various needs. For example, accessibility settings introduced by Jacko (2005) such as magnifiers, text-to-speech utilities, on-screen keyboards and high contrast, could be employed.

3. Programs that are designed for immigrant societies should adjust their design based on different cultural requirements, as pointed out by Veith, Schubert and Wulf (2007). In this research, the foreign brides' anxiety was higher than that of the Taiwanese women. It is suggested that the program needs to be designed based on their culture and language to teach them how to set up a multilingual environment with familiar data input and software. For example, Chinese women are familiar with using Hanyu Pinyin (spelling) data input and QQ to communicate with their friends and family, so this should be taken into consideration in the design of the program.
4. Women who do not own their own computer do not have many chances to practice after class, so they have less access to a computer. It is suggested that after-class practice time be provided on a regular basis to increase their chances to practice. In addition, Selwyn (2003) suggested that governments or NGOs provide more public computers to give the public more chances to use them.
5. Mayhorn, Stronge, McLaughlin and Rogers (2004) argue that step-by-step teaching could reduce older adults' learning load. Consistent with the findings reported by Shieh et al. (2011), this study also found that the use of screen snapshots and step-by-step methods in the design of the teaching materials was helpful to the learners because they could review at home by themselves and could more easily recall what they had learned in class. It is suggested that future programs adopt similar approaches to the design of the training course materials for adult learners.

In addition to improving the adults' computer skills, it appears that the teaching assistants also gained opportunities to learn from the adult members, which echoes the assertions about Intergenerational Learning (Poynton, 2005). In other words, while the participating women improved their computer skills, the TAs also grew via interaction with the women. This is an example of mutual learning that was not expected at the beginning of the program, and so was not investigated in the current study. It is suggested that future research can study this overlooked aspect to further understand the value of Intergenerational Learning occurring between adult learners and young tutors in a training program.

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FACULTY' TECHNOLOGY BARRIERS FACED WITHIN THE FRAMEWORK OF QUALITY PROCESSES: SAU SAMPLE

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ABSTRACT
This research was carried out to determine technology barriers faced by the instructors within the framework of quality processes conducted at the University of Sakarya.Therefore, technology barriers encountered in the process of teaching while using web sites developed in order to manage quality operations from a single center were examined within the framework of quality processes. According to the research results, the perceptions of barriers of the instructors did not differ too much according to sex, according to the availability of computer training and according to computer and internet experience.
Keywords: Quality management, Technology, barrier, teaching staff

INTRODUCTION
Total Quality Management at the University of Sakarya started in 2003, and Sakarya University Academic Evaluation and Quality Improvement Committee consisting of the Rector of the university, Deans, college Principals was established in order to organize the quality processes (http://www.saudek. sakarya.edu.tr/index.php?page=gnl&cpage=satoka). Within the framework of quality processes, a quality delegate was assigned for each unit and processes were carried out by these quality delegates on behalf of the units. EFQM model applications began in 2003 started within the context of total quality management practices and as a result of the independent external evaluation in 2006 the university was awarded with the Excellence Award as a public institution for the first time. The mission and vision of the university was determined as the first step of the studies of Quality and principles that university employees must comply with were gradually defined in the light of: quality, education and research, human resources, environment and promotion policies. (http://www.saudek.sakarya.edu.tr/index.php?page= gnl&cpage=mivite)

Quality process of Sakarya University has started with Bologna Process. The progress of the so-called Bologna Process, the European-wide project aimed at creating a European Higher Education Area and harmonizing European degree structures, is being followed with concern by the European academic community, from students to administrators (Ahola & Mesikammen, 2003).Twenty nine ministers responsible for higher education signed the Bologna declaration denoting the actual start of the so-called Bologna Process. With this document the ministers agreed on establishing an EHEA by 2010 (Heinze&Knill, 2008).In texts on this issue, there are ideas of comparability,mobility, transparency, flexibility, shared European values and diversity put forward as means of creating a European educational space (Fejes, 2007).

The Bologna Declaration laid out policies and joint measures for establishing the EHEA. It included a schedule for achieving the joint objectives thus agreed upon, and a commitment by the Ministers of the countries involved to meet every other year for discussing and assessing progress. The pursuit of the joint policies and measures is commonly referred to as the Bologna process (Neave & Maessen, 2007). Especially Sakarya University in Turkey is one of the leader universities that try to apply Bologna Process decisions. Therefore Sakarya University uses technology in quality process.

Three different internet sites were established to carry out total quality studies from a single center and in order to conduct activities online and the board of university, unit directors, lecturers and administrative staff were enabled to display their field related statistical information and academic activities on these sites.The first of these systems is SAUDEK system. Prioritizing the teaching qualifications, departmental, faculty and university qualifications were established through SAUDEK system which stands for Sakarya University Academic Evaluation and Quality Improvement Committee Education Information System (EOBs) is the system through which academicians carry out applications related to their courses and lecture notes. The objective of Education Support System (EODS) is to develop educational activities carried out at the university and to increase the effectiveness of students' learning processes

Within the scope of the quality improvement movement, it was aimed at providing the instructors with the golden opportunity of utilizing the three aforementioned websites to conduct their educational, instructional & academic studies online, to share their lecture notes with their students, to organize their syllabi with the help of the websites, and to maintain an instant contact with students. To that end, some informative meetings were held for the instructors, and throughout the process, departmental quality delegates did not withhold their assistance from other instructors in the use of the system.

The primary objective of the quality improvement process is not only to encourage the instructors to use these websites but also to transform instructional platforms into those in which students maintain an active participation by benefiting from technology. Roblyer & Edwards (2000) mention five motives behind the utilization of technology for educational purposes:

- Increased student motivation
- Unique instructional capabilities
- Increased teacher efficiency
- Enhanced student information age skills
- Support for constructivist approaches

In addition to educational processes, the use of technology accelerates administrative ones too; and renders centralization possible. New technologies are in a race against time has culminated in the evolution of certain issues such as all of the existing learning-instruction theories, instruction methods, environmental design in parallel to the technology (İşman & İşbulan, 2010). Learning technologies offer a wide range of options to enhance the communication and interaction between teachers and students in universities. ICT can be used to realize innovative educational concepts and teaching and learning scenarios (Schneckenberg, 2009). Within the context of the prevailing quality improvement movement at Sakarya University, sights were set on providing students with ease of access to lecture notes, and permitting both instructors and students to have an active role in the administrative process; with this objective in mind, the systems of EOBS, SAUDEK and EODS have been developed. İşman (2011) states that to motivate students in the instruction process, all factors must be determined well. The primary goal of EOBS and EODS are to define the processes well and to maintain students' active participation in them. Through these two websites, the students are able to be informed from the very the beginning of the semester about the contents of their courses, evaluation policy & grading system, lecture notes, attainments of a course and their relation to the departmental attainments.

After a study carried out on a group of executive candidates; İşman, Gündüz and Canan (2008) drew a conclusion that teachers do not have enough time for the integration of technology, and they are devoid of both technological and administrative assistance in that integration process. Furthermore, according to the same research, it's obvious that technology stands as an important source of anxiety for students. What's more, the authors specify that the perception of technology as a barrier considerably varies according to gender, the state of owing a computer or not, and of receiving training on computers.

İşman and Canan (2008), with their research on teachers and their perception of technology as a barrier, conclude that the financial support for the integration of technology is not sufficient; there are not enough computer labs, the lecturers do not have a good knowledge of technology, and they are not concerned with the integration of it. Moreover, they claim that the teacher candidates' perception of technology varies according to their gender, the state of having a computer and receiving computer training or not.
Pagnucci (1998) in his research identified barriers to technology as follows: lack of technology, fear of technology, cost, lack of software, illiteracy of technology.

PURPOSE
The purpose of this study is to identify technology barriers faced by the instructors within the framework of the quality implementations.However, after determining the technology barriers faced by the instructors, it was aimed to determine whether the barriers the instructors encountereddifferedaccording to:

- gender,
- receiving computer training,
- academic titles,
- experience of computer use,
- experience of Internet use

DATA COLLECTION TOOL
The data collection tools which were used by İşman, Gündüz & Canan (2008) and İşman & Canan (2008) in order to collect the research data, were adapted into quality processes after having obtained permission from the researchers. The data collection tool used in the research consisted of 6 questions defining demographic

characteristics and processes, 28 questions measuring tool identifying barriers faced by instructors within the framework of quality processes.

A data collection tool was distributed to the instructors by hand and the ones who were willing to contribute were given 3 days for submission. The 136 questionnaires that were returned from the faculty members at the end of the data collection process were used as the source of the data in research.

FINDINGS

Table 1. Demographic characteristics of participating teaching staff

		Frequency	Percent
Gender	Male	85	62.5
	Female	51	37.5
Computertraining	Yes	83	61.0
	No	47	34.6
Position	Prof.Dr.	12	8.8
	Assoc.Prof.Dr.	15	11.0
	Assist.Prof.Dr.	43	31.6
	Lecturer	11	8.1
	RA / TA	55	40.4
Faculty	Faculty of Education	34	25.0
	Faculty of Science	23	16.9
	Faculty of Fine Arts	7	5.1
	Faculty of Medicine	9	6.6
	Law School	3	2.2
	Faculty of Engineering	18	13.2
	Faculty of Theology	1	0.7
	Faculty of Economics and Administrative Sciences	11	8.1
	Faculty of Technology	3	2.2
	Faculty of Computer and Information technology	5	3.7
	Faculty of Business Administration	17	12.5
	School of Physical Education and Sports	3	2.2

Demographic characteristics of instructors participating in the survey are summarized in Table 1. According to the research results of the instructors participating in the survey, 62.5% were male and 37.5%. were female, 61% of the instructors who participated in the research had computer training while 34.6 % did not have computer training.The distribution of titles revealed that, of the instructors participating in the study, 8.8%, were professors, 11% were associate professors, 31.6% were assistant professors, 8.1% were instructors and 40.4% were research assistants.The distribution of the instructors who participated in the research were employed in the faculties as follows. Faculty of education: 25%, faculty of arts and science: 16.9%, faculty of engineering: 13.2%, faculty of economics and administrative sciences: 12.5%.

Table 2. Statistical information about the lecturers' experience of using computers and the Internet

	Experience of using computer	Experience of using the internet
Mean	15.59	12.41
Median	15.00	12.00
Std. Deviation	4.547	3.078
Minimum	6	5
Maximum	28	20

According to table 2, faculty members participating in the survey are summarized in descriptive statistics about their experience in using computers and the internet. Table 2 shows that faculty members participating in the survey have an average of 15.59 years of experience of computer use and 12.41 years of experience of internet use. In addition, when looking at the experience of using the computer at extreme values, the least experienced computer user had 6 years of experience while the most experienced one had 28 years of experience and the least experienced internet user had 5 years of experience while the most experienced one had 20 years.

Table 3. Responses to the items of the questionnaire according to the t-test results of gender

	Gender	N	Mean	t	df	Sig. (2-tailed)
Quality processes do not have sufficient evidence that the use of technology will improve learning	Male	83	2.77	2.458	130	0.015
	Female	49	2.37			
I received support from the other instructors in the use of i internet site competences are uploaded to.	Male	83	2.58	-2.963	131	0.004
	Female	50	3.1			
I received support from the quality delegates in the use of t internet site competences are uploaded to.	Male	83	2.98	-2.47	131	0.015
	Female	50	3.44			

The T-test was administered in order to determine whether or not the lecturer responses given to the questionnaire revealed any difference according to gender. According to t -test results, the responses of the instructors differed in only three items according to gender. According to the results, male participants agreed more than female participants with the item stating that there is not enough evidence proving that the use of technology in quality processes will enhance learning (t(130)=2,458,p=0.015). Female participants stated that they received more support from other faculty members than male participants in transferring competences to the internet. (t(131)=-2,963,p=0.004). Similarly, the female participants reported that they received more support from the quality delegates than male participants in uploading competences to the internet (t(131)=-2,47,p=0.015).

Table 4. Responses to the questionnaire items according to the t-test results of receiving computer training.

	training	N	Mean	T	df	Sig. (2-tailed)
Technology education is inadequate within the framework of quality processes	Yes	82	3.5	2.542	126	0.012
	No	46	3.02			
I received support from the faculty management in the use of internet site competences are uploaded to.	Yes	82	2.72	2.244	127	0.027
	No	47	2.32			
I received support from the university management in the use of the internet site competences are uploaded to/	Yes	82	2.77	2.151	127	0.033
	No	47	2.38			
I received support from the quality delegates in the use of the internet site competences are uploaded to.	Yes	82	3.29	2.275	127	0.025
	No	47	2.85			

The T-test was administered in order to determine whether or not the lecturer responses given to the questionnaire revealed any differences according to whether computer training was received or not. According to t -test results, the responses of the instructors differedin only four items according to whether computer training was received or not. T-test results revealed that participants who received computer training found technology education more inadequatethan participants who did not receive computer training within the framework of quality processes (t(126)=2,542,p=0.012). It was witnessed that participants who received computer training. As for the use of the site competences uploaded to the internet, participants who received computer training received more support from the faculty management(t(127)=2,244,p=0.027), university management (t(127)=2,151,p=0.033) and quality delegates (t(127)=2,275,p=0.025) than the participants who did not receive computer training

Table 5. Responses to the items of the questionnaire according to one –way anova Test results of research participants' titles

		Sum of Squares	df	Mean Square	F	Sig.
Instructors within the framework of quality processes lack technology integration	Between Groups	16.860	4	4.215	4.609	0.002
	Within Groups	118.874	130	0.914		
	Total	135.733	134			
Program standarts are not well defined within the quality framework	Between Groups	9.170	4	2.292	2.647	0.036
	Within Groups	111.703	129	0.866		
	Total	120.873	133			
Technology education is inadequate within the framework of quality processes	Between Groups	21.504	4	5.376	5.489	0.000
	Within Groups	124.375	127	0.979		
	Total	145.879	131			
Instructors do not have enough time for technology integration within the framework of quality	Between Groups	18.846	4	4.712	4.170	0.003
	Within Groups	145.751	129	1.130		
	Total	164.597	133			
Instructors do not have enough time to develop technology assisted activities within the framework of quality	Between Groups	9.449	4	2.362	2.718	0.033
	Within Groups	112.103	129	0.869		
	Total	121.552	133			
Quality framework do not give enough time to integrate technology within the aulity framework	Between Groups	8.430	4	2.107	2.629	0.037
	Within Groups	101.813	127	0.802		
	Total	110.242	131			
I have had a hard time while associating the qualifications of the department with the qualifications of the class, on the web site	Between Groups	9.043	4	2.261	3.072	0.019
	Within Groups	94.205	128	0.736		
	Total	103.248	132			

In order to see if the instructors' responses differed according to their title, one way anova test was administered. According to the Anova Test Results, the responses given by the Instructors differed according to their titles, in 7 items.In the analysis of the responses given to "Instructors do not have enough knowledge on how to integrate with the quality processes" which was done according to the instructors' titles, there were significant differences (F(4,130)=4,609,p=0,002). In the post-hoc tests administered after one way anova analysis, it was apparent that the research assistantshad less knowledge about how to integrate technology than assistant professors.Another significant difference was observed in the analysis performed according to Instructors' titles, "The standards for education via technology within the frame of quality was not decided". (F(4,129)=2,647,p=0,036).Post-hoc tests done after one way anova analysis showed no difference between titles.In the analysis of the responses given to "Technology education within the quality frame, is insufficient" which was done according to the Instructors' titles, significant differences were found (F(4,127)=5,489,p=0,000). In the post-hoc tests performed after the one way anova analysis, it was found that more instructors working as research assistants see technology education as insufficient, than the instructors working as professors and assistant professors.In the analysis of the responses given to "Instructors do not have enough time for the integration of technology within the frame of quality" which was done according to the instructors' titles, significant differences were found (F(4,129)=4,170,p=0,003). In the post-hoc tests performed after the one way anova analysis, it was seen that more instructors working as research assistants felt that "instructors do not have as much time for technology integration"than the instructors working as assistant professors.In the analysis of the responses given to "There is not enough financial support to help improve activities supported by technology in the frame of quality" which was done according to the Instructors' titles, significant differences were found(F(4,129)=2,718,p=0,033). Post-hoc tests done after the one way anova analysis showed no difference between titles.In the analysis of the responses given to "Enough time is not given for integrating technology into educational programmes within the quality framework" which was done according to the Instructors' titles, significant differences were found(F(4,127)=2,629,p=0,037). Post-hoc tests done after the one way anova analysis showed no difference between titles. In the analysis of the responses given to "I have had a hard time while associating the qualifications of the department with the qualifications of the class, on the web site" which was done according to the Instructors' titles, significant differences were found(F(4,128)=3,072,p=0,019).In the post-hoc tests performed after the one way anova analysis, it was apparent that the Instructors working as research assistants were having a harder time with associating themselves with the technology than the Instructors working as assistant professors.

Table 6. Responses to the items of the questionnaire according to the t-test results of computer experience

		N	Mean	T	df	Sig. (2-tailed)
Instructors within the framework of quality processes lack of basic information technology	Inexperienced	79	3.52	2.225	128	0.028
	Experienced	51	3.12			
Students do not have enough technology in quality processes	Inexperienced	79	2.96	2.258	129	0.026
	Experienced	52	2.56			
The internet site competences are uploadedtodoes not work	Inexperienced	79	2.73	2.478	129	0.015
	Experienced	52	2.35			

The T-test was administered in order to determine whether or not the lecturer responses given to the questionnaire revealed any differences according to experience of computer use or not. According to the t -test results, the responses of the instructors differed in only three items according to experience of computer use. The T-test results revealed that participants who lacked experience of computer use, stated that they did not have sufficient knowledge of basic information technology within the framework of quality processes (t(128)=2,225,p=0.028). Besides, participants who lacked experience of computer use stated that students did not have sufficient technology within the framework of quality processes (t(129)=2,258,p=0.026). Inexperienced users complained more than experienced users in that the internet site competences uploaded to did not work (t(129)=2,478,p=0.015). Responses given by instructors to the items of the questionnaire revealed no difference according to the t-test results of computer experience

RESULTS

According to research results, the majority of the participants were male. Of the participants 61% of instructors had previously received computer training. The instructors'experiences ofusingcomputers and the Internetis analyzedand the instructorsare reported to have been using computers for an average of15:59 years, the internetfor12:41years. As a result of the statistical analysis on the28 item assessment tool, the t-test analysis revealed significant differences according togender in onlythreeitems. Analysis carried out according to receiving computer training or not, showed significant differences in only 4 items. The One Way Anova analysis conducted according to the titles of instructors indicated significant differences in seven items.

The analysis carried out according to experience of computers, found significant differences in three items, whereas no significant differences were found in items related to experience of the internet. According to the research results, the instructors' perceptions of the barriers did not differ widely according to gender, having received computer training or not, computer experience and experiences of the internet. It is suggested that future research topics related to the perceptions of barriers faced by the teaching staff within the framework of quality processes should obtain the views of instructors explained qualitatively and studies should be conducted by selecting a method of qualitative research.

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INDUSTRY-ORIENTED COMPETENCY REQUIREMENTS FOR MECHATRONICS TECHNOLOGY IN TAIWAN

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ABSTRACT
This study employed a three-phase empirical method to identify competency indicators for mechatronics technology according to industry-oriented criteria. In Phase I, a list of required competencies was compiled using Behavioral Event Interviews (BEI) with three engineers specializing in the field of mechatronics technology. In Phase II, the Delphi technique was performed with ten experts in mechatronics, followed by the K-S (Kolmogorov-Smirnov) one-sample test to evaluate the consistency of opinions amongst respondents. In Phase III, these competencies were quantitatively verified by 62 learners studying mechatronics technology, and a nonparametric Mann-Whitney U-test was then performed. As a result, we developed a list of 36 competencies in 9 domains. Our research findings reveal the practical competencies required for mechatronics technology according to industry-oriented criteria.
Keywords: Competency analysis, Mechatronics, Delphi technique

INTRODUCTION
The shift toward globalization and a knowledge-based economy as well as rapid changes in the labor market now mean that hard work can no longer guarantee employment for young people. Students require a quality education to meet the competency demands of the workplace, and technological education is considered effective only if it meets the requirements of the industry in which they seek employment (Yildirim and Simsek, 2001). Technological training should be directed toward the development of key competencies and problem-solving abilities (Yeh *et al.*, 2010). Industry-oriented competency refers to the ability to obtain and keep a job; therefore, the priority of education should be the development of industry-oriented competency (Kuo *et al.*, 2011).

Mechatronics sequences integrate the fundamental elements of mechanical, electrical, engineering, and information systems, to form a powerful, adaptable, interdisciplinary approach to solving practical problems. A broad-based approach to learning involving student-built projects can encourage creativity and enthusiasm for the subject (Siegwart *et al.*, 1998; James, 2004).

Engineers specializing in mechatronics are expected to adapt quickly to trends in technology and the market, and to apply an integrated approach to the development of products and processes. Mechatronics engineers must be able to work effectively in an industrial environment, apply advanced technological skills according to the principles of mechatronics, and coordinate their actions with team members to facilitate concurrent engineering (Gupta *et al.*, 2003). The curriculum employed in educational programs for mechatronics engineering should cover the core technologies and multi-disciplinary background required by future engineers (Geddam, 2003). Industry has repeatedly requested that educational institutions broaden the scope of undergraduate engineering courses (Witt *et al.*, 2006).

Mechatronics is an integrated multidisciplinary approach to product design and therefore differs fundamentally from classical single-discipline engineering programs (Acar, 1997; Alex, 2006). Mechatronics is poised to become the key enabling technology for enhancing competitiveness in the modern era, making it indispensable to the continued competitiveness of national economies.

The teaching objectives of courses in mechatronics should be to enhance student competency, while preparing students for active employment through the interrelated tasks of operating action, taking action, taking continuous action, and stimulating action (McGee *et al.*, 2009). In this manner, graduates would have the skills required to propose innovative ideas as well as to put them into practice (Spencer and Spencer, 1993; Heinonen and Poikkijoki, 2006).

We reviewed a number of previous studies in which competence was considered an external behavior, comprising knowledge, skills, and attitudes (Stout and Smith, 1986; Stasz, 2000; Chen and Chen, 2005; Chen, 2010). Rychen and Salganik (2003) specified that competency is a psychosocial prerequisite (including both cognitive and non-cognitive aspects) required to perform in a particular context. Klein et al. (2004) focused on job tasks and the development of abilities required of an individual to fulfill the duties of a given occupation to the standards expected by the employer. Displays of competence can be diverse and multi-faceted; a number of competencies are considered innate, while others are acquired through learning. Competencies are the behavioral characteristics (both observable and non-observable) required for the successful performance of a given task.

This study sought to identify the practical competencies required by individuals studying mechatronics technology and confirm the structural features of these competencies using empirical data. We began with a review of the literature and behavioral event interviews (BEI). The feasibility and accuracy of the proposed competency requirements were analyzed using the Delphi technique. Descriptive analysis was adopted to obtain mean, standard deviation, and Z-values for the K-S (Kolmogorov-Smirnov) one-sample test (Wen and Shih, 208) and the nonparametric Mann-Whitney U-test. Scholars in engineering education and experts in mechatronics technology were also engaged to assess the fitness of the competency requirements (Chou *et al.*, 2010). These results could be used by educational institutions for the development of training regimes and testing standards.

COMPETENCY ANALYSIS

The concept of competency was first proposed by McClelland in 1973, and since that time, the term has been widely interpreted. According to Lysaght and Altschuld (2000), competency is the external behavior of an individual according to his/her knowledge, skills, and attitude. As such, competency is reflected in one's values, attitudes, and judgment. Weinert (1999) considered performance competency to be the knowledge, sentiment, and skills required to undertake and complete a task. Competencies can be categorized into general and professional.

Analysis of competency involves the identification of the behaviors required by professionals to perform job-related tasks. These behaviors include motives, characteristics, and skills; or knowledge of the fundamental characteristics. Specifically, competency refers to the ability of employees to work effectively and perform the role they have been assigned (Shang, 2000). Thus, competency is more than an aggregation of knowledge, skills, and attitudes, but also a dynamic concept of putting theory into practice.

Competency refers to the ability to achieve an outcome in a specific situation (Chao *et al.*, 2003). To meet the industrial requirements for mechatronics technology, competencies must be examined to ensure the validity of the items and standards used in the measurement of competency. The curriculum should be implemented according to industry requirements, and the process of analyzing competency should determine whether students have attained the required standards. The main purpose of analyzing competency is to verify whether an individual possess the knowledge, attitudes, and skills required in the workplace (Heitmann *et al.*, 2003; Rebolj *et al.*, 2008).

McClelland (1973) suggested the term competency as a criterion for judging the success of performance. Competency frameworks have been applied in various settings, including the assessment of managers, as training and recruitment tools (Rifkin *et al.*, 1999; Foxon *et al.*, 2003), and for educational professionals recruiting and developing staff as well as designing curriculum (Russ-Eft *et al.*, 2008; Ball, *et al.*, 2012). So (2006) characterized these as attempts to define the human resource needs of a knowledge-based, capitalist society and subsequent researches have published papers dealing with competency levels (Dinçer and Sahinkayas, 2011; Zorba, 2011).

BEHAVIORAL EVENT INTERVIEW (BEI)

Several methods have been developed for defining and developing competency. The most commonly applied of these is the Behavioral Event Interview (BEI), which provides definitions of related competencies by comparing the performance of outstanding experts with that of ordinary individuals. McClelland (1998) explained that BEI is an adaptation of the critical-incident interview used to note differences between outstanding and typical performance. Competencies are defined through structured interviews in which highly successful and typical performers describe what they did, said, and thought. This is followed by content analysis to compare the statements and identify the critical competencies within the setting being investigated. The collection of empirical data and the analysis of systematic content are considered the main advantages of BEI (Hong and Jung, 2011).

Several alternatives to the BEI method have been proposed. Gregory (2008) conducted interviews on the subject of competency with highly regarded communicators to identify the competencies associated with practitioners in public relations. In the context of education, Marrelli (1998) and Marrelli *et al.* (2005) suggested applying BEI only to superior performers. This approach appears to be a useful means of identifying the competencies required in formal education where goals are usually predetermined, specific, and subject to assessment and evaluation.

METHODOLOGY

This study employed a three-phase method for the collection and analysis of data. Phase I involved the application of BEI to define competencies associated with the tasks of three engineers involved in mechatronics. Phase II employed involved the Delphi technique on ten experts to examine the consistency of the BEI findings. Phase III involved quantitatively verifying the results of Phases I and II with a group of individuals currently mechatronics learners.

There were two primary reasons for adopting this method. First, BEI was seen as the best way to identify the competencies of field engineers required for the initial investigation. Second, we believed that the best way to ensure that the results were valid and generalized was to have the data from Phases 1 and 3 verified by a group of students actively engaged in learning mechatronics technology (Gayeski *et al.*, 2007).

Delphi technique

The Delphi technique is widely used for gathering data from respondents within a specific domain of expertise. This approach is a process of group communication meant to achieve a convergence of opinion regarding a specific real-world issue. The Delphi process has been used in various fields of study, including program planning, needs assessment, policy determination, and resource utilization to develop a comprehensive range of alternatives, explore or expose underlying assumptions, and correlate judgments in many disciplines. The Delphi technique is well suited to consensus building through its use of a series of questionnaires delivered through multiple iterations to collect data from a panel of selected subjects. Any staff member who assigns a rank deviating by 10 or more points from the corresponding first Delphi median rank is requested to state the rationale for the dissenting opinion in the space provided (Dalkey and Helmer, 1951). The number of subjects used to perform the Delphi technique should be kept to a minimum as determined by a representative pooling of judgments and the information processing capability of the research team. However, previous studies provide no consensus as to the optimal number of subjects. Researchers have suggested that 10-15 subjects could be sufficient if the background of the subjects is homogeneous. Nonetheless, results should be verified through follow-up investigation. Delbecq et al. (1975) suggested that 10-15 subjects could be sufficient if the background of the subjects is homogeneous.

The Delphi technique avoids many characteristics of traditional decision-making processes, in which participants discuss issues face to face in order to reach an agreement. By filling out questionnaires individually, experts have a sense of full participation and remain free from interruption (Rowe *et al.*, 1991). Thus, this study recruited ten participants, included six experts in the mechatronics industry and four professors in a technological university.

Questionnaire design

The questionnaire was designed to collect data regarding competency indicators in nine domains: (1) sensor techniques, (2) electrical machinery control techniques, (3) PLC techniques, (4) pneumatic control techniques, (5) mechatronics techniques, (6) graphical monitoring and control techniques, (7) computer control techniques, (8) remote monitoring and control techniques, and (9) system integration techniques. Thirty-six professional competencies associated with the industrial aspects of the mechatronics technology were identified. Each competency was rated according to its importance in terms of job performance using a Likert scale: 5 for 'very important', 4 for 'more important', 3 for 'somewhat important', 2 for 'less important', and 1 for 'least important'.

Participants

Based on the results of literature review, Kayaoğlu *et al*. (2011) and Aktaş *et al.* (2011) adopted a small sample size to compare two different groups in statistical analysis. Kayaoğlu *et al.* (2011) investigated whether a difference exists between learning vocabulary via animation and via traditional paper-based method. This small scale study was selected as the experimental group (n=17), and control group (n=22). Aktaş *et al.* (2011) investigated that teaching of different pattern types by using computer animations and activities. The sample of this study was 28 eighth grade students.

Three field engineers in mechatronics technology oversaw the BEI in Phase I. The ten participants in the Delphi technique in Phase II included four professors and six field experts with an average of 8 years experience in teaching, research, and the development of mechatronics technology. Four of these had doctoral degrees in educational technology or engineering. The participants in the survey in Phase III included 62 students studying mechatronics technology at a technological university in Taiwan.

Instruments

The content of the BEI in Phase I was verified with regard to content validity. Thirty-six questions were examined using the Delphi technique in Phase II. The content validity of these questions dealt mainly with the thoughts and experiences of experts in teaching and researching mechatronics. The survey instrument used in

Phase III was used to assign an importance rating to each of the 36 competencies related to the instruction of mechatronics and its relationship to their own studies.

Procedure
The three phases of the study were performed between September and November 2011. In Phase I, the three experts were first sent emails explaining the purpose of the study, the nature of the interview process, and the questions they would be asked. Actual face-to-face interviews took an average of one hour per engineer. During these interviews, the interviewees were asked to respond to questions and provide detailed accounts of how they handled critical study situations. The interviews were audio-recorded with the permission of the learners.

In Phase II, emails were first sent out to the ten participates explaining the purpose of the Delphi technique surveys. Surveys were then conducted to determine the competency items for working in the mechatronics industry.

Phase III was a validation survey involving sixty-two individuals studying mechatronics technology. The respondents were volunteers who had learned about the survey primarily from their instructors. Figure 1 illustrates the three-phase process of competency analysis.

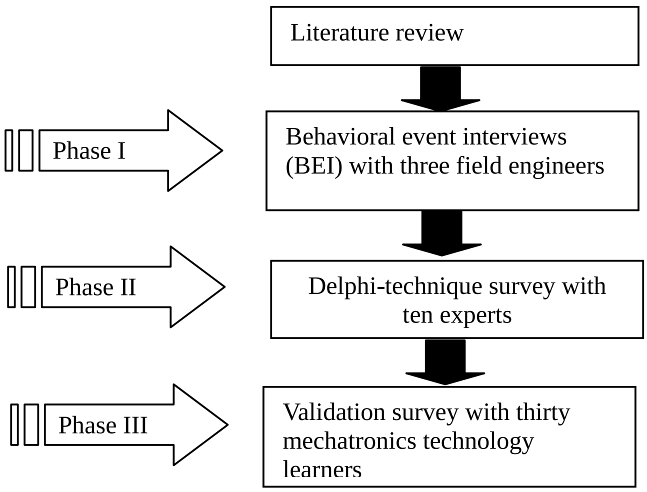

Figure1. Three-phases of the competency analysis process

Data analysis
For data analysis in Phase II, descriptive analysis was adopted for the mean (M), standard deviation (SD), and Z-value of the K-S Test. After the questionnaires were received, correlation analysis was performed to determine relationships between two sets of the second and third rounds of the Delphi technique.

For data analysis in Phase III, since the sample size is small, the non-parametric Mann-Whitney U-test was used to confirm the importance of the 36 competencies in this study (Shyr, 2009).

RESULTS
Results of the Delphi survey of experts are shown in the Table 1. The nine domains for industry-oriented competency requirements for mechatronics technology include the following: sensors, electrical machinery control, programmable logic control, pneumatic control, mechatronics, graphical monitoring and control, computer control, remote monitoring and control, and system integration. For the K-S test, a value equal to 0.05 was considered statistically significant, indicating that participants considered these indicators more important and consistent. Regarding the importance of job performance, the mean score for the 36 working competencies in nine domains of the mechatronics industry was above 4.4, which indicates that the Delphi group considered the competencies listed in the questionnaire to be ”more important” and the items that participants considered important and consistent.

Table 1. Analysis of the consistency in data of the professional competency items for the K-S test

Competencies Indicators	Z-value
1.Sensor Technique	
1-1.Can understand the basic principles of sensors	1.897*

1-2.Can understand the functions and characteristics of sensors	1.897*
1-3.Is familiar with the application of sensors	2.214*
1-4.Possesses the ability to design simple circuits with sensors	1.581*
2.Electrical Machinery Control Technique	
2-1. Can understand the basic principles of electrical machinery	1.897*
2-2. Can understand the characteristics and control of electrical machinery	1.897*
2-3. Is familiar with the application of electrical equipment	1.897*
2-4. Possesses the ability to maintain electrical equipment	1.897*
3.Programmable Logic Control (PLC) Technique	
3-1. Can understand the commands and syntax for PLC	1.897*
3-2. Is familiar with the applications of PLC	2.846*
3-3. Is familiar with the communication methods for PLC	1.581*
3-4. Possesses the ability to debug for PLC	2.530*
4.Pneumatic Control Technique	
4-1. Can understand the basic characteristics and principles of pneumatic components	2.530*
4-2. Is familiar with the selection and placement of pneumatic components	1.897*
4-3. Is familiar with the application of pneumatic control components	1.897*
4-4. Possesses the ability to control pneumatic components	2.214*
5.Mechatronics Technique	
5-1. Can understand the concepts of mechatronics	2.214*
5-2. Is familiar with the operation of mechatronics module	2.530*
5-3. Is familiar with the control technique of mechatronics	2.214*
5-4. Possesses the ability to design mechatronics	2.530*
6.Graphical Monitoring and Control Technique	
6-1. Can understand the concepts of graphical monitoring and control	1.897*
6-2. Is familiar with the use of graphical monitoring software	1.581*
6-3. Is familiar with the planning of graphical monitoring and control	1.897*
6-4. Possesses the ability to integrate graphical monitoring control and peripheral devices	2.846*
7.Computer Control Technique	
7-1. Can understand the use of various computer control techniques	1.897*
7-2. Is familiar with the computer control technique using software	1.897*
7-3. Is familiar with the computer control technique using hardware	1.897*
7-4. Possesses the ability to integrate computer control technique with mechatronics systems	2.530*
8.Remote Monitoring and Control Technique	
8-1. Can understand the concepts of remote monitoring and control	2.214*
8-2. Is familiar with the planning of remote monitoring and control	2.214*
8-3. Is familiar with the operation of remote monitoring and control	1.897*
8-4. Possesses the ability to integrate remote monitoring control with mechatronics equipment	2.530*
9.System Integration Technique	
9-1. Can understand the concepts of system integration	1.897*
9-2. Is familiar with the assembly with automation equipment	2.214*
9-3. Possesses the ability to system integration	2.530*
9-4. Possesses the ability to construct a set mechatronics control system	2.214*

*$p<0.05$

As shown in Table 2, the industry-oriented competencies for mechatronics technology comprise 36 indicators. These include understanding the basic principles of sensors, understanding the functions and characteristics of sensors, familiarity with the application of sensors, the ability to design simple circuits using sensors, understanding the basic principles of electrical machinery, understanding the characteristics and control of electrical machinery, familiarity with the application of electrical equipment, the ability to maintain electrical equipment, understanding the commands and syntax for PLC, familiarity with the applications of PLC, familiarity with the communication methods used in PLC, the ability to debug PLC, understanding the basic characteristics and principles of pneumatic components, familiarity with the selection and placement of pneumatic components, familiarity with the application of pneumatic control components, the ability to control pneumatic components, understanding the concepts of mechatronics, familiarity with the operation of mechatronics modules, familiarity with the control of mechatronics, the ability to design mechatronics, understanding the concepts of graphical monitoring and control, familiarity with the use of graphical monitoring software, familiarity with the planning of graphical monitoring and control, the ability to integrate graphical monitoring control and peripheral devices, understanding how to use various computer control techniques, familiarity with computer software in control techniques, familiarity with the hardware used in computer control techniques, the ability to integrate computer control techniques with mechatronics systems, understanding the concepts of remote monitoring and control, familiarity with the planning of remote monitoring and control, familiarity with the operation of remote monitoring and control, the ability to integrate remote monitoring control with mechatronics equipment, understanding the concepts of system integration, familiarity with the process of assembly using automated equipment, the ability to perform system integration, and the ability to construct a set mechatronics control system.

Further analysis was conducted to confirm whether the ten experts and sixty-two learners differed in the mean ratings regarding the importance of the competencies. The nonparametric Mann-Whitney U-test was used and the results are presented in Table 2. The level of significance α was selected to be 0.05 and the corresponding two-tail critical value was ±1.96. The mean ratings of the experts regarding the importance of the competencies did not significantly differ from those of the learners.

DISCUSSION

This study makes three important contributions. First, the results add to the literature by presenting a set of working competency requirements and their relative importance is based on empirical data. Second, the working competencies identified in this study can contribute to the development and improvement of learner support programs. Third, the findings improve the methodology of determining competency by piloting a three-phase method involving both qualitative and quantitative approaches.

The findings indicate the kinds of industry-oriented competencies as well as intrinsic and extrinsic motivations required by institutions to promote the efficient learning of mechatronics. As indicated in other studies (Simpson, 2003; Johnson and Onwuegbuzie, 2004), comprehensive, ongoing learner support systems are required to help students in their studies. We demonstrate the value of the three-phase method as a systematic and reliable methodology for identifying working competencies associated with mechatronics technology. Various methods were applied individually and in combination to identify and validate the competencies of various professionals (Lucia and Lepsinger, 1999; Simpson, 2003; Klein *et al.*, 2004). The proposed three-phased method integrates three carefully selected methods – a behavioral event interview, the Delphi technique, and a validation survey using the synergetic method. These competencies were then clarified, elaborated on, validated, and classified by experts in the field and experienced researchers. Finally, the defined competencies were validated by surveying a group of mechatronics technology learners to finalize the competency list.

It is worth noting that the selection of Taiwan participants who are well-versed in mechatronics technology use and accustomed to instructor-led classes may limit the generalized ability of our findings.

CONCLUSIONS

The industry-oriented competency indicators for mechatronics technology cover nine domains, including the following: sensors, electrical machinery control, programmable logic control, pneumatic control, mechatronics, graphical monitoring and control, computer control, remote monitoring and control, and system integration. These provide a reference for the planning and revision of core courses at the university level. Future studies may include task analysis to determine the expertise, knowledge, and types of assignments required for each competence, as a reference for the development of instructional materials.

Table 2: The results of Mann-Whitney U-test

Competencies Indicators	Experts (n = 10)		Learners (n=62)		U-test (p value)
	M	SD	M	SD	
1.Sensor Technique					
1-1.Can understand the basic principles of sensors	4.60	0.516	4.71	0.458	-0.694(0.488)
1-2.Can understand the functions and characteristics of sensors	4.60	0.516	4.74	0.441	-0.923(0.356)
1-3.Is familiar with the application of sensors	4.70	0.483	4.69	0.465	-0.041(0.967)
1-4.Possesses the ability to design simple circuits with sensors	4.40	0.699	4.65	0.482	-1.083(0.279)
2.Electrical Machinery Control Technique					
2-1. Can understand the basic principles of electrical machinery	4.60	0.516	4.73	0.450	-0.807(0.420)
2-2. Can understand the characteristics and control of electrical machinery	4.60	0.516	4.60	0.495	-0.019(0.985)

2-3. Is familiar with the application of electrical equipment	4.60	0.516	4.65	0.482	-0.274(0.784)
2-4. Possesses the ability to maintain electrical equipment	4.40	0.516	4.60	0.495	-1.158(0.247)
3.Programmable Logic Control (PLC) Technique					
3-1. Can understand the commands and syntax for PLC	4.60	0.516	4.71	0.458	-0.694(0.488)
3-2. Is familiar with the applications of PLC	4.90	0.316	4.66	0.477	-1.510(0.131)
3-3. Is familiar with the communication methods for PLC	4.50	0.527	4.56	0.500	-0.378(0.705)
3-4. Possesses the ability to debug for PLC	4.80	0.422	4.50	0.536	-1.675(0.094)
4.Pneumatic Control Technique					
4-1. Can understand the basic characteristics and principles of pneumatic components	4.80	0.422	4.61	0.491	-1.135(0.256)
4-2. Is familiar with the selection and placement of pneumatic components	4.60	0.516	4.52	0.620	-0.262(0.793)
4-3. Is familiar with the application of pneumatic control components	4.60	0.516	4.45	0.619	-0.627(0.531)
4-4. Possesses the ability to control pneumatic components	4.70	0.483	4.42	0.615	-1.342(0.180)
5.Mechatronics Technique					
5-1. Can understand the concepts of mechatronics	4.70	0.483	4.58	0.497	-0.709(0.478)
5-2. Is familiar with the operation of mechatronics module	4.80	0.422	4.66	0.477	-0.867(0.386)
5-3. Is familiar with the control technique of mechatronics	4.70	0.483	4.65	0.482	-0.336(0.737)
5-4. Possesses the ability to design mechatronics	4.80	0.422	4.61	0.610	-0.849(0.396)
6.Graphical Monitoring and Control Technique					
6-1. Can understand the concepts of graphical monitoring and control	4.50	0.707	4.66	0.477	-0.580(0.562)
6-2. Is familiar with the use of graphical monitoring software	4.50	0.527	4.74	0.441	-1.551(0.121)
6-3. Is familiar with the planning of graphical monitoring and control	4.40	0.516	4.61	0.554	-1.339(0.181)
6-4. Possesses the ability to integrate graphical monitoring control and peripheral devices	4.90	0.316	4.61	0.491	-1.757(0.079)
7.Computer Control Technique					
7-1. Can understand the use of various computer control techniques	4.60	0.516	4.68	0.471	-0.479(0.632)
7-2. Is familiar with the computer control technique using software	4.60	0.516	4.55	0.502	-0.303(0.762)
7-3. Is familiar with the computer control technique using hardware	4.60	0.516	4.61	0.554	-0.194(0.846)
7-4. Possesses the ability to integrate computer control technique with mechatronics systems	4.80	0.422	4.61	0.491	-1.135(0.256)
8.Remote Monitoring and Control Technique					
8-1. Can understand the concepts of remote monitoring and control	4.70	0.483	4.53	0.503	-0.984(0.325)
8-2. Is familiar with the planning of remote monitoring and control	4.70	0.483	4.58	0.497	-0.709(0.478)
8-3. Is familiar with the operation of remote monitoring and control	4.60	0.516	4.56	0.500	-0.209(0.835)
8-4. Possesses the ability to integrate remote monitoring control with mechatronics equipment	4.80	0.422	4.65	0.482	-0.957(0.338)
9.System Integration Technique					
9-1. Can understand the concepts of system integration	4.60	0.516	4.61	0.491	-0.077(0.939)
9-2. Is familiar with the assembly with automation equipment	4.70	0.483	4.60	0.495	-0.617(0.537)
9-3. Possesses the ability to system integration	4.80	0.422	4.58	0.560	-1.166(0.244)
9-4. Possesses the ability to construct a set mechatronics control system	4.70	0.483	4.45	0.563	-1.301(0.193)

The competencies identified in this study could serve as a basis for the integration of teaching activities in mechatronics technology education dealing with professional subjects or extracurricular activities, school competitions, and the development of skill tests.

Our analysis determined that the consensus-building process of the three-phased method progressed as anticipated and that it was successful in identifying and validating the technological competency items demanded by the mechatronics technology industry. Data analysis revealed a decrease in the standard deviation and an increase in the mean, both of which are indicative of an increase in consensus. In short, the results of this study include: (1) analysis of the competencies required for students in mechatronics technology according to industry-oriented criteria, and (2) the development of working competency indicators for students to enhance the competencies in the application of mechatronics technology.

There remains a need for further research using a larger sample size to validate and generalize the results, as recommended by Johnson and Onwuegbuzie (2004). Standardized methods of measuring the effectiveness of the instructional activities must be designed and implemented. The optimal uses of assessment data to improve programs in mechatronics technology education and assist students in developing competence remain to be identified. Further study with learners with different technology proficiencies and different learning experiences is needed. The three-phased empirical method adopted in this study is found to be a useful method, which can be applied to develop and elaborate competencies in a wide variety of educational and training contexts.

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INTEGRATING BLOG AND FACE-TO-FACE INSTRUCTION INTO AN ESP COURSE: ENGLISH FOR HOSPITALITY AND TOURISM

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ABSTRACT
With the rapid growth of international trade and globalization, English language has been emphasized in Asia countries, thus professionals with a good command of English has become essential and important. This study aimed to establish a blended model combining face-to-face (F2F) instruction for English for Specific Purposes (ESP) course: English for Hospitality and Tourism. The research method was a combination of qualitative and quantitative approaches, including peer and instructor feedback, interviews, and the learning satisfaction survey. A total of 44 English- majored sophomore students participated in the study. The results of the study reveal that this model could contribute to learning effectiveness and satisfaction of an ESP course when the course is well planned, the equipment is sufficient and supportive as well as students are familiar with related applications. Most importantly, peer and the instructor's feedback and the characteristics of the blog, including free access, ease of revision, and interesting material, were major factors that motivated students to learn effectively and enhanced their satisfaction with the course.
Keywords: blended learning, blog, English for Specific Purposes (ESP), English for Hospitality and Tourism

INTRODUCTION

Several years ago, the Taiwan government has realized the current and future importance of "e-learning" and introduced a number of initiatives for promoting the development and uptake of this important approach to learning (Tsai, Chen, and Chen, 2010). Meanwhile, second language (L2) education has been shifted from solely traditional instruction approach into more computer-assisted instruction and e-learning. The Internet allows lower-cost language instruction, providing more opportunities for educational institutions to offer courses online (Godwin-Jones, 2003). Web 2.0 technology can be a potential tool for collaborative learning for enhancing learner's learning performance, such as personal knowledge construction or group knowledge sharing (Chiang et al, 2011; Liaw, Chen, & Huang, 2008).

E-learning may increase flexibility of access, eliminate geographical barriers, and improve convenience of use and effectiveness of collaborative learning. Tam, Kan, and Ng (2010) also concluded that language teachers can promote the use of technology; particularly the online chats could be an option for L2 learners and between learners and the teacher. E-learning has been regarded as a teaching assisted tool for instructors, and learners' intention to use e-learning is influenced by perceived usefulness and self-efficacy (Liaw, 2008; Liaw, Huang, & Chen, 2007). Furthermore, some studies also indicated that students tend to perform better in an online learning environment than in a conventional classroom instruction (Liu, Ho, & Song, 2011; Yusuf & Afolabi, 2010). Online teaching and learning activities have continued to expand as an alternative to traditional face-to-face teaching and learning. In addition, computer-assisted language learning can promote collaborative, learner-centered knowledge construction and offer a more comfortable and less face-threatening environment for interaction than do instruction and discussion in a traditional classroom setting (Dickson, et al., 2008).

Blogs can be used as a collaborative tool for student groups, while instructors can use them as a medium for such tasks as delivering news, messages, and resources, encouraging discussion, and giving feedback and comments (Well, Pegler, & Mason, 2005). Many studies also pointed out some advantages of using blogs in education and its positive effects on improving students' performance. Many studies suggested integrating blogging with instruction may erase the limitation of classroom walls and provide students with more possibilities to connect with others outside of the classroom as well as to enhance the effect of teaching and learning (Chen et al, 2011; Liu & Chang, 2010; 2011; Liu and Lin, 2007; Liu, Shih, & Tsai, 2011; Lou, Wu, & Shih, 2010; Richardson, 2006; Shih, 2010;).

Blended learning (BL) is effective in facilitating online collaborative learning. Cooperative learning allows students to reflect and evaluate their work in the group, as well as to provide suggestions for improvement (Shih, 2010). In addition, blended learning combines several delivery methods to provide the most efficient and effective teaching and learning experiences (Cortizo, et al., 2009; Harriman, 2004; Lou et al, 20). Both face-to-face instruction and electronic feedback, including asynchronous feedback and discussion, can facilitate the productive overall use of feedback (Hyland & Hyland, 2006). As a result, the form of blogs can be used in an ESP/EOP/EAP course for L2 learners at the college level to enhance student learning motivation, satisfaction, and performance as well as to improve the instructor's teaching effectiveness.

However, with both the advantages of traditional instruction and e-learning as part of blended learning, the researcher (the course instructor) decided to administer a blended approach to the English for Hospitality and Tourism course at a technological university. The major purposes of this study were (1) to establish an effective blog-based blended model for the English for Hospitality and Tourism course, (2) to investigate the effects of using a blended model on the course, and (3) to explore students' learning satisfaction with the blog blended learning.

RESEARCH METHOD

The research method consisted of a mix of quantitative and qualitative approaches, including comments and feedback from the peer students on the blogs, satisfaction questionnaire survey, and interview. Data collected from panelist reviews were analyzed using quantitative methods. Comments and responses to the learning satisfaction survey questionnaire (LSSQ), and interview were statistically analyzed.

Research participants

The participants in this study were 44 English-majored sophomore students enrolled in an elective ESP course named "English for Hospitality and Tourism." at a four-year public university in southern Taiwan. In addition, there were seven students, four males and three females, who volunteered to participate in the interview process during the last week of class. The students were coded as S1-M, S2-F, S3-M, S4-M, S5-F, S6-F, and S7-F (M represents male student; F represents female student).

Research instruments

The research instruments include students' blog short films, the Learning Satisfaction Survey Questionnaire (LSSQ), and the student interview questionnaire. The Learning Satisfaction Survey Questionnaire (LSSQ) contains seven demographic questions, 37 close-ended questions, and one open-ended questionnaire.

Students' short films and blogs

At the beginning of the class, the 44 students were separated into seven groups. Each one of them was to make a film related to the course subjects and to upload it to his or her blog. The length of the film was limited for less than five minutes. The file size of each film was not to be overly large. Neither the layout nor the pattern of each blog and film was subject to limitations. However, a comment and discussion board was a requirement for each. The blog was to allow upload and download of films, easy access, and easy revision (Figure 1).

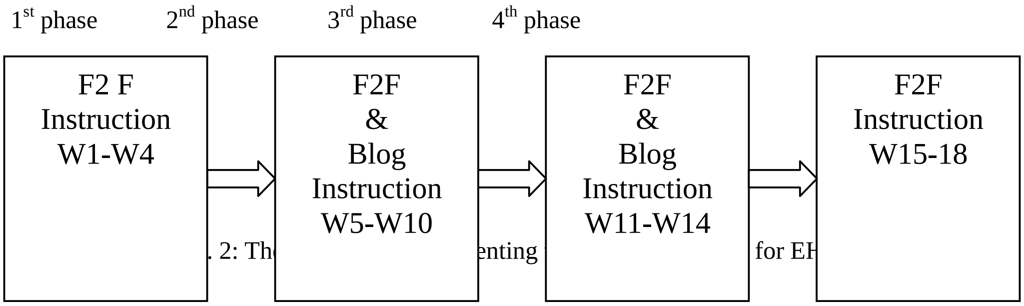
Fig. 1: An example of the students' blog

The learning satisfaction survey questionnaire (LSSQ)

The LSSQ contains a total of 7 demographic questions, 37 questions, and 1 open-ended question. A 5-point Likert scale (strongly agree=5; agree=4; neutral=3; disagree=2; strongly disagree=1) was employed to obtain students' satisfaction and attitudes toward the statements on the survey questionnaire. Prior to the survey, the content of the questionnaire was validated by two professors of English department and one professor of vocation education. Thus, the construct validity was established. A total of 43 valid responses were collected and analyzed. The questionnaire obtained a .976 of Cronbach alpha value, indicating the reliability of the questionnaire was also established.

Implementation

The implementation of the English for Hospitality and Tourism (EHT) course was divided into four phases (as shown in Figure 2). This arrangement was intended to facilitate a combination of blended learning and face-to-face (F2F) instruction. Each phrase was last about four to six weeks but the instructor adjusted the length and instructional contents based on students' needs and course schedule.



Student Interview Questions

In order to obtain more in-depth information on students' opinions about this blended learning course, a student interview was conducted and the interview questions are (1) "what do you think of the blended model used in this course that combined blog film with face-to face instruction in class?" (2) "what do you want to suggest that the teacher improve?" and (3) "which part of this course did you like most, and which did you dislike most?"

RESULTS & DISCUSSIONS

The results section contains a qualitative evaluation of the students' progress and of student responses to the interview questionnaires; it also features a statistical analysis of the peer and instructor comments on the films and a statistical analysis of the responses to the survey questionnaire.

Results of the students and the instructor's comments on the blog film

The 44 students in the seven groups were required to make comments about their group members' films. After all group members had commented on each other's films, the instructor also reviewed all films and gave comments for students to improve their films and performance. Most of the students' and the instructor's comments on the group members' films were very alike, such as issues of enunciation, posture, gesture, and background noise. In sum, the comments on the blog films show that blog learning can provide opportunities for improvement in terms of not only professional skills but also familiarity with blog applications.

Results of the Learning Satisfaction Survey Questionnaire (LSSQ)

The statistical results of the responses to the LSSQ are discussed as follows. The mean scores of the 37 questions ranged from 3.07 to 3.574 with acceptable standard deviations; thus, all students displayed moderate to high level of agreement regarding the statements in the survey questionnaire. For the design of the blog platform and film section, Question 4 "Position of the uploaded film may influence my blog learning willingness of English for Hospitality and Tourism course" obtained the lowest mean score of 3.09 among the seven questions, indicating the position of the uploaded film only less influenced students' learning motivation. Q3 "Color and fonts of the blog interface may influence my blog learning willingness" and Q7 "Topic of the film may influence my blog learning willingness" obtained mean scores of 3.51 equally, indicating colors, fonts, and topics may influence students' blog learning motivation.

For "Opinions toward the blog platform," Q18 "Free of charge for using blog to learn the course is a great advantage" obtained the highest mean score of 3.72 among the seven questions, indicating students were more concerned about the charge of using the blog platform. Q13 "System stability of blog can be the advantage for learning the course" obtained the lowest mean score of 3.07, indicating system stability was not a major issue for them.

In Part III "Learning attitude toward blog," all the eight questions obtained means scores ranging from 3.21 to 3.37, indicating students posses moderate learning attitude toward the blog. In Part IV "Learning effectiveness of blog application," the 15 questions obtained mean scores ranging from 3.16 to 3.74. Notably, Q33 "Reviewing my own films can help me understand my own strengths and weaknesses of learning the course" obtained the highest mean score among the 37 questions of the survey questionnaire, indicating students highly agreed with the function and effectiveness of using blog to learn English for Hospitality and Tourism course. Meanwhile, Q37 "Through blog learning English for Hospitality and Tourism course, it can also improve my interpersonal skills and relationship with classmates" obtained the lowest mean score of 3.16 in this section, indicating learning the course through blog did not affect their interpersonal skills and relationship with their classmates. In sum, students were satisfied with integrating the blog film with the traditional face to face (F2F) instruction based on the statistical results of the survey questionnaires. In addition, students agreed that the blog film was effective in learning the course of English for Hospitality and Tourism.

Regarding the results of the demographical information of the LSSQ, a total of 33 students indicated that they spent more than two hours on the internet every day; and 10 students spent about an hour and a half to two hours on the internet. In another words, the students spend a lot of time on the internet daily. Regarding what type of message they leave on their own blogs, 13 out of 43 students leave messages about their own feelings on the blogs. For browsing other's blogs, 15 students indicated that they visited others' blogs at least once per day and 12 students indicated that they visited other's blogs at least six times per day. Finally, most of the students indicated that they visited others' blogs were to respond to others' comments, write down own feelings, and chat with friends on others' blogs. However, the results of the demographical information on the questionnaire are not surprising. Most of the students use their own blogs as a placer to write down their feelings and chat with friends.

Results of factor analysis of the LSSQ

The results of KMO & Bartlett test show the KMO=.774>.6 and Bartlett Test of Sphericity=1926.29 with .000 of significance, indicating there are common factors existing in the questionnaire and it is suitable to conduct factor analysis. Thus, the confirmatory factor analysis was performed in order to identify the underlying factors that explain the pattern of correlations within a set of observed variables. According to Table 1, there are four factors were extracted, which explained over 76% of variance.

Table 1 Variance explained in factor analysis

Factor	Initial eigenvalues total	% of variance	Cumulative %
1	28.777	63.100	63.100
2	2.492	5.465	68.565
3	1.810	3.968	72.533
4	1.643	3.603	76.135

For Factor I, there are 15 questions loaded: Q 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, and 37; Factor II contains eight questions: Q15, 16, 17, 18, 19, 20, 21, and 22; Factor III contains seven questions: Q8, 9, 10, 11, 12, 13, and 14, and Factor IV contains six questions: Q1, 2, 3, 4, 6, and 7. Q5 "Size of the film may influence my blog learning willingness of English for Hospitality and Tourism course" was deleted after the factor analysis. After carefully examined the statements of the LSSQ, the four factors are named. They are Factor I: Blended learning effectiveness; Factor II: Learning attitude towards the blog platform; Factor III: Operation of the blog platform; and Factor IV: The Design of the blog platform and the short film.

Results of student interview

The researcher interviewed seven volunteer students to obtain in-depth information about the blog blended learning class. The interview questions are listed as follows, followed by the students' responses and discussions.

1. "What do you think of the blended model for this course, being half blog film and half in-class presentations?"

> *I think the blended model for the course can improve students' participation in this course, and give them chances to display real situations. (S1-M)*
>
> *I think that it good for students to learn more. They can have more resource to use. (S3-M)*
>
> *I think I can learn some film making skills and experiences besides practicing my professional English. (S6-F)*

According to the students' interview responses, the seven students all possessed positive attitudes toward the blog-based blended teaching and learning approach to teaching English for Hospitality and Tourism course. They all strongly agreed about combining the blog applications for teaching Hospitality and Tourism course is helpful for them to learn some technology and useful for the course.

2. "What do you want to suggest that the teacher improve?"

> *I think teacher should teach students how to use software related to the film such as transforming the format. (S6-F)*

I think having blog film is better than in class presentation. …hope teachers can continue this kind of course. (S4-M)

Maybe teacher can give students more chances to visit the hotel if the time is ok. The teacher can. (S5-M)

Students mentioned that the instructor's comments and suggestions were very useful and beneficial to them, helping to improve their professional English performance. In addition, students suggested that on-site visitation to hotels can be arranged and it will be very beneficial for them.

3. "What parts of this course did you like and dislike most?"

I like to take the videos, but I also dislike doing it. It takes me so much time, but I can have a chance to practice my English ability about the rules for hotels and restaurants. (S2-M)

I think I like most of parts because I can use some useful vocabulary, patterns, and others to deal with some problems in every situation (in the hotel, restaurant, on the road, etc.). I don't have any parts I dislike most. (S7-F)

I liked the blog thing because I am too shy to present in front of class, although I know I need to overcome my fear. (S3-M)

What most of the students liked most in the course was that the blended approach was interesting and fun. On the other hand, the blog-based blended approach may consume a lot of time for students to make the film, which can be a notable issue for instructors when designing a blog-based blended instruction course.

CONCLUSIONS AND SUGGESTIONS

Conclusions

The results of this study show that such educational goals have been achieved, confirming the effectiveness of the blog-based blended model for the English for Hospitality and Tourism course. The findings of the study are discussed and presented as follows: (1) the blended model combining blog and face-to-face instruction can be an effective teaching and learning approach for L2 learners and instructors of Hospitality and Tourism related courses; (2) students' professional skills were improved through this blended approach, such as enunciation, facial expressions, posture, gestures, multimedia software usage, and filming applications; (3) students could benefit from the processes of self-autonomous, collaborative learning, reviews of their peers' and their own films, and the instructor's feedback through blogging (Chen, et al, 2011; Liu & Chang, 2010; Liu & Lin, 2007; Liu, Shih, & Tsai, 2011; Lou, Wu, & Shih, 2010; Shih, 2010) and (4) students are more willing to share their thoughts, ideas, and comments with peers on the blog for avoiding losing face in front of others and thus to ease their stage fright. Furthermore, the factors of the learning satisfaction survey questionnaire were confirmed, containing Factor I: Blended learning effectiveness; Factor II: Learning attitude towards the blog platform; Factor III: Operation of the blog platform; and Factor IV: The Design of the blog platform and the short film. Finally, using blended teaching approach into an ESP could be very time-consuming and it requires some extra efforts from both the instructor and students but its outcome can be very rewarding.

Suggestions

In order to implement this type of the blended ESP course successfully, the suggestions are: (1) technological equipment and facility, such as computer equipment and internet speed are extremely important for students when filming and uploading their films; (2) on-site visitations to hotels or travel agencies should be arranged for students in order to make this course more thorough and complete as well as to increase the effectiveness of the English for Hospitality and Tourism course; (3) in class presentations and model practices are as equally important as blog learning for students to learn the course effectively; and (4) further empirical studies on different subject courses or levels of students may be carried out to provide proofs and evidences to enhance teaching and learning effectiveness through this blended learning approach.

The limitations of this study are as follows. First all, the subjects of the study were solely from a university, a larger scale of study can be conducted in the future for increasing the reliability and generalizability of the stduy. Additionally, a further investigation on the students' performances after the class as well as a in-depth investigation on the students' interactions on the blogs can be conducted in the future.

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LEARNER CHARACTERISTIC BASED LEARNING EFFORT CURVE MODE: THE CORE MECHANISM ON DEVELOPING PERSONALIZED ADAPTIVE E-LEARNING PLATFORM

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ABSTRACT
This study aims to develop the core mechanism for realizing the development of personalized adaptive e-learning platform, which is based on the previous learning effort curve research and takes into account the learner characteristics of learning style and self-efficacy. 125 university students from Taiwan are classified into 16 groups according to learning efficiency, learning style and self-efficacy. The learner characteristic based learning effort curve mode (LECM) is developed by conducting multi-factor regression on the corresponding learning effort curves generated by the specific group. The research findings conclude that the learner characteristic based LECM is able to represent the specific learning characteristics of the corresponding learning style and self-efficacy effectively. The core value of the learner characteristic based LECM is to realize the future development of personalized adaptive e-learning platform through taking it as the core mechanism.
Keywords: e-learning, learner characteristics, learning effort, learning style, self-efficacy

INTRODUCTION
Simonson et al. (2003) argued that most of e-learning platforms focused on ICT (Information and Communication Technology) operation instead of learner characteristics. However, Kumar (1999) recommended that the design of e-learning platforms should consider learner characteristics in order to promote learning efficacy. Because the future trend of services and products is towards personalization, there are some research confirm that multimedia teaching materials improve students' studies, for example, a experimental design prove multimedia teaching materials lead to significance difference in students' chemistry test grades (Lou, Lin, Shih & Tseng, 2012). How to set e-learning material, such as the design of an e-learning platform should consider personalization and adaptability as key criterions. Brusilovsky (2001) noted that the importance of e-learning was to develop the personalized adaptive e-learning mechanism which adapted to individual learner characteristic. Therefore, this study aims to develop the core mechanism which supports the development of personalized adaptive e-learning platform.

A good e-learning mechanism must be based on learner characteristics. The classification of learning style makes adaptive e-learning more sensible (Keh, 2004) and self-efficacy is the key factor of e-learning performance (Yu, 2007; Thompson & Lynch, 2003). However, most of e-learning platforms do not consider learner characteristics and even lack for dynamic real-time based mechanisms which promote effective learning. Hence, most of e-learning platforms are not able to achieve adaptive learning effectively.

This study takes learning style and self-efficacy as learner characteristics. And then utilize the dynamic real-time based learning effort quantification technique (Hsu et al, 2009, Hsu & Chang, 2011) to construct learner characteristic based LECM which is in line with the learning characteristic of corresponding learner characteristic. For the future research, the normalized learner characteristic based LECM is generated by enlarging the quantity and coverage areas of sampling. And then take the normalized learner characteristic based LECM as the core mechanism in developing learning progress diagnosis database. In the meantime the specific adaptive learning path and support is also developed based on the corresponding learning characteristics which are interpreted from the learner characteristic based LECM at modular base. Through embedding modulized adaptive learning path and support, dynamic real-time based learning effort quantification technique and learning progress diagnosis database into an e-learning platform, authors plan to realize the development of personalized adaptive e-learning platform.

LITERATURE REVIEW
In this study, learning style and self-efficacy are taken into consideration for the learner characteristics according to the findings of literature review.

Learning Style
The learning style is the preference of message acquisition approach in learning process and context (Kraus et al., 2001). People can promote learning through constructing the learning process and learning context which fit with the preference of specific learning style (Gau & Tzai, 1999; Reiff, 1992). Because of the technology

development, there are more and more digital devices using in the processing of learning, some research focus on Ubiquitous learning, which students can learn at every time and everywhere (Huang, Chen & Wang, 2012). Besides Ubiquitous learning, it is also important about the learning material and theory itself. The learning style theory (Kolb, 1985) has been cited widely in academic researches (Demirkan, & Demirbas, 2008; Wang et al., 2006). Kolb (1985) constructed the learning process into two perspectives and four directions. One is apprehension perspective which includes the directions of concrete experience (CE) and abstract conceptualization (AC) according to the consideration of experience acquisition. The other is transformation perspective which includes directions of reflective observation (RO) and active experimentation (AE) according to experience transformation (Kolb & Kolb, 2005a). In light of CE-AC and RO-AE, learning style is classified into four quadrants which are accommodator, assimilator, converger and diverger (Kolb, 1985). Please refer to Kolb's learning style quadrant shown in Figure 1.

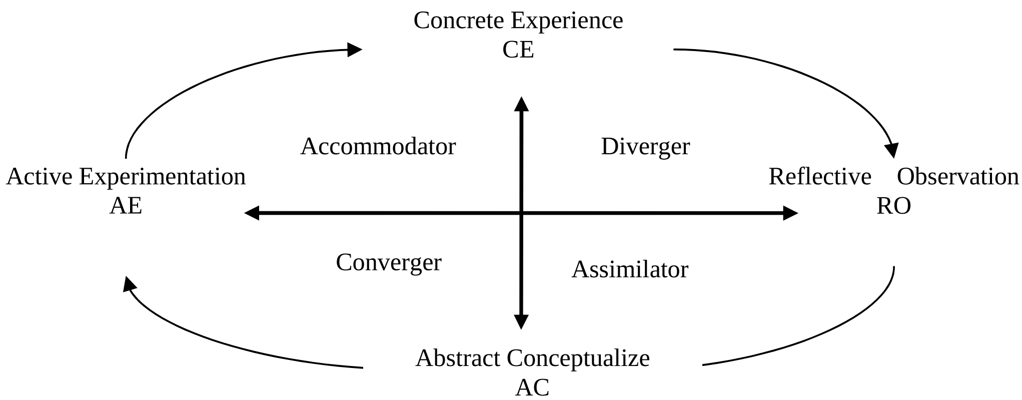

Figure 1. Kolb's learning style quadrant

Chou and Wong (2000) noted that there was significant interaction between e-learning approaches and learning styles. Federico (2000) found that there was significant correlation between learning style and e-learning performance. Kraus et al. (2001) also found that e-learning performance was enhanced once the curriculum of e-learning was suitable for the needs of specific learning style. Terrell (2002) and Meyer (2003) argued that learning style has decisive influence on e-learning performance. Papanikolaou et al. (2006) argued that learning style should be considered in the design of e-learning platform in order to promote learning motivation and performance. In summary, learning style is an important learner characteristic to be considered in e-learning. Akdemir & Koszalka (2008) stated learning styles play critical roles that influence student retention and success in web-based learning environment. Besides all, Ku & Chang (2011) discussed the recent studies about learning style, and support the view that learning style is an ongoing issue of great importance to educational research obviously.

Self-efficacy

Self-efficacy is the belief in success (Bandura, 1986). Such belief is generated by the self assessment on the ability to accomplish specific task. Therefore, self-efficacy represents the confidence level in accomplishing specific task successfully. People are more capable of achieving specific goal continuously while they have high self-efficacy. Jerusalem & Schwarzer (1992) argued that self-efficacy is the self-conscious control ability to adapt to pressure while face problems. Therefore, self-efficacy is a resource of pressure adaptation. People with high self-efficacy have better self-conscious control ability, which results in controlling challenging environment effectively (Gecas, 1989; Greenglass et al., 1999; Kear, 2000). Usually people with higher self-efficacy are more possible to carry out challenging tasks. Some research apply digital game to study, the motivational materials be proved enabling the application and maximize (Moon, Jahng & Kim, 2011). Furthermore, they are more capable of recovering from frustration in order to carry out tasks successfully instead of giving up at halfway (Bandura, 1992, 1997; Jerusalem & Schwarzer, 1992; Kear, 2000; Scholz et al., 2002).

Lent (1984) noted that students with high self-efficacy achieve better learning performance. Hutchins (2004) noted that self-efficacy is the key factor for learners to acquire and sustain skills continuously. In autonomic e-learning context, self-efficacy plays important role in learning performance promotion (Hsu, 2007; Thompson & Lynch, 2003). In summary, self-efficacy is an important learner characteristic to be considered in e-learning.

Learning Efficiency

The traditional assessment in education primarily deals with learning performance which presents a learner's achievement measured by the test score on task. Learning performance is one assessment dimension of cognitive load. Higher cognitive load often results in lower test score and less learning performance (Pass & van Merriëboer, 1994). For many practical cases, it is feasible for two people to achieve the same learning performance levels with devoting different effort levels. Hence, both people have identical learning performance but expertise might be higher for the person who performs the task with less effort than for the person who devotes substantial effort. Therefore, an appropriate diagnostic technique of expertise should include assessments of effort and performance. Kalyuga and Sweller (2005) developed a dynamic diagnostic technique named cognitive efficiency (E) which is defined as E=P/R, where R is the effort rating and P is the performance rating on the same task. But cognitive efficiency is not a real-time based technique because the effort is not able to be assessed at real-time base. Therefore, Hsu et al. (2009) developed learning efficiency which is a learning progress diagnosis technique. It is defined as learning performance divided by learning effort equals to learning efficiency. Consequently, the learning effort of a leaner is able to be assessed and quantitatively measured by self selecting learning pathes at dynamic real-time based approach.

In Hsu and Chang's research (2011), the learning effort is represented as a visualized learning effort curve. By comparing the learning effort curve modes generated by the high learning efficiency and low learning efficiency groups in e-learning process, the progress of learning effort tends to descend for the high learning efficiency group. In contrast, the progress of learning effort tends to ascend for the low learning efficiency group (Hsu & Chang, 2011). Such finding is in accordance with the arguments of cognition load theory that lower effort results in higher performance (Kalyuga et al., 2000; Mousavi et al., 1995; Sweller et al., 1998).

METHOD

Subjects

178 university students from Taiwan participated the e-learning activity on IC3 Mentor e-learning platform. 125 of 178 were qualified as the subjects based on the readiness of learning records and the assessment results of learning style inventory and self-efficacy scale.

Tool

The research tool includes learning style inventory, self-efficacy scale, IC3 Mentor e-learning platform, rapid assessment quantification technique and learning effort quantification technique. Subjects were classified according to learner characteristics by applying the assessments of learning style inventory and self-efficacy scale. The learning records of each individual subject generated in the e-learning process on IC3 Mentor were converted into learning effort and learning efficiency that were presented in numerical data format by applying rapid assessment quantification technique and learning effort quantification technique.

1. Learning Style Inventory (LSI)

The learning style inventory developed by Kolb (1984) had been examined by Cronbach α coefficient test with the results of .82, .71, .83 and .78 for accommodator, assimilator, converger and diverger accordingly (Kolb, 1985). Many scholars also claimed that LSI is an effective research tool with high reliability (Commings & Wirley, 2001; Demirbas & Demirkan, 2007; Wells et al., 1991). The validity of LSI is also very high (Sewall, 1986). It takes about 10 to 15 minutes to answer 12 questions in LSI; therefore, LSI does not cause too much loading on subjects. In this study, LSI is used to assess subjects' learning style and classify subjects into four learning styles which are accommodator, assimilator, converger and diverger accordingly.

2. Self-Efficacy Scale (SES)

The self-efficacy scale developed by Zhang and Schwarzer (1995) had been applied on 293 university students and the Cronbach α coefficient test with the result .91 indicated that SES is an effective research tool with high reliability. And there is only a single component to be extracted by principle component analysis, which represents high validity (Scholz et al., 2002). There are 10 questions in SES and every question is assessed by the 4-point scale which is incorrect for 1, fairly correct for 2, mostly correct for 3 and fully correct for 4. Total score points will be around 10 to 40 points. Subjects with higher SES scores represent better self-efficacy. In this study, SES is used to assess self-efficacy and classify subjects into high and low self-efficacy groups.

3. IC3 Mentor E-Learning Platform

IC3 Mentor is the e-learning platform of IC3 (Internet and Computing Core Certifications) which is a global ICT (Information and Communication Technology) certification applied over 128 countries worldwide (Certiport, 2008). IC3 Mentor is a learning/assessment blended learning system. Learners can self-determine the learning path in the multi-layer learning structure of IC3 Mentor.

4. Dynamic Real-Time based Learning Effort Quantification Technique

Learning effort (Hsu et al, 2009, Hsu & Chang, 2011) is developed based on cognition load theory (Sweller, 1990) and dynamic assessment theory (Allal & Ducrey, 2000). Learning effort with positive value represents ascending learning effort, and learning effort with negative value represents descending learning effort. Dynamic real-time based learning effort quantification technique (Hsu et al, 2009, Hsu & Chang, 2011) is developed as a dynamic real-time based quantification technique based on learning effort, RAT- Rapid Assessment Test (Kalyuga & Sweller, 2004) and cognition efficiency theory (Kalyuga & Sweller, 2005). It was utilized to convert learning records into learning effort numerical data in this study.

5. Learning Effort Curve

The learning effort numerical data, which is converted from learning records by the dynamic real-time based learning effort quantification technique, is a two dimensional numerical data that can be transformed to a visual graphic information called learning effort curve (Hsu et al, 2009, Hsu & Chang, 2011). Refer to Figure 2, learning effort is increasing from learning unit 1 to 4, which presents a learner tends towards learning effort growth. Learning effort is decreasing from learning unit 4 to 6, which presents a learner tends towards descending learning effort.

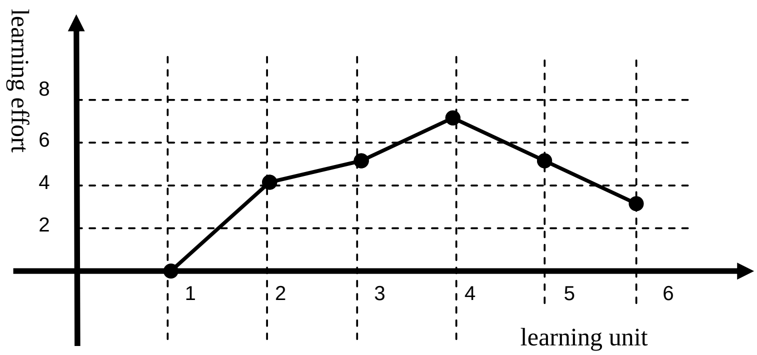

Figure 2. Learning effort curve

Procedure

The research structure is shown in Figure 3. The detail procedure is shown as following:

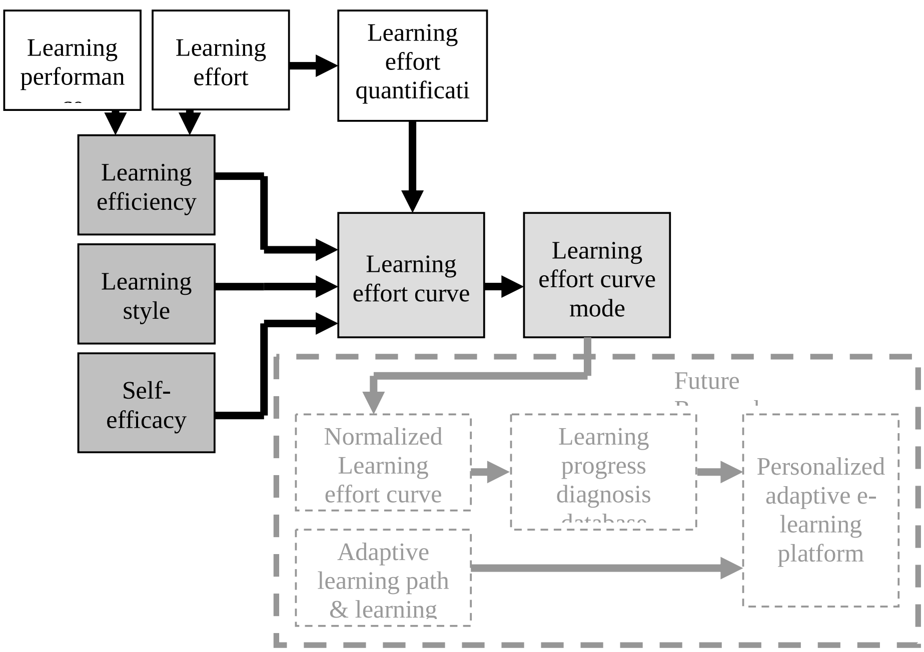

Figure 3. Research structure

1. Subjects are classified according to learner characteristics which include learning style and self-efficacy. For learning style, subjects are classified into accommodator, assimilator, converger and diverger by the assessment of LSI. For self-efficacy, subjects are classified into low and high self-efficacy groups by the assessment of SES.
2. All subjects conduct e-learning on IC^3 Mentor platform. Every subject was requested to accomplish the same 31 learning units with the same learning sequence. The learning records of each subject are recorded at real-time base in the learning process.
3. The learning records of each subject are converted into learning effort numerical data by the dynamic real-time based learning effort quantification technique. Then the learning effort numerical data is transformed into a two-dimensional curve called learning effort curve by the graphic processing. Every subject generates his/her own learning effort curve at dynamic real-time based approach in the learning process.
4. In the meantime, the learning records of each subject are also converted into learning performance numerical data by RAT (Kalyuga & Sweller, 2004; Hsu et al, 2009, Hsu & Chang, 2011). The learning efficiency is generated by the numerical calculation of learning performance and learning effort (Hsu et al, 2009, Hsu & Chang, 2011). For learning efficiency, subjects are classified into low and high learning efficiency groups.
5. Based on procedure 1 and 4, subjects are classified into 16 learner characteristic based groups according to learning style, self-efficacy and learning efficiency. In the meantime individuals' learning effort curves are also classified into 16 groups accordingly. The learner characteristic based LECM for each group is generated by conducting multi-factor regression on the learning effort curves classified in the specific group. Consequently, 16 learner characteristic based LECMs are generated for 16 groups accordingly.
6. For the future research, the normalized learner characteristic based LECM is generated by enlarging the quantity and coverage areas of sampling. And then take the normalized learner characteristic based LECM as the core mechanism in developing learning progress diagnosis database. In the meantime the specific adaptive learning path and support is also developed according to the corresponding learning characteristics which are interpreted from learner characteristic based LECM at modular base. Through embedding modulized adaptive learning path and support, dynamic real-time based learning effort quantification technique and learning progress diagnosis database into an e-learning platform, authors plan to achieve the development of personalized adaptive e-learning platform.

RESULTS

Learner Characteristic Based Learning Effort Curve Mode (LECM)

Subjects are classified into 16 groups according to learning style, self-efficacy and learning efficiency. The sample distribution chart is represented in Table 1.

Table 1. Sample distribution chart – learning style vs. self-efficacy vs. learning efficiency

Learning Style	Self-efficacy (SE)	Samples	Learning Efficiency (LE)	Samples	Group
Accommodator	High SE	9	High LE	3	1
			Low LE	6	2
	Low SE	9	High LE	4	3
			Low LE	5	4
Assimilator	High SE	28	High LE	14	5
			Low LE	14	6
	Low SE	14	High LE	6	7
			Low LE	8	8
Converger	High SE	34	High LE	17	9
			Low LE	17	10

	Low SE	14	High LE	7	11
			Low LE	7	12
Diverger	High SE	15	High LE	10	13
			Low LE	5	14
	Low SE	2	High LE	2	15
			Low LE	0	16

The learner characteristic based LECM is generated for each group by conducting multi-factor regression processing. But the sample quantity of group 15 and 16 is not sufficient (please refer to Table 1) for multi-factor regression processing. Hence, only 14 learner characteristic based LECMs are generated in this study, which represents the learning effort curve mode according to specific learner characteristic of each group. 14 learner characteristic based LECMs are shown in Figure 4.

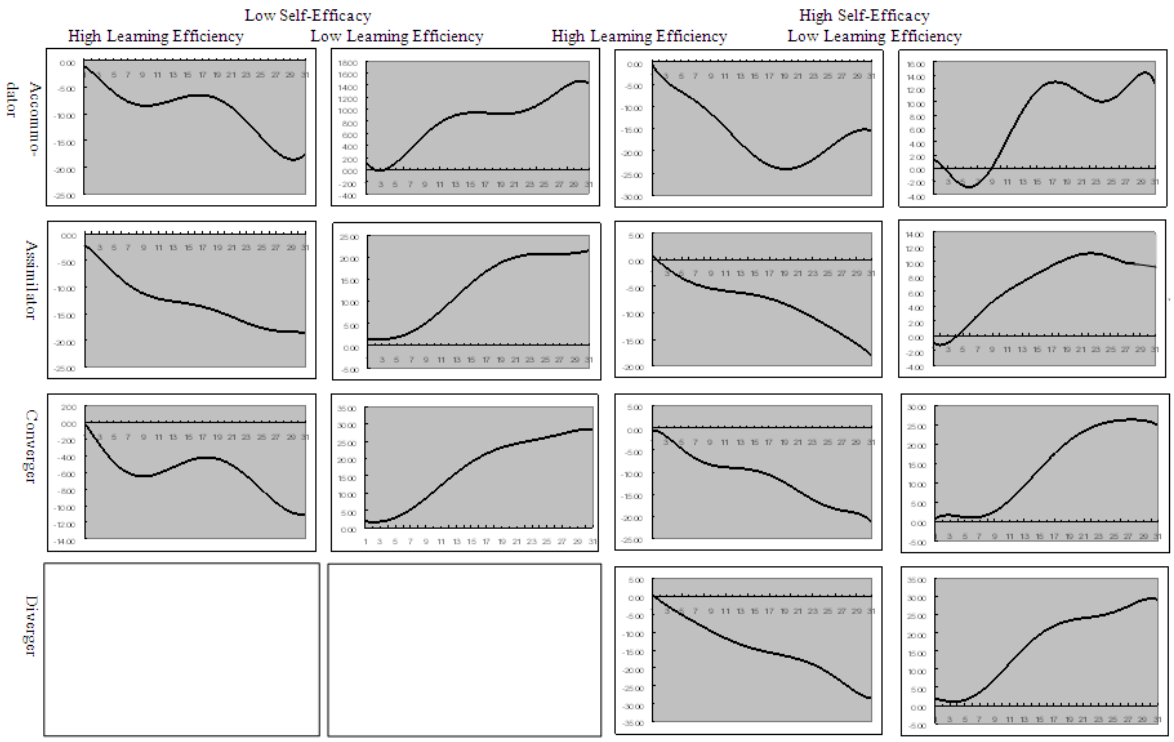

Figure 4. Learner characteristic based learning effort curve modes

The findings are shown as following according to the analysis on 14 learner characteristic based LECMs:

1. The overall characteristic of learner characteristic based LECMs

All learner characteristic based LECMs represent the consistent characteristic no matter what learning style or self-efficacy belongs to. For the high learning efficiency groups, the learning effort of all learner characteristic based LECMs tends to descend continuously and stays at negative learning effort value. In contrast, the learning effort of all learner characteristic based LECMs tends to ascend continuously and stays at positive learning effort value for the low learning efficiency groups. Such is in line with the learning effort curve studies (Hsu & Chang, 2011).

2. The influence of self-efficacy on learner characteristic based LECMs

For high learning efficiency, no matter what learning style belongs to, the learning effort in high self-efficacy groups indicates more variance range and more descending trend compared with the one in low self-efficacy groups. That is, subjects with high self-efficacy tend to promote learning efficiency through descending learning effort continuously. Furthermore, for low learning efficiency groups, no matter what learning style belongs to, the learning effort in high self-efficacy groups indicates less variance range and less ascending trend compared with the one in low self-efficacy groups. And it is easier to approach convergent mode. That is, subjects with high self-efficacy tend to achieve learning effort saturation through adapting to the impact caused by ascending learning effort. Such lowers the risk of discontinuous learning caused by divergent ascending learning effort. These findings are in line with self-efficacy studies (Bandura, 1997; Jerusalem & Schwarzer, 1992; Kear, 2000; Schwarzer & Scholz, 2002) that it is easier for people with high self-efficacy to adapt themselves to learning frustration and recover themselves for continuous learning.

3. The influence of learning style on learner characteristic based LECM

(1)Accommodator's Learner Characteristic Based LECM

Accommodator's learner characteristic based LECM represents non-linear inflection. Learner characteristic based LECM tends to descend and then ascend in the ascending range. Or in the other way, learner characteristic based LECM tends to ascend and then descend in the descending range. Such is in line with the study findings on accommodator characteristics that an accommodator is a risk-taking person who is more easily influenced by the learning context and other learners and tends to approach tasks by trials and errors (Diaz & Cartnal, 1999; Kolb & Kolb, 2005b; Reid, 1995; Smith & Kolb, 1996; Wu, 1997). Therefore, accommodator's learner characteristic based LECM represents tremble curve profile with several inflections of learning effort caused by the process of trials and errors.

(2)Assimilator's Learner Characteristic Based LECM

Assimilator's learner characteristic based LECM represents less learning effort variance range. Such is in line with the study findings on assimilator characteristics that an assimilator tends to establish institutionalization by integrating all the learning experiences and knowledge. An assimilator follows the model established in institutionalization in order to reduce trials and errors and risk-taking (Diaz & Cartnal, 1999; Kolb & Kolb, 2005b; Reid, 1995; Smith & Kolb, 1996; Wu, 1997). Therefore, an assimilator's learning effort variance stays relative low because of institutionalization.

(3)Converger's Learner Characteristic Based LECM

Converger's learner characteristic based LECM represents convergent mode. Such is in line with the study findings on converger characteristics that a converger tends to keep problems converge gradually in order to get resolution through practical practices (Diaz & Cartnal, 1999; Kolb & Kolb, 2005b; Reid, 1995; Smith & Kolb, 1996; Wu, 1997). In the problem convergence process, the learning effort variance is getting lower gradually along with the progress of problem resolution. Therefore, converger's learner characteristic based LECM tends to approach convergence.

(4)Diverger's Learner Characteristic Based LECM

Diverger's learner characteristic based LECM represents divergent mode. Such is in line with the study findings on diverger characteristics that a diverger tends to approach problem shooting by imagination and feeling with innovative explorartion (Diaz & Cartnal, 1999; Kolb & Kolb, 2005b; Reid, 1995; Smith & Kolb, 1996; Wu, 1997). A diverger's learning effort keeps descending while his/her feeling is in line with successful learning progress. In contrast, a diverger's learning effort keeps ascending while he/she experiences learning frustration. Therefore, diverger's learner characteristic based LECM tends to approach divergence.

DISCUSSIONS

For the future research, first of all, the normalized learner characteristic based LECM for every learner characteristic based group will be established by enlarging the quantity and coverage areas of sampling. Once the normalized learner characteristic based LECMs are established, the learning characteristics of each normalized learner characteristic based LECM can be extracted by analyzing the mathematical characteristics of the curve profile of learning sectors which include descending sector, ascending sector, convergent sector, divergent sector and inflection points. And then develop learning progress diagnosis database based on the learning characteristics extracted from normalized learner characteristic based LECMs, which contains the learning progress for each specific sector of normalized learner characteristic based LECM. That is, a learner's learning progress can be diagnosed by crossly comparing the numerical data converted from his/her learning effort curve with the corresponding learning characteristics in the learning progress diagnosis database at dynamic real-time based approach. As long as the specific learning characteristic is identified from the learning effort curve generated by the learner in the e-learning process, which is in line with the corresponding learning characteristic in the learner progress diagnosis database, then the learning progress of a specific learner can be anticipated since it tends to be similar to the corresponding learning progress in the learning progress diagnosis database. In the meantime, the modulized adaptive learning path and support is developed through interpreting the learning characteristics of the specific learning sector of the normalized learner characteristic based LECM. Therefore, once the learning progress can be diagnosed through e-learning process at dynamic real-time based approach, and then the e-learning platform can provide the suitable adaptive learning path and support for a specific learner at personally base according to the anticipation of future learning progress accordingly. Consequently, it's a feasible approach to achieve personalized adaptive e-learning by the core mechanism of learner characteristic based LECM. Hence, it's the core value of learner characteristic based LECM on this study.

The detailed future research is shown as following:

1. Normalized Learner Characteristic Based LECM

The learner characteristic based LECM can be normalized by enlarging the quantity and coverage areas of sampling. Then the variance between a specific learner's learning effort curve and the normalized learner characteristic based LECM is reduced. That is, the normalized learner characteristic based LECM becomes an effective tool in representing a learner's learning effort resume at learner characteristic base. Hence, specific normalized learner characteristic based LECMs are established for each learner characteristic based group.

2. Learning progress diagnosis Database

The learning characteristics of each normalized learner characteristic based LECM can be extracted by analyzing the mathematical characteristics of the curve profile of learning sectors which include descending sector, ascending sector, convergent sector, divergent sector and inflection points. And then the learning progress diagnosis database is developed by classifying those learning characteristics extracted from normalized learner characteristic based LECMs in the mathematical format for every learning characteristic based group.

3. Modulized Adaptive Learning Path and support

For a particular learner characteristic, the learning characteristics can be interpreted under specific learning sector of the normalized learner characteristic based LECM. And then the corresponding learning path and support is designed to suit with the specific requirements accordingly in order to enhance learning, which is an adaptive approach. Such is designed to adapt to the requirements of specific learning sector of the normalized learner characteristic based LECM accordingly; therefore, it is also a modulized approach to establish different modulized adaptive learning path and support for the corresponding requirements of specific learning sector.

4. The Personalized Adaptive e-Learning Platform

By crossly comparing a learner's learning effort curve with the learning progress diagnosis database at specific learning sector, the corresponding learning characteristics in the learning progress diagnosis database is identified. And then the future learning progress of the learner's learning effort curve can be anticipated. The suitable modulized adaptive learning path and support is provided according to the anticipation status in order to improve learning at dynamic real-time based approach. The learning sector is moving forward dynamically along the learning process in order to conduct learning progress diagnosis at real-time based approach. The modulized adaptive learning path and support will be replaced by a new module according to the learning progress diagnosis results. As long as the learning sector is moving forward continuously along the whole learning process, then the corresponding modulized adaptive learning path and support is provided according to learning progress diagnosis results at real-time based approach. Consequently, the personalized adaptive e-learning platform is constructed to promote learning by receiving suitable modulized adaptive learning path and support through the continuously feed-forward learning progress diagnosis at real-time based approach.

CONCLUSION

E-learning should consider learner characteristics in order to promote learning. Learning style and self-efficacy become the key factors in the development of adaptive e-learning, which are the key learner characteristics considered in this study. Subjects were classified into 16 learner characteristic based groups in light of learning style, self-efficacy and learning efficiency. The learning effort curves generated by the subjects in the specific group were transformed into the learning effort curve mode (LECM) at learner characteristic base, which represented the specific learning effort curve mode for the corresponding profile of learner characteristics based group. By the analysis of learner characteristic based LECMs for 16 groups, the findings indicate that the learning effort of learner characteristic based LECMs tends to descend continuously for the high learning efficiency groups; the learning effort of learner characteristic based LECMs tends to ascend continuously for the low learning efficiency groups. That is, no matter what learner characteristics belong to, descending learning effort results in high learning performance and ascending learning effort results in low learning efficiency, which is in accordance with the previous research findings on learning efficiency and learning effort curves (Hsu et al, 2009, Hsu & Chang, 2011). Furthermore, the particular learning characteristic of the person with specific learning style and self-efficacy is in line with the progress of learning effort represented by the corresponding learner characteristic based LECM. Therefore, for the specific learner characteristics, the learner characteristic based LECM is proved to be an effective core mechanism for the development of learning progress diagnosis.

The normalized learner characteristic based LECM is required to be established because there are missing learner characteristic based LECMs for two groups and the quantity and coverage areas of sampling is also relative smaller in this study. For the future research, the first step is to establish the normalized learner characteristic based LECM, and then take the normalized learner characteristic based LECMs as the core mechanism to develop the learning progress diagnosis database. In the meantime the adaptive learning path and support is designed at modular base for specific requirements at different learning progress status. The final target of the future research is to realize personalized adaptive e-learning by embedding the modulized adaptive learning path and support, the dynamic real-time based learning effort quantification technique and learning progress diagnosis database into an e-learning platform. By the personalized adaptive e-learning platform, learner's learning progress can be feed-forward diagnosed and anticipated continuously by the learning progress diagnosis database. And then the corresponding modulized adaptive learning path and support is provided according to learning progress diagnosis results at real-time based approach.

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MEASURING COMPUTER SCIENCE KNOWLEDGE LEVEL OF HUNGARIAN STUDENTS SPECIALIZED IN INFORMATICS WITH ROMANIAN STUDENTS ATTENDING A SCIENCE COURSE OR A MATHEMATICS-INFORMATICS COURSE

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ABSTRACT
An analysis of Information Technology knowledge of Hungarian and Romanian students was made with the help of a self developed web based Informatics Test. The goal of this research is an analysis of the Computer Science knowledge level of Hungarian and Romanian students attending a Science course or a Mathematics-Informatics course. Analysed was how effectively can students from different grades answer questions dealing with different subjects. After having evaluated the test results correctness of the original presumption emerged. Significance level was 5% through the analysis. It was found significant divergence in knowledge of Hungarian students and Romanian students attending a science course (Profil Real) and a Mathematics-Informatics course. Romanian students attending a science course and a Mathematics-Informatics course scored higher in programming than their Hungarian counterparts specialized in Informatics in the 11th grade. After the calculating values of the partial correlation we have got same results by subjects too.

After the evaluation a final conclusion can be made: Romanian students of the Real Profile have the same or more practice in programming than Hungarian students specialized in Informatics, though the latters have the same or higher Computer Science knowledge level. Unfortunately, Hungarian teachers concentrate on word processing and spreadsheet calculation and teach programming just for the students specialized in Informatics, although algorithm thinking would be important for every student before finishing secondary school.

Keywords - measuring, information technology, knowledge, level, hungarian, romanian, students

I. INTRODUCTION

Some research was done comparing the Schoolsystems (Döbert et al, 2002) and the role of Information and Communication Technology in the education of some European countries (Hüsing and Korte, 2006; Dagienè and Mittermeier, 2006; SFIB, 2004).

We can see all students have different level of computer usage abilities by same Information Technology Education in a country (Isman, Celikli, 2009) and we can find more differentiation by countries.

The goal of this research is an analysis of the IT skills and programming knowledge of Hungarian and Romanian students attending a Science course or a Mathematics-Informatics course.

The National Basic Curriculum of Hungary describes the curriculum grade by grade, subject by subject to teachers.

Information Technology education in Romania bears a close resemblance to the one in Hungary from the point of view of the material discussed. Theoretical knowledge, word processing, spreadsheet calculation, database management and programming are parts of the curriculum in both countries.

Though topics are the same but the number of CS classes are different. This research is analysing whether differences in the IT skills of students depend on the number classes they are taught in or not.

In order to be able to compare the students' IT skills in the different countries a detailed analysis was needed. Various curriculums in the different grades had to be checked, as well as the number of weekly Informatics classes and whether Informatics was a compulsory or an optional subject. Still, this is not enough to carry out the examination. Further, the students' knowledge had to be checked in various grades of the different countries. To be able to make comparisons between these students, a uniform questionnaire had to be devised in which questions regarding the different subject matters of Information Technology had to be asked. Only after having sent out these questionnaires to students of the different countries could the survey be carried out on the basis of their answers.

First, let us have a look at how many Informatics classes are held in the respective countries (Table I.). Information Technology is only an elective course in the last two years of the secondary school in Hungary.

TABLE I. Number of Information Technology Classes in Different Grades

Country	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Hungary	1	1	1	1	2	2	2	2	2	2	3*	3*
Romania	0	0	0	0	0/1	0/1	0/1	0/1	1-2; 3-4; 6-7**	1-2; 3-4; 6-7**	1-2; 3-4; 6-7**	1-2; 3-4; 6-7**

* selectable
** depends on specialization

In Romanian schools the bulk of students get their first experience in Information Technology in the 9th grade. It also happen that students' study Informatics in one class a week for one or two years in the 5th-8th grades of certain schools, but this is rare and the curriculum also depends on the teacher to a great extent.

In Hungary students start to learn Information Technology earlier, so my starting hypothesis' were based on this knowledge before making a comparison.

The first starting hypothesis was that Hungarian students specialized in Informatics have higher Computer Science literacy and programming knowledge than Romanian counterparts attending a science course.

The second starting hypothesis was that Hungarian students specialized in Informatics have the same Computer Science literacy and programming knowledge as Romanian students specialized in Mathematics-Informatics because they spend more time on this subject.

II. INFORMATION TECHNOLOGY EDUCATION IN HUNGARY

IT education is based on a national curriculum in Hungary (Ministry, E. H, 2003). According to the National Basic Curriculum (NBC) of Hungary the use of IT is to be demonstrated in the first four school grades since 2003 (e.g. search on the Internet, painting with computers etc.) and is taught in 1 class weekly. According to the Information Technology curriculum the following subjects are taught from the 5th grade to the 12th grade at the schools of Hungary in 2 classes weekly:

- Word processing
- Spreadsheet calculation
- Presentation
- Algorithm and programming
- Database management

Generally the Microsoft Office packet is taught and it can be seen that teaching Word processing takes 4 years in Hungary (Table II.). Basic algorithms or rather programming appears in Information Technology sooner, but recursion, list and tree data structures are only selectable part of the curriculum. Database management begins in the 9th grade. In grades 11-12 CS is just selectable. At basic level it is taught 2 hours weekly, on a higher level 3 hours weekly and a final exam can be taken.

TABLE II. The subjects of CS by grades in Hungary

Subject	Grade							
	5.	6.	7.	8.	9.	10.	11.	12.
Word processing		✔	✔	✔	✔			
Spreadsheet calculation				✔	✔			
Presentation						✔		
Algorithm and programming			✔	✔	✔			
Database management					✔			

III. INFORMATION TECHNOLOGY EDUCATION IN ROMANIA

The Romanian school system differs from the Hungarian one since the students take a country-wide ability test at the end of the 8th grade (Eurydice, 2008). Admittance into the secondary school they have opted is based on their scores. Those who would like enroll into a Mathematics-Informatics course of the chosen secondary school have to score higher in this country-wide test. In Romanian schools the bulk of the students have their first experience in Information Technology in the 9th grade. It also happens that students study Informatics in one class a week for one or two years in the 5th-8th grades in certain schools, but this is rare and the curriculum depends heavily on the teacher.

Syllabuses usually involve simply the use of Office tools. Algorithms and database management are not taught. It is a nation-wide phenomenon that Information Technology is taught from the 9th grade in Romania but the curriculum prescribes the subject matters covered and also determines the weekly number of Informatics classes.
If admitted to a social science course, there are one or two Informatics classes a week in the first two years of secondary school education. Students in the 9th grade are taught managing the operating system, word processing, e-mailing, using the Internet and preparing a simple homepage. Students in the 10th grade learn preparing presentations, spreadsheet calculation and database management so programming is still not mentioned.

Those who are admitted to a natural sciences course are taught Information Technology in 3-4 classes a week in secondary school; this number can be raised to 6-7 classes a week if you study in a Mathematics-Informatics course and have chosen to learn Informatics intensively.

Students admitted to a natural sciences course learn word processing, spreadsheet calculation and preparing presentations at a similar pace as students of social sciences courses but the higher weekly number of classes allows to deal with some other topics as well. The main task is to get to know the basic algorithms and the use of one-dimensional arrays in the 9th grade. To find and arrange various algorithms are parts of the curriculum in the 10th grade. Students in the 11th grade get acquainted with two-dimensional arrays, functions, procedures, stacks, lists, row data structures, binary trees and backtracking algorithms. In the 12th grade the focus is put on database management: preparation of databases, tables, relations, reports, queries and forms (Ministerul, E., 2009).

IV. COMPARISON TOOLS

It is possible to compare the Hungarian and Romanian Information Technology education examining the students' knowledge. Since it is quite difficult to send out questionnaires physically to the various schools and the order of the questions can not be changed in that case, and also because students sitting close to each other in the classroom can see the other's answers, so the most effective solution seemed to be a web-based Informatics test.

Some research was done making test to standardize the IT education in Switzerland (Bucher and Wirthensohn, 2004) and Austria (Micheuz, 2005).

Questions of various difficulties were formed in the main topics of Information Technology. The topics chosen were part of Informatics education in almost every country: theoretical knowledge, word processing, spreadsheet calculation, database management and programming. There can be significant deviations in the curricula of some countries; therefore the test was expanded with questions on cryptographical knowledge as well as formal languages and automats since in certain German provinces these are also part of the Information Technology curriculum (note: the test is appropriate to compare the IT education of other countries too.) (Kiss, 2008).

The database structure for the test had to be planned in a suitable way so that the data could be obtained later on. The personal data of the students filling in the test were put in a separate table as well as their answers to the questions. When filling in the test the students first had to give their actual grade and some other data. If students gave the username of their teacher then the teacher also could see how they succeeded and would get a feedback on their progress. *Grade* was important because he/she would get a question sheet depending on the grade given. Students could mark topics not taught to them (except basic information technology and office packages). If they marked one, the system would not ask questions dealing with the topic but saved it with the answer „I have never learned that". With this option students got fewer questions and answers would flow in at a quicker pace. Next, students could begin to fill in the test.

Every test question has 6 possible answers, only one of which is correct, 3 of them bad, and the 5th choice is: „I have never learned that", the 6th: „I have forgotten it". The answers „I have never learned that" and „I have forgotten it" show which part of the curriculum the students have not learned in that grade and if they could remember it or not. Every question has two time limits given in seconds. The first is the minimum time to read, understand and answer the question, the second is the maximum answering time. The software saves the total time used by the student. These time limits are not seen or known by the students. These are used during the evaluation so a correct answer is accepted only if it arrives in the available time interval. Teachers can register on this site too if they are willing to give some of their data. The system is protected by registration code, and registered teachers can log in with their username and password. If a student filling in the test gives the username of the teacher too than the teacher can later see his/her answers and the results. Some reports can be generated helping the work of the teacher. It is recorded whether the students have given them the right to inspect. It is also indicated if they have marked a question as not learned or if the topic of the question is familiar to them but they have forgotten the right answer.

The evaluation of the answers is only possible after processing the saved data. The first step is to check whether the students of the given country have learned the given topic. If they have not, the comparison with the data of the students of other countries is impossible to make.

If the students knew the topic because they had learned it, it had to be checked if the time spent answering the questions was within the limits given. If so, the answer could be accepted as right.

The mean and the standard deviation of the right answers had to be calculated in the various grades and countries and make comparisons with the help of statistical means. In order to be able to do this, enough students filling in the test were needed in each grade. When comparing the IT skills of students in two countries, the Independent Samples T-test was taken.

V. NUMBER OF PARTICIPIANTS

The knowledge of the Hungarian students specialized in Information Technology and that of the Romanian students attending a science course and a Mathematics- Informatics course are worth comparing only in the last two years of secondary school because the number of students filling in the test reaches the required amount there (Table III.).

TABLE III. The number of participants per grades and countries

Grades	Hungarian	Romanian	
	Informatics course	**sciences course**	**Mathematics-Informatics course**
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	69	94	212
12	91	87	158

After the examination it turns out what knowledge the students can acquire in the intensive Informatics training in the different countries and it is also revealed that the students of which country know more of the various topics.

VI.COMPARING THE INFORMATICS KNOWLEDGE OF HUNGARIAN AND ROMANIAN STUDENTS - SURVEY RESULTS

The web-test on Informatics was filled in by altogether 1002 students from 22 Romanian cities. The comparison between the Hungarian students receiving basic Information Technology education and the Romanian students attending a social science course can only be made in the 10th and 12th grades. The survey could not be carried out up to the 8th grade since teaching Informatics is only compulsory from the 9th grade in Romania; students do not learn Informatics in a uniform system and it depends on the teacher what is taught. In Hungary, students can learn more Informatics weekly in the last two years of secondary school if they choose it as an optional subject. In Romania students learn more Information Technology if they are specialized in natural science, and if attending a Mathematics-Informatics course then they have even more classes a week. So the comparison should be limited to the students learning Informatics in the last two years of secondary school.

A. Survey results of the Hungarian students specialized in Informatics and the Romanian students attending a science course in the second part of secondary school on the basis of topics

1) Result by subjects

The following table shows the results by countries and by subject (Table VI.). The mean shows how many questions could the students answer, the next column the ratio in percentage, and the last one the standard deviations.

TABLE IV. The mean and the standard deviation of right answers by Hungarian students specialized in Informatics and Romanian students attending a science course in the second part of secondary school on the basis of topics

Grade	Subject	Nationality of students	Mean	percent of the correct answers	Std. Deviation
11.	Theoretical knowledge	Hungarian	13,43	29,21%	7,61
		Romanian	8,33	18,12%	3,26
11.	Word processing	Hungarian	5,48	39,13%	3,30
		Romanian	3,00	21,43%	2,04
11.	Spreadsheet calculation	Hungarian	3,85	20,24%	1,97
		Romanian	2,50	13,16%	1,57
11.	Database management	Hungarian	3,09	17,15%	2,67
		Romanian	1,42	7,87%	1,38
11.	SQL	Hungarian	0,45	5,62%	1,55
		Romanian	0,00	0,00%	0,00
11.	Programming	Hungarian	7,09	27,26%	4,67
		Romanian	5,42	20,83%	1,68
11.	OOP	Hungarian	0,16	1,99%	0,66
		Romanian	0,00	0,00%	0,00
12.	Theoretical knowledge	Hungarian	16,81	36,55%	6,86
		Romanian	11,64	25,30%	5,14
12.	Word processing	Hungarian	5,75	41,05%	2,35
		Romanian	4,27	30,52%	2,00
12.	Spreadsheet calculation	Hungarian	4,59	24,18%	3,53
		Romanian	2,91	15,31%	2,12
12.	Database management	Hungarian	2,68	14,90%	2,92
		Romanian	4,09	22,73%	2,07
12.	SQL	Hungarian	1,22	15,25%	2,32
		Romanian	3,00	37,50%	2,65
12.	Programming	Hungarian	5,60	21,56%	3,96
		Romanian	6,36	24,48%	1,50
12.	OOP	Hungarian	0,23	2,88%	0,70
		Romanian	1,64	20,45%	1,57

Looking at the data in the table you can see that Hungarian students achieve better results in the field of theoretical knowledge, word processing, spreadsheet calculation, database management and programming in the 11th grade. They learn some SQL while the Romanian students do not. We have previously noticed that Hungarian students did not learn programming in the basic Information Technology education. They could answer right just 27% of the questions as a result of the first year spent in a specialized Informatics class. Object-oriented programming is missing form the education in both countries.

In the 12th grade the Hungarian students were still ahead in theoretical knowledge, word processing and spreadsheet calculation but Romanian students caught up in the field of database management. This is the grade where Romanian students get acquainted with this topic. Based on their scores you can say they learn more of SQL and show more proficiency in programming; the Hungarian students do not perform better any more. There is one essential difference between the educational programs of the two countries: Romanian students attending a science course learn the basics of object-oriented programming in the last year of secondary school while their Hungarian peers do not, not even in specialized Informatics classes.

2) Correlation between the subjects by Hungarian students specialized in Informatics and Romanian students attending a science course

A partial correlation calculation was done regarding the subjects in order to do a deeper analysis of the results by countries and grades (Falus-Ollé, 2008).

TABLE V. Correlation between the subject by Hungarian students specialized in Informatics in grade 11th

Subjects	Control Variables	Theoretical knowledge	Word processing	Spreadsheet calculation	Database management	Programming
Theoretical knowledge	Correlation	1,00	**0,68**	**0,71**	*0,29*	**0,79**
	Sig. (2-tailed)		0,00	0,00	0,02	0,00
Word processing	Correlation	**0,68**	1,00	**0,67**	*0,34*	**0,57**
	Sig. (2-tailed)	0,00		0,00	0,01	0,00
Spreadsheet calculation	Correlation	**0,71**	**0,67**	1,00	*0,36*	**0,74**
	Sig. (2-tailed)	0,00	0,00		0,02	0,00
Database management	Correlation	*0,29*	*0,34*	*0,36*	1,00	0,24
	Sig. (2-tailed)	0,02	0,01	0,01		0,39
Programming	Correlation	**0,79**	**0,57**	**0,74**	0,24	1,00
	Sig. (2-tailed)	0,00	0,00	0,00	0,39	

According to the table the results by Hungarian students in the 11th grade show positive calculated values of correlation between the subjects (Table V.). The calculated values show middle strong connection between theoretical knowledge and word processing, spreadsheet calculation and programming, between word processing and spreadsheet calculation, between spreadsheet calculation and programming. The strong of correlation is middle between word processing and programming. The calculated values show weak connection between theoretical knowledge and database management, between word processing and database management, between database management and programming. We can recognise same results with earlier analysing, the Hungarian students specialized in informatics learn more theoretical knowledge, word processing, spreadsheet calculation and programming but is not in this grade enough time to learn deep database management. We cannot see connection between database management and programming. I have not analysed the object oriented programming and SQL subject, because the number of successful answers was very low. We can in this point declare the Hungarian students specialized in informatics learn in 11th grade programming and learned earlier in basic course theoretical knowledge, word processing and spreadsheet calculation.

TABLE VI. Correlation between the subject by Hungarian students specialized in Informatics in grade 12th

Subjects	Control Variables	Theoretical knowledge	Word processing	Spreadsheet calculation	Database management	SQL	Programming
Theoretical knowledge	Correlation	1,00	**0,48**	*0,23*	*0,38*	0,18	*0,28*
	Sig. (2-tailed)		0,00	0,03	0,00	0,09	0,01
Word processing	Correlation	**0,48**	1,00	0,04	*0,30*	0,05	*0,26*
	Sig. (2-tailed)	0,00		0,74	0,00	0,63	0,01
Spreadsheet calculation	Correlation	*0,23*	0,04	1,00	*0,26*	0,14	*0,22*
	Sig. (2-tailed)	0,03	0,74		0,01	0,19	0,04
Database management	Correlation	*0,38*	*0,30*	*0,26*	1,00	*0,34*	**0,66**
	Sig. (2-tailed)	0,00	0,00	0,01		0,00	0,00
SQL	Correlation	*0,18*	0,05	0,14	*0,34*	1,00	*0,21*
	Sig. (2-tailed)	0,09	0,63	0,19	0,00		0,04
Programming	Correlation	*0,28*	*0,26*	*0,22*	**0,66**	*0,21*	1,00
	Sig. (2-tailed)	0,01	0,01	0,04	0,00	0,04	

In the table we can see the calculated values and the strength of the correlation between the subjects (Table VI.). The calculated values show middle connection between theoretical knowledge and word processing. The strong of correlation is middle between database management and programming. It means the correlation is stronger by these two subjects than one year earlier. The teachers have more time to teach database management in last grade in secondary school.

TABLE VII. Correlation between the subject by Romanian students attending a science course in grade 11th

Subjects	Control Variables	Theoretical knowledge	Word processing	Spreadsheet calculation	Database management	SQL	Programming
Theoretical knowledge	Correlation	1,00	**0,48**	*0,23*	**0,60**	-0,05	0,12
	Sig. (2-tailed)		0,01	0,24	0,00	0,80	0,56
Word processing	Correlation	**0,48**	1,00	**0,40**	**0,45**	-0,13	0,03
	Sig. (2-tailed)	0,01		0,04	0,02	0,51	0,90
Spreadsheet calculation	Correlation	*0,23*	**0,40**	1,00	0,15	0,12	-0,16
	Sig. (2-tailed)	0,24	0,04		0,45	0,56	0,42
Database management	Correlation	**0,60**	**0,45**	0,15	1,00	0,07	0,17
	Sig. (2-tailed)	0,00	0,02	0,45		0,74	0,40
SQL	Correlation	-0,05	-0,13	0,12	0,07	1,00	-0,12
	Sig. (2-tailed)	0,80	0,51	0,56	0,74		0,56
Programming	Correlation	0,12	0,03	-0,16	0,17	-0,12	1,00
	Sig. (2-tailed)	0,56	0,90	0,42	0,40	0,56	

According to the table the results by Romanian students attending a science course in the 11th grade show mostly positive calculated values of correlation between the subjects (Table VII.). The calculated values show middle strong connection between theoretical knowledge and database management. The strong of correlation is middle between theoretical knowledge and word processing, between database management and word processing. It means Romanian students attending a science course in the 11th have more chance to learn database management than Hungarian their peers.

TABLE VIII. Correlation between the subject by Romanian students attending a science course in grade 12th

Subjects	Control Variables	Theoretical knowledge	Word processing	Spreadsheet calculation	Database management	SQL	Programming	OOP
Theoretical knowledge	Correlation	1,00	0,28	**0,45**	**0,44**	0,34	**0,44**	0,10
	Sig. (2-tailed)		0,24	0,05	0,00	0,14	0,05	0,69
Word processing	Correlation	0,28	1,00	0,19	**0,38**	0,38	**0,61**	0,26
	Sig. (2-tailed)	0,24		0,43	0,10	0,09	0,00	0,27
Spreadsheet calculation	Correlation	**0,45**	0,19	1,00	**0,46**	0,42	0,16	0,14
	Sig. (2-tailed)	0,05	0,43		0,05	0,07	0,50	0,55
Database management	Correlation	**0,44**	**0,38**	**0,46**	1,00	**0,46**	0,33	**0,54**
	Sig. (2-tailed)	0,00	0,10	0,05		0,04	0,15	0,01
SQL	Correlation	0,34	0,38	0,42	**0,46**	1,00	0,21	**0,63**
	Sig. (2-tailed)	0,14	0,09	0,07	0,04		0,37	0,00
Programming	Correlation	**0,44**	**0,61**	0,16	0,33	0,21	1,00	0,04
	Sig. (2-tailed)	0,05	0,00	0,50	0,15	0,37		0,85
Object Oriented Programming	Correlation	0,10	0,26	0,14	**0,54**	**0,63**	0,04	1,00
	Sig. (2-tailed)	0,69	0,27	0,55	0,01	0,00	0,85	

In the table we can see the calculated values and the strength of the correlation between the subjects (Table VIII). The calculated values show by Romanian students attending a science course in the 12th grade middle strong correlation between programming and word processing, between Object Oriented Programming and SQL, database management. The strong of correlation is middle between theoretical knowledge and database management, spreadsheet calculation and programming, between word processing and database management, between spreadsheet calculation and database management. It means the Romanian students attending a science course in the 12th learn more subjects than their Hungarian peers, the Romanian teachers concentrate on more subjects than Hungarian teachers.

3) Analysis of the means by subjects

The next step in the analysis was to inspect whether the means by subject would differ if using the Independent samples test. The null hypothesis was that no significant difference would exist between the means of all subjects by countries. Because of having two independent samples it was possible to use the T-test to decide whether the hypothesis was true or not (Table IX.). If the analysis of the results (*Levene test*) showed the variance of the two groups different ($p<0,05$) (Levene, 1960), in this case the means could be compared with *Welch's t test* ($p<0,05$) (Welch, 1947), else the means could be compared with *T-test* ($p<0,05$) (Nahalka, 1993).

TABLE IX. Independent sample test of Hungarian students specialized in Informatics and Romanian students attending a science course in the second part of secondary school on the basis of topics

Grade	**Subject**	**Levene's test for Equality of variances**		**T-test for equality of means**		**means are different**
		F	**Sig.**	**t**	**Sig. (2-tailed**	
11.	Theoretical knowledge	3,89	0,05	2,28	0,03	yes
11.	Word processing	3,33	0,07	2,51	0,01	yes
11.	Spreadsheet calculation	0,04	0,84	2,08	0,05	yes
11.	Database management	8,29	0,01	2,11	0,00	yes
11.	SQL	4,26	0,04	1,00	0,02	yes
11.	Programming	7,74	0,01	1,22	0,03	yes
11.	OOP	3,04	0,08	0,84	0,40	no
12.	Theoretical knowledge	0,63	0,43	2,42	0,02	yes
12.	Word processing	0,23	0,63	1,99	0,05	yes
12.	Spreadsheet calculation	4,08	0,04	1,57	0,03	yes
12.	Database management	1,00	0,32	-1,55	0,12	no
12.	SQL	1,01	0,32	-2,37	0,02	yes
12.	Programming	5,45	0,02	-0,63	0,23	no
12.	OOP	18,58	0,00	-5,31	0,01	yes

Having finished the statistical analysis you can see there are no differences in object-oriented programming between Hungarian and Romanian students in the 11th grade; they do not learn this topic at all. Hungarian students have better IT skills and programming knowledge in this grade.

In the 12th grade the Hungarian students do not obtain higher scores in database management and programming anymore; there are no differences between the means of correct answers, the Romanian students caught up with their Hungarian counterparts, but there are significant differences between the means of good answers concerning the other fields of Information Technology. That means Hungarian students have better IT skills but not deeper programming knowledge in this grade.

B. Survey results of the Hungarian students specialized in Informatics and the Romanian students attending a Mathematics-Informatics course in the second part of secondary school on the basis of topics

1) Result by subjects

The following table shows the results by countries and by subject (Table X.). The mean shows how many questions could the students answer, the next column shows the ratio in percentage and the last one the standard deviations.

TABLE X. The mean and the standard deviation of right answers by Hungarian students specialized in Informatics and Romanian students attending a Mathematics-Informatics course in the second part of secondary school on the basis of topics

Grade	Subject	Nationality of students	Mean	percent of the correct answers	Std. Deviation
11.	Theoretical knowledge	Hungarian	13,43	29,21%	7,61
		Romanian	12,41	26,97%	4,01
11.	Word processing	Hungarian	5,48	39,13%	3,30
		Romanian	3,85	27,51%	2,20
11.	Spreadsheet calculation	Hungarian	3,85	20,24%	1,97
		Romanian	3,41	17,93%	2,15
11.	Database management	Hungarian	3,09	17,15%	2,67
		Romanian	3,26	18,11%	2,60
11.	SQL	Hungarian	0,45	5,62%	1,55
		Romanian	0,59	7,41%	1,28
11.	Programming	Hungarian	7,09	27,26%	4,67
		Romanian	10,70	41,17%	2,66
11.	OOP	Hungarian	0,16	1,99%	0,66
		Romanian	0,00	0,00%	0,00
12.	Theoretical knowledge	Hungarian	16,81	36,55%	6,86
		Romanian	15,30	33,26%	4,92
12.	Word processing	Hungarian	5,75	41,05%	2,35
		.Romanian	5,70	40,71%	2,27
12.	Spreadsheet calculation	Hungarian	4,59	24,18%	3,53
		Romanian	5,20	27,37%	2,63
12.	Database management	Hungarian	2,68	14,90%	2,92
		Romanian	5,75	31,94%	3,11
12.	SQL	Hungarian	1,22	15,25%	2,32
		Romanian	4,05	50,63%	3,33
12.	Programming	Hungarian	5,60	21,56%	3,96
		Romanian	13,05	50,19%	2,98
12.	OOP	Hungarian	0,23	2,88%	0,70
		Romanian	1,05	13,13%	1,54

In the 11th grade Hungarian students attending an Informatics course performed better in theoretical knowledge, word processing, spreadsheet calculation, database management and programming than Romanian students attending a science course. On the basis of the data in the table this advantage remains only in the field of word processing if compared with the scores of the Romanian students attending a Mathematics-Informatics course; word processing is noticeably more emphasized in Hungary. The topic of SQL is only mentioned in both countries. Romanian students had higher scores in programming. They have not learned object-oriented programming in this grade yet.

In the 12th grade the Hungarian advantage in the field of word processing disappears, Romanian students achieved the same scores. They even produced better results in the field of database management, SQL and programming than their Hungarian peers and their results are similar to those of the students attending a science course since object-oriented programming appears in this grade.

2) Correlation between the subjects by Romanian students attending a Mathematics-Informatics course

We have seen earlier the partial correlation by Hungarian students specialized in Informatics and Romanian students attending a science course. The following tables show the calculated values of correlation by Romanian students attending Mathematics-Informatics course it helps to do a deeper analysis of the results by countries and grades.

TABLE XI. Correlation between the subject by Romanian students attending a Mathematics-Informatics course in grade 11th

Subjects	Control Variables	Theoretical knowledge	Word processing	Spreadsheet calculation	Database management	Programming
Theoretical knowledge	Correlation	1	0,16	-0,23	0,19	0,12
	Sig. (2-tailed)		0,62	0,47	0,56	0,72
Word processing	Correlation	0,16	1	**0,57**	0,16	-0,27
	Sig. (2-tailed)	0,62		0,05	0,61	0,94
Spreadsheet calculation	Correlation	-0,23	**0,57**	1	-0,23	-0,09
	Sig. (2-tailed)	0,47	0,05		0,47	0,79
Database management	Correlation	0,19	0,16	-0,23	1	0,12
	Sig. (2-tailed)	0,56	0,61	0,47		0,72
Programming	Correlation	0,12	-0,27	-0,09	0,79	1
	Sig. (2-tailed)	0,72	0,94	0,79	0,12	

According to the table the results by Romanian students attending a Mathematics-Informatics course in the 11th grade show mostly positive calculated values of correlation between the subjects (Table XI.). The calculated values show middle strong connection between spreadsheet calculation word processing.

TABLE XII. Correlation between the subject by Romanian students attending a Mathematics-Informatics course in grade 12th

Subjects	Control Variables	Theoretical knowledge	Word processing	Spreadsheet calculation	Database management	SQL	Programming	OOP
Theoretical knowledge	Correlation	1,00	0,47	**0,62**	**0,70**	0,55	0,01	0,50
	Sig. (2-tailed)		0,14	0,04	0,02	0,08	0,78	0,12
Word processing	Correlation	0,47	1,00	0,10	0,38	0,51	0,01	0,38
	Sig. (2-tailed)	0,14		0,77	0,25	0,11	0,78	0,25
Spreadsheet calculation	Correlation	**0,62**	0,10	1,00	**0,80**	**0,71**	-0,05	0,38
	Sig. (2-tailed)	0,04	0,77		0,00	0,01	0,88	0,25
Database management	Correlation	**0,70**	0,38	**0,80**	1,00	**0,79**	-0,14	**0,72**
	Sig. (2-tailed)	0,02	0,25	0,00		0,00	0,68	0,01
SQL	Correlation	0,55	0,51	**0,71**	**0,79**	1,00	-0,40	0,46
	Sig. (2-tailed)	0,08	0,11	0,01	0,00		0,21	0,16
Programming	Correlation	0,01	0,01	-0,05	-0,14	-0,40	1,00	-0,11
	Sig. (2-tailed)	0,78	0,78	0,88	0,68	0,21		0,75
Object Oriented Programming	Correlation	0,50	0,38	0,38	**0,72**	0,46	-0,11	1,00
	Sig. (2-tailed)	0,12	0,25	0,25	0,01	0,16	0,75	

According to the table the results by Romanian students attending a science course in the 11th grade show mostly positive calculated values of correlation between the subjects (Table XII.). If we make a comparison with the results by 11th grade we can recognize more middle and middle strong correlation values between the subjects. The calculated values show middle strong connection between database management and spreadsheet calculation, SQL. The strong of correlation is middle between theoretical knowledge and database management, spreadsheet calculation, between spreadsheet calculation and SQL, between database management and Object Oriented Programming. It means Romanian students attending a Mathematics-Informatics course in the 12th could learn more in topic database management, SQL, Object Oriented Programming, spreadsheet calculation and SQL than Hungarian their peers.

3) Analysis of the means by subjects

The next step in the analysis was to inspect whether the means by subject would differ if using the Independent samples test (Table VII.).

TABLE XIII. Independent sample test of Hungarian students specialized in Informatics and Romanian students attending a Mathematics-Informatics course in the second part of secondary school on the basis of topics

Grade	**Subject**	**Levene's test for Equality of variances**		**T-test for equality of means**		**means are different**
		F	**Sig.**	**t**	**Sig. (2-tailed**	
11.	Theoretical knowledge	4,99	0,03	0,67	0,39	no
11.	Word processing	3,20	0,08	2,36	0,02	yes
11.	Spreadsheet calculation	0,93	0,34	0,77	0,44	no
11.	Database management	0,01	0,91	-0,29	0,77	no
11.	SQL	0,21	0,65	-0,43	0,67	no
11.	Programming	6,30	0,01	-3,79	0,00	yes
12.	Theoretical knowledge	1,58	0,21	0,93	0,26	no
12.	Word processing	0,05	0,82	0,08	0,93	no
12.	Spreadsheet calculation	2,86	0,09	-0,75	0,45	no
12.	Database management	0,45	0,50	-4,20	0,00	yes
12.	SQL	10,76	0,00	-4,53	0,00	yes
12.	Programming	0,67	0,42	-7,92	0,00	yes
12.	OOP	31,42	0,00	-3,67	0,03	yes

Looking at the table containing the statistical data you can see that the analysis carried out on the basis of percentile data has proved to be correct.

In the 11th grade Romanian students achieved better results in programming, while their Hungarian peers were better in word processing but they have the same knowledge in the other fields.

In the 12th grade the Romanian students caught up with the Hungarians in the field of word processing and achieved better results in programming (at OOP too), database management and SQL. Romanian students attending a Mathematics-Informatics course students have the same IT skills and better programing knowledge at the end of the secondary grammar school than Hungarians specialized in Informatics.
Next, a deeper analysis of the different topics of programming follows.

Comparing the Programming knowledge of Hungarian students specialized in Informatics with Romanian students attending a science course in the second part of secondary school

Hungarian students do not learn programming in a basic Informatics course (Kiss, 2011a, Kiss, 2011b). This means only scores of those students can be analyzed who have chosen Informatics as an optional subject and learn Informatics in the last two years of secondary school (Kiss, 2010a). Earlier significant differences were found between the means of good answers in programming at the 11th grade (table). A deeper analysis of the different programming topics was needed to make a decision about the second hypothesis as it was in the case when knowledge by genders was discussed in Hungarian grammar schools (Kiss, 2010b) and higher education (Kiss, 2010c). It was found in another study that male teachers expressed greater knowledge about computers than female teachers. 23.8% of science teachers (Akdemir, Ocak, 2008).

The following table is a break-down by programming topics, showing what percent of students of this grade could answer correctly the questions put to them (Table VIII.).

Once again a Z-test (Korpás, 2002) was accomplished in order to know if the means by Programming topics were equal or not.

In the above case the null hypothesis was that no significant difference existed between the means by nationality. The monitoring was held on the p=5% significance level. The critical value of Z-test was between -1,96 and 1,96 at p=5% significance level. If the calculated value of Z-test was in this range, the null hypothesis could be kept. The next table shows the calculated values of Z-test and the decision on keeping or not the null hypothesis by nationality.

TABLE XIV. How many percent of students answered successfully the questions - grouping by Hungarian students specialized in Informatics and Romanian students attending a science course in the nationality in the 11th grade

	Hungarian		**Romanian**			
Programming topic	**%**	**Std. dev.**	**%**	**Std. dev.**	**Value of Z-test**	**Decision**
Flowchart	35,2%	0,48	14,3%	0,36	-1,18	The means are equal
Structogram	22,0%	0,42	4,8%	0,22	-0,52	The means are equal
FOR cycle	43,4%	0,50	35,7%	0,48	-2,74	The means are not equal
Repeat-Until cycle	19,2%	0,40	14,3%	0,35	-1,44	The means are equal
Do-While cycle	26,4%	0,44	9,5%	0,30	-0,93	The means are equal
Parameter passing	16,5%	0,37	28,6%	0,46	-2,49	The means are not equal
Sort algorithm	14,3%	0,37	26,2%	0,45	-2,36	The means are not equal
Array management	9,9%	0,30	4,8%	0,22	-0,70	The means are equal
Subroutine	42,9%	0,50	36,5%	0,49	-2,67	The means are not equal
Stack management	12,1%	0,33	23,8%	0,44	-2,23	The means are not equal
binary three knowledge	6,0%	0,24	7,1%	0,26	-1,09	The means are equal
list knowledge	19,2%	0,40	21,4%	0,42	-1,96	The means are equal
Recursion	15,0%	0,48	22,2%	0,42	-1,98	The means are not equal
binary search algorithm	11,0%	0,31	19,0%	0,40	-1,92	The means are equal
The Eight Queens Problem	25,0%	0,28	14,3%	0,36	-1,64	The means are equal

According to the table it can be asserted at p=5% significance level that Hungarian students specialized in Informatics and Romanian students attending a science course are not on the same knowledge level regarding the different programming topics in the 11th grade (Table). Hungarian students answered the FOR cycle and subroutine questions more successfully, but, on the other hand, Romanian students had the same or even better knowledge in parameter passing, sort algorithm, stack management and recursion. Romanian students attending a science course in the 11th grade have more practice in Programming than Hungarian ones specialized in Informatics. To offset this disadvantage Hungarian teachers should start to teach programming already in the 7th grade (in accordance with the National Basic Curriculum).

Comparing the Programming knowledge of Hungarian students specialized in Informatics with Romanian students attending a Mathematics-Informatics course in the second part of secondary school

Earlier significant differences were found between the means of good answers regarding programming topics in the 11th grade as well as in the 12th grade (Table IX.). A further analysis is made to see the differences by programming topics.

The following table is a break-down by programming topics, showing what percent of students in the 11th grade could answer correctly the questions put to them.

TABLE XV. Percent of students answering successfully the questions - grouping by Hungarian students specialized in Informatics and Romanian students attending a Mathematics-Informatics course in the 11th grade

	Hungarian		**Romanian**			
Programming topic	**%**	**Std. dev.**	**%**	**Std. dev.**	**Value of Z-test**	**Decision**
Flowchart	35,2%	0,48	65,0%	0,49	-5,05	The means are not equal
Structogram	22,0%	0,42	10,0%	0,31	-1,01	The means are equal
FOR cycle	43,4%	0,50	85,0%	0,36	-8,55	The means are not equal
Repeat-Until cycle	19,2%	0,40	32,5%	0,47	-2,66	The means are not equal
Do-While cycle	26,4%	0,44	52,5%	0,51	-4,03	The means are not equal

Parameter passing	16,5%	0,37	60,0%	0,50	-4,93	The means are not equal
Sort algorithm	14,3%	0,37	20,0%	0,41	-1,88	The means are equal
Array management	9,9%	0,30	40,0%	0,50	-3,29	The means are not equal
Subroutine	42,9%	0,50	70,0%	0,46	-5,62	The means are not equal
Stack management	12,1%	0,33	25,0%	0,44	-2,26	The means are not equal
binary three knowledge	6,0%	0,24	10,0%	0,30	-1,32	The means are equal
list knowledge	19,2%	0,40	47,5%	0,51	-3,75	The means are not equal
Recursion	15,0%	0,48	35,0%	0,48	-2,80	The means are not equal
binary search algorithm	11,0%	0,31	55,0%	0,51	-4,52	The means are not equal
The Eight Queens Problem	25,0%	0,28	40,0%	0,50	-3,38	The means are not equal

According to the table it can be said at p=5% significance level that bigger part of Romanian students students attending a Mathematics-Informatics course could give correct answers than Hungarian students specialized in Informatics, except the topics Structogram, Sort algorithm and binary tree knowledge where knowledge levels were about the same. This means that the programming skill of Romanian students was higher than that of their Hungarian counterparts. At this point it should be noticed once again that Hungarian students start to learn programming later, because a big part of teachers omit this subject from the Information Technology Education of secondary schools which is however against the regulations of the National Basic Curriculum (prescribing it from the 7^{th} grade).

Now let's analyse the situation in the 12th grade too! The following table is a break-down by programming topics, showing what percent of students in the 12^{th} grade could answer correctly the questions put to them (Table X.).

TABLE XVI. Percent of students answering successfully the questions - grouping by Hungarian students specialized in Informatics and Romanian students attending a Mathematics-Informatics course in the 12th grade

	Hungarian		**Romanian**			
Programming topic	**%**	**Std. dev.**	**%**	**Std. dev.**	**Value of Z-test**	**Decision**
Flowchart	35,2%	0,48	60,0%	0,50	-4,52	The means are not equal
Structogram	22,0%	0,42	15,0%	0,37	-1,40	The means are equal
FOR cycle	43,4%	0,50	65,0%	0,48	-5,14	The means are not equal
Repeat-Until cycle	19,2%	0,40	37,5%	0,49	-3,01	The means are not equal
Do-While cycle	26,4%	0,44	65,0%	0,48	-5,27	The means are not equal
Parameter passing	16,5%	0,37	55,0%	0,50	-4,44	The means are not equal
Sort algorithm	14,3%	0,37	37,5%	0,49	-3,08	The means are not equal
Array management	9,9%	0,30	40,0%	0,50	-3,29	The means are not equal
Subroutine	42,9%	0,50	78,3%	0,42	-6,93	The means are not equal
Stack management	12,1%	0,33	40,0%	0,50	-3,28	The means are not equal
binary three knowledge	6,0%	0,24	22,5%	0,42	-2,24	The means are not equal
list knowledge	19,2%	0,40	65,0%	0,48	-5,43	The means are not equal
Recursion	15,0%	0,48	40,0%	0,49	-3,15	The means are not equal
binary search algorithm	11,0%	0,31	50,0%	0,51	-4,08	The means are not equal
The Eight Queens Problem	25,0%	0,28	50,0%	0,51	-4,15	The means are not equal

According to the table Romanian students attending a Mathematics-Informatics course could answer the programming questions more successfully than Hungarian students specialized in Informatics in the 12^{th} grade, except by Structograms, where their knowledge was the same. The programming skill of Romanian students was better than that of the Hungarian students before the final exam. Romanian students making their final exam of Information Technology and intending to go to the university or college can start their programming studies from a higher level and do not need to spend much time to acquire the basics of programming. On the contrary, Hungarian students have many problems with basic programming too, so they first have to fix this after entering university or college (generally in their first year) and they can be taught only after that on a higher level. Therefore, Hungarian teachers should make more efforts when teaching programming in the secondary grammar schools if their students choose Information Technology as a final exam subject or when they decide to teach this part of Information Technology earlier. Also, more classes in Information Technology could be helpful too. On the other hand, university lecturers teaching programming should be aware of their students having problems with programming basics and find a way to make up for lost ground.

VII. CONCLUSION

One of my starting hypothesises was that the Hungarian students specialized in Informatics would do better than their Romanian peers attending a science course.

This proved to be true in the 11th grade except for object oriented programming a subject left out of the education in both countries.

In the 12th grade Romanian students achieved better results in object oriented programming and SQL, and achieved the same result in programming and database management. Hungarian students performed better at theoretical knowledge, word processing and spreadsheet calculation in both grades. Here you can see the advantage of more weekly classes (3-4) taught in science courses of Information Technology Education in Romania. The students can make up for their handicap, and have same knowledge in programming and database management, and even more so in object oriented programming. Their Hungarian peers have higher Computer Science knowledge level at the end of the secondary grammar school.

Another starting hypothesis was that as for Computer Science literacy and programming knowledge Romanian students attending a science course and a Mathematics-Informatics course would reach the same scores than the Hungarian students specialized in Information Technology.

This assumption turned out to be partly correct in the 11th and 12th grade. Hungarian students received higher scores in word processing, while Romanians in programming. They achieved the same scores in the other topics of Information Technology in the 11th grade.

Romanian students attending a Mathematics-Informatics course have the same Computer Science knowledge level and better programing knowledge in the 12th grade than Hungarian students specialized in Informatics.

Here must be mentioned that while in Romania object-oriented programming has been discussed in these two courses, in Hungary students do not learn it, not even in a specialized Informatics course, though those who have to deal with programming cannot avoid getting to know this field thoroughly later on.

Now a final conclusion can be made: Romanian students of the Real Profile (i.e. the Sciences program) have the same or more practice in programming than Hungarian students specialized in Informatics, though the latters have the same or better Computer Science literacy. Unfortunately, Hungarian teachers concentrate on word processing and spreadsheet calculation and teach programming just for the students specialized in Informatics, although algorithm thinking would be important for every student before finishing secondary school. After the calculating values of the partial correlation we have got same results by subject.

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PROJECT-BASED LEARNING WITH AN ONLINE PEER ASSESSMENT SYSTEM IN A PHOTONICS INSTRUCTION FOR ENHANCING LED DESIGN SKILLS

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ABSTRACT
This study proposed a novel instructional approach, a two-stage LED simulation of Project-based learning (PBL) course with online peer assessment (OPA), and explored how to apply OPA to the different structured problems in a PBL course to enhance students' professional skills in LED design as well as meta-cognitive thinking. The participants of the study, 73 junior students were divided into two groups, OPA group (with OPA) and Traditional group (without OPA). The evaluation results were listed as follows. (1) OPA group performed better than Traditional group in concept clarification. (2) For the enhancement of LED design skills in well-structured problem solving, OPA group performed better than Traditional group. (3) For the enhancement of LED design skills in ill-structured problem solving, there was no significant difference between the performances of these two groups. (4) For students' perception about the effect of OPA applied in PBL, OPA group could benefit from inquiry learning and reflective thinking. Most students agreed that the two-stage LED simulation of PBL course was challenging and interesting and they learned useful things from the course.
Keywords: Cooperative/collaborative learning, interdisciplinary projects, improving classroom teaching.

INTRODUCTION
The application scope of LED devices has widened recently. Taiwan has gained the second largest market share in the global LED market since 2002 and its market size for LEDs will be NT$540 billion in 2015 (Huang, 2009). Efficiently fostering LED device design professionals has become an issue in higher education to meet the growing demand for the engineers in Taiwan's LED industry. For a student in higher education to successfully completing a LED design requires prior knowledge of semiconductor physics, quantum mechanics, optoelectronics, and material science. Universities need to offer an interdisciplinary curriculum that combines theory and practice to engage students in authentic real-world tasks and to develop their skills in problem solving (Macías-Guarasa, Montero, San-Segundo, Araujo, & Nieto-Taladriz, 2006).

Project-based learning (PBL), a student-centered teaching approach, enables students to integrate their knowledge, skills, values, and attitudes and to construct knowledge through a variety of learning experiences (Maskell & Grabau, 1998). Students deal with interdisciplinary issues as well as pursue solutions to a problem by asking and refining questions, debating ideas, making predictions, collecting and analyzing data, drawing conclusions, and communicating their findings to others (Macías-Guarasa et al., 2006). Moreover, with the assistant of computer simulation technology, the strength of PBL has been highly enhanced for the decades. Simulation-assisted learning (SAL) can help students understand the real world, be able to explore and test hypotheses, and come to a reasoned explanation of the phenomenon in question (Lunette and Hofstein, 1991; Stern et al., 2006). Furthermore, the time and cost required for the development of the products can be markedly reduced by the elimination of unnecessary trial fabrications (Yaeger et al., 2004; Chang, Chen, Kuo, & Shen, 2011). Nevertheless, some studies have revealed that the simulation itself cannot provide an abundant learning environment and that one-on-one simulation-based instruction cannot enrich knowledge acquisition (Rieber & Parmley, 1995).

Peer assessment recently has often been applied as an alternative assessment method in many different fields, (Strachan & Wilcox, 1996; Falchikov & Goldfinch, 2000). In the process of peer assessment, students are able to evaluate and learn from peers' work and comments, then work with self-comparison; discover the shortcomings of their own work, and determine the right way to improve their works (Topping, 1998; McGourty, 2000). Thus, the process enhances students' meta-cognitive understanding about their own learning process (Wen & Tsai, 2006; Liu & Lin, 2007); and develops their social and transferable skills (Topping, 1998), and helps them to clarify their misconceptions.

With the vigorous development of information networks, online peer assessment (OPA) has been a success, which provides a more comfortable learning environment that is free from geographic and time constraints. It also allows participants to work and be graded anonymously (Davies, 2000; Lin, Liu, & Yuan, 2001; Liu, Lin, Chiu, & Yuan, 2001; Tsai, Liu, Lin, & Yuan, 2001; Freeman & McKenzie, 2002; Liu & Lin, 2007; Shih, 2011). Many studies have focused on the factors that affect the performance of OPA, including the number of OPAs (Tsai et al., 2001), students' perception and attitudes about PA and OPA (Wen & Tsai, 2006), teachers' perception about PA (Wen, Tsai, & Chang, 2006), provision of prerequisite instruction and training of OPA for students before conducting OPA (Orsmond & Merry, 1996), and PA in a Web-based portfolio assessment environment (Chang, Tseng, & Lou, 2011).

As for the literature of students' perception and attitudes about OPA, Wen & Tsai (2006) developed an instrument to examine university students' opinions toward OPA. Four subscales, Positive Attitudes, Online Attitudes, Understanding-and-Action, and Negative Attitudes, were extracted. Results revealed that participating students held positive attitudes toward the use of PA activities, but they viewed OPA as a technical tool to facilitate assessment processes, rather than as a learning aid. Moreover, most of the students suggested that the PA score should be counted as a small part of the total course grade, and there was an effect of the perceived importance of PA score on students' attitudes toward these four subscales.

However, few literature deals with how OPA works in different structured problems in a PBL course and students' perception about the effect of OPA applied in PBL, which could be an important guidance for teachers to successfully implement OPA in PBL. This study proposed a novel instructional approach, a two-stage LED simulation of PBL course with OPA to enhance students' learning performance in LED design. Moreover, the study explored how to apply OPA according to the structured level of a problem in a PBL course to enhance students' meta- cognitive thinking. Knowledge maps, a photonics scoreboard, and the Constructivist Project-based Learning Environment Survey (CPLES) (Chang, 2006), quantitative research approach, were conducted to demonstrate the effects of this learning course. Furthermore, an in-depth-interview, a qualitative research approach, was used to gather an in-depth understanding of students' behavior and the reasons that govern such behavior. The study addressed the following research issues. (1) The effect of OPA upon concept clarification. (2) The effect of OPA upon enhancing LED design skills in structured problem solving. (3) The effect of OPA upon enhancing LED design skills in ill-structured problem solving. (4) Students' perception about the effect of OPA applied in PBL.

Two-stage LED simulation of PBL course with OPA

According to the theories of constructivism (Honebein, 1996; Wilson, 1996; Tsai, 1998; 2000) and cognitive load (Sweller, Van-Merrienboer, & Paas, 1998), the two-stage LED simulation of PBL course with OPA was developed to enhance students' professional skills in LED design as well as meta-cognitive thinking (Chang, Chen, Kuo, & Shen, 2011). The computer simulation software, APSYS, developed by the Crosslight Software Inc., Canada, was adopted in the PBL course. To achieve the above objectives, the LED simulation of PBL course was divided into two stages. The first stage aims to help students learn the operation of APSYS and realize the concept of the active region and how parameters influence an LED. Thus, the project at the first stage was developed as a well-structured problem which was easier for students to solve. The goal of the second stage was to help students realize that several parameter settings could achieve the development goal for the given wavelength, current, and power. Students should find an optimal solution among these parameter settings. The project at the second stage was developed as an ill-structured problem which provided more challenge for students to overcome.

Fig. 1 shows the LED simulation of PBL with OPA. First, the instructor assigned a project to all the teams. Second, the students discussed this between themselves and researched information online and in textbooks or technical journals to form their initial ideas. Third, students performed simulations to clarify their concepts. In this step, the teammates were expected to produce a solution to their set project following the simulation. In the fourth step, students checked if their solutions met the aim of the project. Students who had met the objective at this stage finished the simulation. Students who had not achieved the project goal were required to repeat steps 3–5. Repeating steps 3–5 helps students to build their concepts of the operating principle of LEDs. In the sixth step, all teams compared their results when they had achieved the objective. The team online PA step enabled the students to examine each others' results to understand how to gain better results by using different parameters.

The structure of a blue LED used in this study is shown in Fig. 2. In the first stage, students were asked to adjust the InGaN well layer, the Shockley–Read–Hall (SRH) lifetime, and the internal loss in order to learn how these parameters influence the performance of the LED. For instance, increasing the indium (In) composition in the InGaN well layer lengthens the wavelength; decreasing the thickness of the InGaN well layer shortens the wavelength; reducing the internal loss can raise the output power and internal quantum efficiency.

Two objectives were included in the second simulation stage. The first was to design an LED with a wavelength of 460 nm, an injection current of 30 mA, and an output power of 1.5 mW, according to the study of Oder et al. (2004). The other objective was to design an LED with a wavelength of 476 nm, an injection current of 35 mA, and an output power of 1 mW, after the paper of Choi et al. (2003). In this stage, students attempted to reach the given targets based on the concepts that were established in the first stage.

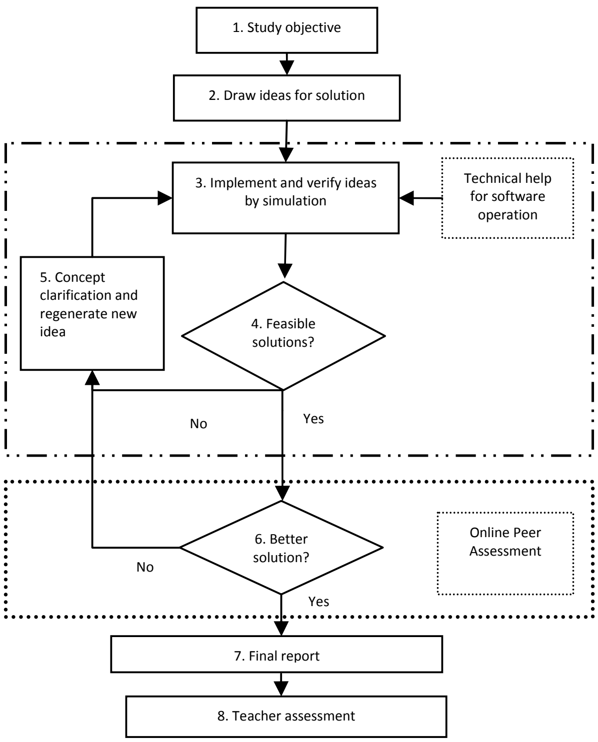

Fig. 1. Process of simulation-based learning with online peer assessment.

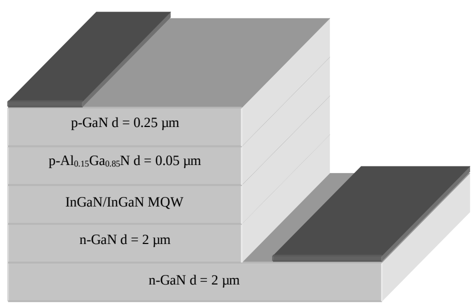

Fig. 2. Structure of the blue LED under study.

Online peer assessment

In the OPA system, there were two kinds of identities: teacher (administrator) and student. Fig. 3 showed the OPA system provided teacher with the mechanisms to control and manage OPA process. The functions of OPA system were to upload students' homework, assess each other, and provide suggestions about others' projects. The study conducted OPA three times. Only the last two scores were adopted as the evaluation, since the first one was given to students as the OPA training to ensure its feasibility.

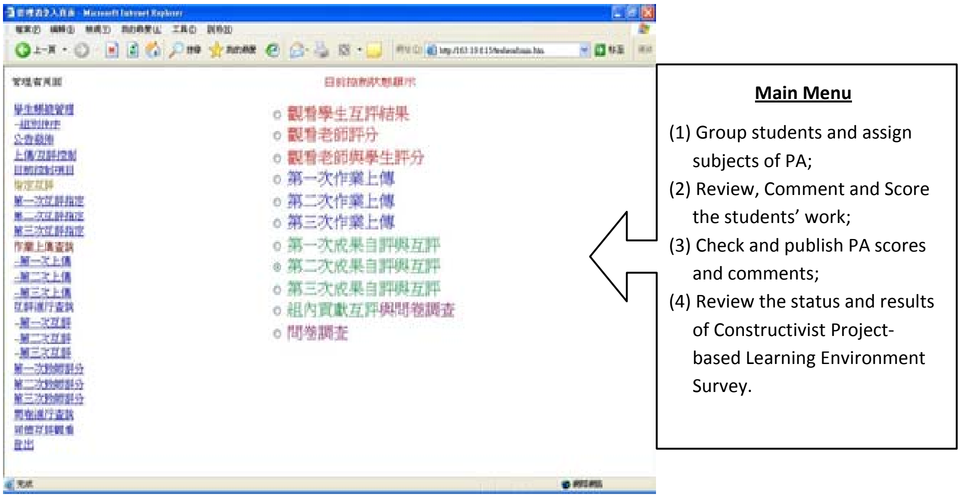

Fig. 3. Administrator control interface of OPA.

RESEARCH METHODOLOGY

Participants

The participants of the study were 73 junior students of two classes, the Department of Physics, National Changhua University of Education, Taiwan. This instruction was implemented in a one-semester Experimental Physics.

Experimental design

The 73 junior students were divided into two groups. One group was labeled as "OPA group" (with OPA); the other was labeled as "Traditional group" (without OPA). In addition to learning the operating principle of LEDs by SAL, the teams of OPA group were requested to review the other three teams' projects and give review comments twice at each stage. Therefore, each team received review comments from three teams to help clarify their concepts and correct the parameters of their LED design. The teams of Traditional group learned the operating principle of LEDs only by SAL and worked on the project without OPA.

Evaluation tools

As mentioned, the study measured students' knowledge, skill, and attitude in terms of three evaluation tools, a knowledge map, a photonics scoreboard, and the CPLES, respectively.

The knowledge map was adopted to evaluate the students' understanding of the principles of LED operation. In the project-based instruction procedure, students were required to present their concepts of the LED via a knowledge map both before and after the course to examine whether the OPA helped them improve their understanding of the concepts of the LED. An expert in the department of Physics, National Changhua University of Education, graded the students' knowledge maps based on the linkages between concepts. A correct proposition scored one point and an incorrect proposition scored zero points.

The study created the photonics scoreboard, built on an internet platform, for peer and expert assessments. The photonics scoreboard had five rating items: the accuracy of device structure, originality, parameter adequacy, device performance, and device applicability. Each item was scored on a scale of 1–6 points. Moreover, the scoring system provided reviewers with an open-ended column in which they could make review comments to peers' work. Students could learn from peers' work and comments, and then improve their works.

The CPLES was adopted to investigate students' perception about the effect of OPA applied in the PBL environment. Students were surveyed with the CPLES, a 5-point Likert-scale questionnaire (1 = strongly disagree, 5 = strongly agree), as shown in Table 1. The two subscales, Open-endedness and Authenticity, were used to measure the PBL environment arrangement; the other four subscales, Inquiry learning, Reflective learning, Teamwork, and Creative problem solving, were utilized to measure how the four skills were enhanced via the PBL with OPA. In analyses of the reliability and of the exploratory factor of the CPLES, the Cronbach α for the whole instrument is over 0.95, and the amount of explained variance is over 62% for each field test (Chang, 2006). Both figures were high enough to demonstrate that CPLES can be applied to assess the students' perception.

Table 1: Items for each sub-scale of the Project-Based Learning Environment Survey.

Questions for each sub-scale Upon completion of the project-based learning course, please answer the following questions.	
Inquiry learning sub-scale - I had the opportunity to: 1. Conduct research to find the answers to questions. 2. Conduct research to verify my ideas. 3. Proceed with further research to solve new problems. 4. Design/develop research methods by myself. 5. Collect data, analyze data and present the report.	Creative problem solving sub-scale - I had the opportunity to: 1. Detect errors and confirm that they were properly corrected. 2. Propose my own creative ideas. 3. Apply my creative ideas into designs or assigned tasks. 4. Evaluate all the possible solutions to problems.
Reflective learning sub-scale - I had the opportunity to: 1. Reflect on how I learn things. 2. Deliberate upon my thoughts in detail. 3. Learn how to become a better learner. 4. Present my areas of uncertainty. 5. Criticize my own research results.	Open-endedness sub-scale - The teacher let us: 1. Design methods for problem-solving by ourselves. 2. Present our own project proposals. 3. Use various types of data to solve the same problem in different ways. 4. Study the particular problems of our own that interested us. 5. Decide how to proceed with our project. 6. Solve problems from various perspectives.
Teamwork sub-scale - I had the opportunity to: 1. Use the information provided by group members to solve problems. 2. Contribute to the group goals. 3. Help other group members with their work. 4. Be a leader to teach other group members. 5. Exchange and share information or opinions with other students. 6. I loved working with my teammates.	Authenticity sub-scale 1. The problems met in this project indicate the complexity of practical problems. 2. The information presented in this project is relevant to authentic real-world problems. 3. The knowledge and experience provided by this project are relevant to authentic real-world problems. 4. The problems in this project are derived from practical problems in authentic real-world tasks. 5. Upon the completion of this project, I fully understood its objective and the subject matter.

Experimental procedure

Fig. 4 shows the procedure of the PBL with OPA. The analysis of the evaluation data were listed as follows.

RESULTS

Effect of OPA upon concept clarification

In order to determine if these two groups had the same levels of knowledge on the principles of LED operation before OPA treatment, a t-test of independent samples on the scores of knowledge map pre-test for these two groups (scores KMO-0 and KMT-0) was performed. Since the Levene test on homogeneous variance is not significant ($F = 0.014$, $p=0.908$), the t-test on the scores of pre-test could be proceeded with and the results were listed in Table 2.

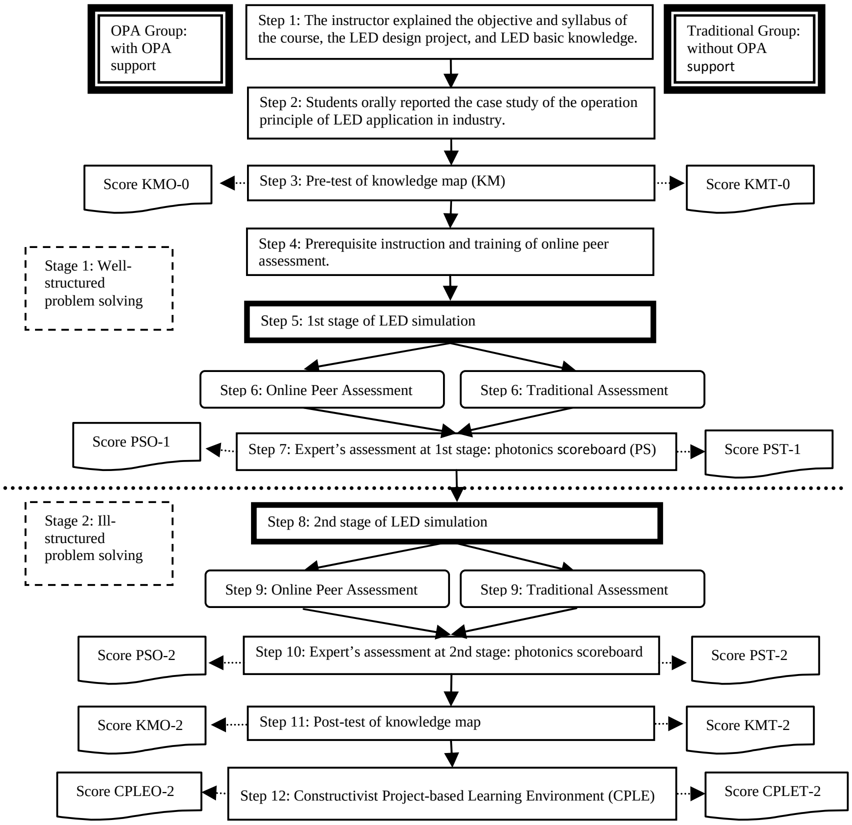

Fig. 4. Procedure of the project-based course with online peer assessment and related evaluations.

Table 2: t-test of the pre-test knowledge maps for OPA group and Traditional group.

	N	M	S.D.	t value	p value
Knowledge map pre-test of OPA group	37	2.78	1.456	1.864	0.067
Knowledge map pre-test of Traditional group	36	2.08	1.746		

* p<0.05, ** p<0.01, *** p<0.001

The pretest result revealed that these two groups had similar levels of knowledge on the principles of LED operation before proceeding with the project. To determine if the effect of OPA upon concept clarification worked significantly, the Levene test on homogeneous variance was adopted firstly (F = 3.965, p=0.050), and the t-test on the scores of knowledge map post-test for these two groups (scores KMO-2 and KMT-2) were listed in Table 3.

Table 3: t-test of the post-test knowledge maps for OPA group and Traditional group.

	N	M	S.D.	t value	p value
Knowledge map post-test of OPA group	37	5.16	1.21	3.767*	0.000*
Knowledge map post-test of Traditional group	36	3.69	2.03		

* p<0.05, ** p<0.01, *** p<0.001

The t-test result revealed that the scores of OPA group on knowledge map post-test is significantly higher than those of Traditional group, which means the effect of OPA upon concept clarification worked significantly.

Effect of OPA upon enhancing LED design skills in well-structured problem solving

To determine if the effect of OPA upon enhancing LED design skills in well-structured problem solving worked significantly, the Levene test on homogeneous variance was adopted firstly (F = 1.132, p=.291), and a t-test on the expert's assessment scores of photonics scoreboard on well-structured problem solving for these two groups (score PSO-1 and PST-1) were listed in Table 4.

Table 4: t-test of the expert's assessment scores on well-structured problem solving for OPA group and Traditional group.

Well-structured problem solving	N	M	S.D.	t value	p value
Expert's assessment scores of photonics scoreboard for OPA group	37	21.73	1.503	5.136^{***}	0.000
Expert's assessment scores of photonics scoreboard for Traditional group	36	20.03	1.320		

* p<0.05, ** p<0.01, *** p<0.001

The t-test result revealed that the scores of OPA group on photonics scoreboard is significantly higher than those of Traditional group, which means the effect of OPA upon enhancing LED design skills in well-structured problem solving worked significantly.

Effect of OPA upon enhancing LED design skills in ill-structured problem solving

To determine if the effect of OPA upon enhancing LED design skills in ill-structured problem solving worked significantly, the Levene test on homogeneous variance was performed (F = 2.037, p=.158), and a t-test on the expert's assessment scores of photonics scoreboard on ill-structured problem solving for these two groups (score PSO-2 and PST-2) were listed in Table 5.

Table 5: t-test of the expert's assessment scores on ill-structured problem solving for OPA group and Traditional group.

Ill-structured problem solving	N	M	S.D.	t value	p value
Expert's assessment scores of photonics scoreboard for OPA group	37	21.86	.585	-1.029	0.307
Expert's assessment scores of photonics scoreboard for Traditional group	36	22.00	.535		

* p<0.05, ** p<0.01, *** p<0.001

The t-test result revealed that there is no significant difference between the scores of these two groups, which means the effect of OPA upon enhancing LED design skills in ill-structured problem solving did not work significantly, though it did in well-structured problem solving.

Students' perception about the effect of OPA applied in PBL

To determine if students agree that OPA applied in PBL worked significantly, a t-test on CPLES for these two groups (scores CPLEO-2 and CPLET-2) were listed in Table 6.

Table 6: t-test of the scores in Constructivist Project-based Learning Environment Survey for OPA group and Traditional group

Sub-scales	A		B		t-test	
	N=35		N=30		t value	p value
	M	S.D.	M	S.D.		
Inquiry learning	3.70	0.41	3.42	0.53	2.435	0.018^{*}
Reflective learning	3.81	0.41	3.60	0.38	2.142	0.036^{*}
Teamwork	3.93	0.40	3.77	0.46	1.461	0.149
Creative problem solving	3.71	0.57	3.64	0.49	0.494	0.623
Open-endedness	3.62	0.69	3.62	0.56	0.015	0.988
Authenticity	3.54	0.54	3.51	0.60	0.257	0.798

* p<0.05, ** p<0.01, *** p<0.001

The t-test result revealed that the scores of OPA group on the subscales of CPLES, inquiry learning and reflective learning, were significantly higher than those of Traditional group, which means OPA group outperformed Traditional group on enhancing students' inquiry learning and reflective learning. However, for the other two subscales, Creative problem solving and Teamwork, there is no significant difference between these two groups.

Interview results- qualitative feedback

In order to gather an in-depth understanding of students' behavior and the reasons that govern such behavior, we collected the feedback from the final project presentations of each group and then conducted in-depth interviews with them several times after the presentation. The interviews were recorded and encoded. S1 represents the interview results with OPA group; S1-1 represents the interview with the number one team of OPA group. S2 represents the interview with Traditional group, and so on.

Students' opinions on online peer assessment

S1-1: Comments and advice from others is helpful to refine our work, but assessing other's work is even more important and we learn more.

S1-3: We could learn useful knowledge and practical skills from this interesting course. At the beginning, we do not know how to review other's work…we were not sure if our suggestions is correct or not, but after two or three OPA experience, we had more confident when rating our peer.

S1-4: Although the figure did not match the requirement at the first try, we adjusted the parameters according to comments from classmates, and the results were better.

S1-6: According to the simulation results and online PA, we could summarize the regulation of parameter adjustment, and generalize the operating principle of LEDs.

Students in OPA group considered that OPA helped them improve their works effectively. Students of the first, third, fourth, and sixth teams agreed that OPA could help them to modify their works by taking others' comments. However, some complains which could be a valuable reference to improve the implementation of OPA in PBL were listed as follows.

S1-2: Because we had too much subjects to learn in this (junior) year, we could not do our best in this course especially in OPA. Besides, we needed to start preparing for the entrance examination of graduate schools at this year.

S1-3 & S1-5: Most of the review comments worked well at the beginning, but sometimes they failed later and misled our focus in the wrong direction on problem solving. We doubted that some reviewers tried to give wrong comment purposely for the sake of getting competitive advantages.

S1-4: We always waste much time in adjusting parameters by guessing. When you adjust a new parameter, you have to rerun this program and it took a long time.

Students in OPA group showed an over-reliance on the review comments. Moreover, the second/one more in-dept interview with OPA group members were conducted and it revealed that the prior success experiences which were referred from the review comments as well as their own thinking might also misled or limit their thinking. Furthermore, the first priority of these students was passing the entrance examination of graduate schools to fulfill with the expectation from their parents or society. Therefore, they push themselves very hard to learn effectively and prevent from making any "try and error" which could be harmful to enhance their meta-cognitive skills and self regulation learning.

Students' opinions on two-stage LED simulation of PBL course

Some comments were made by Traditional groups.

S2-1: The two-stage LED simulation of PBL was interesting yet challenging. We learned useful things from the course.

S2-2 & S2-6: At the very beginning, we felt excited while we knew this PBL course would be provided for us at this semester, but we are frustrated to design LED by guessing the parameters. We are not used to this course; we have no idea how to adjust the parameters from the huge scope of numbers.

S2-3, S2-4 & S2-6: We suggest that the teacher give us more references so that we could use them to optimize our parameters.

According to the interview results, we discovered that students of both Traditional and OPA groups were not used to such instruction and some of them could not learn independently and actively, which could be the problem for most of students in Taiwan. Some of them also demonstrated a lack of self-confidence when rating their peer, which is similar to the previous studies (Orsmond & Merry, 1996; Sullivan, Hitchcock, & Dunnington, 1999). Students thought that failure caused frustrations and cost too much time. The second and sixth teams of Tradition group indicated that this course differed from those they had taken previously, so they feel excluded and frustrated. Furthermore, students hoped that the teacher could provide more knowledge and hints about the parameters of LED; the students showed an over-reliance on books as well as teacher's assistance, and were not able to search for information actively.

CONCLUSIONS

The study addressed and explored how to apply OPA according to the structured level of a problem in a PBL course to enhance students' professional skills in LED design as well as meta-cognitive thinking. The evaluation results elicit the following relevant facts:

(1) OPA group performed better than Traditional group in concept clarification.

(2) For the enhancement of LED design skills in well-structured problem solving, OPA group performed better than Traditional group.
(3) For the enhancement of LED design skills in ill-structured problem solving, there was no significant difference between the performances of these two groups.
(4) For students' perception about the effect of OPA applied in PBL, OPA could enhance students' inquiry learning and reflective thinking skills but creative problem solving and teamwork skills. Most students agreed that the two-stage LED simulation of PBL course was challenging and interesting and they learned useful things from the course. However, the students showed an over-reliance on the review comments or prior success experiences and lost their independent and critical thinking abilities.

Most students of OPA considered the PBL course with OPA to be an effective tool in understanding operating principle of LEDs and clarifying concepts which were similar to the studies of Topping (1998), Wen & Tsai (2006), and Liu & Lin (2007). However, the OPA did not work significantly to enhance the students' professional skills in LED design as well as meta-cognitive thinking in ill-structured problem solving.

DISCUSSION AND SUGGESTIONS

This study has provided useful evidence on OPA that is applied in PBL, which can help university students clarify concept as well as enhance their inquiry learning, reflective thinking abilities and LED design skills in well-structured problem solving. However, there are some limitations for OPA in ill-structured problem solving as described below.

First, the students of OPA declined their learning passions when they failed to solve the ill-structured problems according to the peers' review comments after several tries. The students showed an over-reliance on the review comments or prior success experiences and lost their independent and critical thinking abilities. The Einstellung effect (set effect) occurs when the first idea that comes to mind, triggered by familiar features of a problem, prevents a better solution being found. It has been shown to affect both people facing novel problems and experts within their field of expertise (Bilalic, McLeod, & Gobet, 2008). It makes learner become inflexible to deal with novel/ill-structured problems, which is harmful to skill learning and skill transfer (Luchins, 1942; Gagne, Yekovich, & Yekovich, 1993). Moreover, the quality of problem definition determined the quality of solution (Getzels, 1975). In the study, some teams of OPA group were misled to the wrong direction in problem definition or solving which were suggested by peer reviewers. Teacher-facilitators could provide a scaffold example to show students how to generate "smart tries" systematically as well as monitor the learners to function systematically (planning, implementing, asking questions/reflective thinking and seeking input adjustment) and reflect on their learning at the end of each try.

Secondly, insufficient time and lack of motivation declined students' participation in OPA. A very unusual phenomenon in Taiwan is that university students started to focus on the preparation for the entrance examination of graduate schools since their sophomore year or junior year. Thus, they do not have enough time to do their best in this course because passing the entrance examination of graduate schools to fulfill with the expectation from their parents or society is the first priority. Besides, some students commented that they learned slowly and they needed more time to get the project done. Wallas (1926) pointed out that a creative problem solving process involved four stages, i.e., preparation, incubation, illumination, and verification, which all took time to implement. Therefore, stimulating students' motivation required more precaution when the course was developed and implemented.

LIMITATIONS

Even though a rigorous research procedure was used, this work has some imitations that could be addressed in future studies. First, a quasi-experiment design was adopted without detailing the individual difference of learners. Individual difference variable, such as learning style, could be a direction for future study. Second, the findings and implications are obtained from just one study that examined a particular computer simulation software (i.e., APSYS) and targeted a specific group in Taiwan. Moreover, the OPA group might have more out-of-class time to work on their project than the traditional group, even though both OPA group and Traditional group students were required to finish their projects of each stage during the scheduled time. Hence, the positive effect could be partly attributed on more learning time than the intervention (i.e., OPA) alone. Thus, caution must be taken when generalizing our findings and discussion to other educational technologies or groups. Third, the students in Taiwan have unique value and behavior patterns, such as they had different definition on learning achievement and their first priority was to pass the entrance examination. Therefore, a cross-cultural validation using another large sample gathered elsewhere is required for further generalization of our findings.

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RELATIONSHIP BETWEEN AFFECTIVE LEARNING, INSTRUCTOR ATTRACTIVENESS AND INSTRUCTOR EVALUATION IN VIDEOCONFERENCE-BASED DISTANCE EDUCATION COURSES

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ABSTRACT
This paper is intended to reveal the results of a study in which the relationship between learners' perceptions of affective learning, instructors' attractiveness and instructor evaluations in a videoconference based distance education course was investigated. An online survey instrument was used to collect quantitative data. A series of Pearson product-moment correlation coefficient was computed to assess the relationships between these variables. The results have shown that there were positive correlations between task attractiveness, social attractiveness, affective learning and instructor evaluations in videoconference-based open and distance courses. Overall, almost all of these correlations were moderate level except the ones between the instructor evaluations and task attractiveness as well as the instructor evaluations and the social attractiveness. Positive, strong relationships were observed between these variables. Increases in task and social attractiveness were correlated with increase in the instructor evaluations.

INTRODUCTION

Advancements in the information and communication technologies have let the use of synchronous communication tools more frequently, especially in open and distance learning (ODL). Videoconference systems is one these tools. Although videoconference has been used in education and business purposes for more than three decades, its diffusion in ODL environments has been dramatically increased in 2000s. Despite this increase, one can easily infer that the literature does not include enough number of studies focusing on affects of the instructors' communication behaviors on students learning in videoconference based ODL. These types of studies, for sure, help designers and the practitioners improve the quality of their services.

In the field of educational psychology, learning is categorized into three domains: Cognitive, Affective, and Psychomotor. According to Roberts (1990, p. 19) "The role of affective modes of knowing in learning processes remains an elusive, fragmented area of study. Not only does research cross many disciplinary boundaries, but language about affect changes from one individual to the next". However, Krathwohl, Bloom and Masia (1964) have provided a well-received definition and a classification of learning objectives regarding affective learning. Their definition indicates that affective learning is about feelings, values, appreciation, enthusiasms, motivations, and attitudes of the learners toward the content, the instructor and the setting. They also classified the learning affective learning objectives into five groups (receiving, responding, valuing, organization, and characterization) based on the principle of internalization. ''Internalization refers to the process whereby a person's affect toward an object passes from a general awareness level to a point where the affect is 'internalized' and consistently guides or controls the person's behavior'' (cited by Seels & Glasgow, 1990, p. 28). Kearney, Plax and Wendt-Wasco (1985) indicated that students with a positive attitude toward the course content are more likely to learn the cognitive content advanced. They also stated that students who have internalized higher order affect are more likely to generalize such content to non-academic environments pertinent to their life-long adaptation. Furthermore, same authors as well as others have also found that teachers' communication behaviors are also another factor effective on students' affective learning (Kearney, Plax, & Wendt-Wasco, 1985; Plax, Kearney, McCroskey & Richmond, 1986). In open and distance learning, the research studies have also shown similar results (Bozkaya & Erdem-Aydin, 2007; So, 2010). For instance, Hurd (2007) investigated the distance language learners affects and their achievement and suggested that the affective dimensions of language learning may be particularly significant for distance learners, in that they need to manage their own feelings in order to compensate for the physical absence of a teacher and peers. However, most research on affective learner variables still concentrates on classroom-based learners, and there is very little on those learning in other contexts, such as ODL.

Instructor attractiveness is also considered as another construct regarding instructor's communication behaviors. According to the social psychologist, attractiveness or interpersonal attractiveness refers to the tendency of someone to have appreciation and positive feelings towards someone else (Berscheid & Hatfield-Walster, 1969). It is regarded as a determinant factor on the development and continuation of relations in social environments where interaction takes place (Unal-Colak & Kobak, 2011). Based on interpersonal attractiveness, McCroskey and McCain (1974) developed a framework and measures to determine the interpersonal attractiveness in various settings. Their framework suggested three dimensions of interpersonal attraction: a person's desire to work with another person (task attractiveness), to socialize with another person (social attractiveness), and attraction to another person based on physical appearance (physical attractiveness). Studies on this variable have emphasized that individuals rated as highly attractive are more persuasive and credible than less attractive individuals (McCroskey, Hamilton, & Weiner, 1974); furthermore, interpersonal attraction has been linked both to the amount of communication people engage in and to the quality of their exchanges (McCroskey et al., 1974). One of the setting interpersonal attractiveness was investigated has been the filed of educational communications. In a number of studies, instructor attractiveness was investigated according to the three dimensions mentioned above. The results of these studies in the field of educational communications have revealed that student perceptions of instructor attractiveness have been positively associated with instructor immediacy and with perceptions of attitude and background similarity (Edwards & Edwards, 2001; Rocca & McCroskey, 1999). Similarly, a positive correlation between instructor attractiveness and students' motivation to communicate in class and motivation to learning has been observed in several other studies, such as Myers & Huebner, (2011), and Unal-Colak and Kobak (2011). Although, the literature does not provide satisfactory information about the instructor attractiveness in videoconference based ODL, in the light of these studies, one may infer that interpersonal attractiveness is a critical factor in videoconference based ODL too.

As it has been briefly summarized above, there is a shortage of studies in the ODL literature about affective learning and interpersonal attractiveness of the instructors in videoconference based learning. This study intended to examine the relationship between the learners' perceptions regarding affective learning, instructors' attractiveness and their evaluations of the instructors. Since computer mediated communications have become one of the main interpersonal communication and instructional means, as educators we need to examine carefully the impact of its various aspects on learning in different settings.

PURPOSE AND RESEARCH QUESTIONS

The primary purpose of this study was to examine the relationship between the learners' perceptions of affective learning, instructors' attractiveness and instructor evaluations in videoconference based distance education courses in Turkey. Within the framework of this purpose, the answers of the following research questions were sought:

1. What were the perceptions of the learners on the instructors' task and social attractiveness?
2. What were the perceptions of the learners on affective learning in their videoconference-based courses?
3. How successful did the learners find their instructors in their videoconference -based courses?
4. Is there a relationship between the learners' perceptions of task attractiveness, social attractiveness, affective learning and their evaluations of the instructors?

METHODOLOGY

This study was conducted in Anadolu University of Turkey. Anadolu University is considered one of the mega universities of the world due to large number of distance students. Currently it has 1.6 million students enrolled to its distance programs. In majority of its programs text-based instructions are supported by videoconference, TV broadcasts, online synchronous and asynchronous learning opportunities. The university does not only provide education opportunity to the learners in Turkey but also in many other countries. However, since the primary language of the programs is Turkish, only Turkish-speaking learners can join these programs. Azerbaijan is one of the countries where locals can get an education in Turkish. In 2009, Anadolu University has collaborated with a semi-public institution, entitled as Eurasia Innovation Institute, to offer distance higher education to Turkish speaking people in Azerbaijan. Currently, the University provides 2 bachelors' and 3 associate degree programs to around 2000 learners in Azerbaijan. Similar to its programs in Turkey, the instructional strategy is self-paced individualized learning. In other words, the learners have to study the specially prepared textbooks by themselves and take centralized exam administered face-to-face, four times in an academic year in two major cities of Azerbaijan. The learners may choose to attend videoconference-based course sessions while studying individually. These courses are offered every week at least one to three hours for each course by the professors of Anadolu University. These courses not only help learners interact with the instructors but also serve as a means for the learners meet with their peers and socialize (Anadolu University, 2012).

The study was conducted as a part of a series of studies in which effectiveness, efficiency and appeal of the videoconference-based ODL lectures have been examined. Around 1200 students from Azerbaijan were asked to take a part in this study. However only 56 learners in 3 different courses from different levels and programs provided complete data for the analyses. The demographics regarding the participants are provided in Table 1.

Table 1: Demographics about the participants

Characteristics		**N**	**%**
Gender	Female	29	51.8
	Male	27	48.2
Age	19-21	31	55.4
	22-28	25	44.6

McCroskey's (1994) Affective Learning Scale was used to collect data regarding the distance learners' perceptions of affect toward the content and videoconference-based classes. This self-report, bipolar, 8-item scale was used in many studies and its reliability has been very good. The reliabilities for the affect for content measure have ranged from .85 to well above .90 while the reliabilities for the videoconference-based classes have been measured around .90. In this study, the reliability has computed as .88. The same scale originally includes two more sections (8 more items) concerning instructor evaluation. These items were also used to collect data about the learners' assessments of the course instructors. In order to collect data on the learners' perceptions of interpersonal attractiveness toward the course instructor, Interpersonal Attractiveness Scale was employed. This scale was first introduced by McCroskey and McCain (1974) and later, in 2006, McCroskey, McCroskey and Richmond have revised the scale. In this study, this second generation of the scale consisted of 38 items and 7-points ranging from 'strongly disagree' to 'strongly agree' was used. The average reliability of this scale in various studies was identified as .94. In this study, however, it was found a bit lower but still quite high .89.

These two scales were first translated to Turkish and then presented to a panel of experts in the fields of English language, communications, and ODL as well as a group (four) of learners to be reviewed. After collecting the experts and the learners' comments, the instrument was finalized and transferred to an online format. The same students were also asked to examine the online form. Later, the online instrument was introduced to students during the videoconference sessions of the three courses. The course instructors asked the learners complete the forms in two weeks but data collection was continue around one and a half month (April-May 2012).

FINDINGS

Table 1 shows descriptive statistics about the learners' perceptions of the task and social attractiveness as well as on affective learning and instructor evaluations in the videoconference-based courses. According to the analysis, the majority of the leaners indicated higher perceptions regarding all the variables. They especially have shown a higher degree of agreement on items related to the affective learning and the instructor evaluations. One can infer this finding that the majority of learners have a positive affect on learning in the videoconference-based course sessions and similarly have positive perceptions about the instructors on these courses. On the other hand, they scored the least about the task attractiveness although it's still higher than expected level. It may means that the learners found the tasks that they encountered during the videoconference sessions not too attractive. A similar result was observed at the social attractiveness of the courses. It may be related to the structured implementation of the videoconference sessions or to the length of sessions (1 hour) that may not be enough to establish satisfactory social interactions.

Table 1: Descriptive Statistics about the Learners' Perceptions

Variable	N	Mean	Standard Deviation
Social Attractiveness	56	3.3341	.78626
Task Attractiveness	56	3.2823	.64694
Affective Learning	56	4.0000	.53407
Affect toward Content	56	4.0357	.86133
Affect toward Class	56	3.9643	.50549
Instructor Evaluation	56	3.9531	.44311
Instructor	56	4.0491	.47773
Taking Another Course	56	3.8571	.60464

On the other hand, as can be observed in Table 2, there are moderate level positive correlations between in social attractiveness, task attractiveness, affective learning and instructor evaluations. Also, strong relationships were also seen within the sub-dimensions of the affective learning and instructor evaluation. It was interesting to notice that the relationship between the instructor evaluations and perceived task (.601) and social attractiveness (.712) of the videoconference-based courses were relatively strong while, the relationships between the affective learning and the attractiveness variables were relatively moderate level. Especially the strengths of the relationships between affect toward class and the attractiveness variables were quite low although statistically the relationships were significant. This may be related to the number of participants. In other words, it would be possible to observe different results when this study conducted in a different setting and/or with a larger number of participants.

Table 2: Correlation Analysis about the Learners' Perceptions

Variable	N	Social	Task	Affect. Learn.	Content	Class	Inst. Eva.	Instr.	Other Cour.
Social Attractiveness	56		.773**	.431**	.434**	.354**	.601**	.597**	.475**
Task Attractiveness	56	.773**		.497**	.519**	.391**	.712**	.719**	.552**
Affective Learning	56	.431**	.497**		.898**	.919**	.694**	.730**	.513**
Content	56	434**	.519**	.898**		.651**	.638**	.716**	.435**
Class	56	.354**	.391**	.919**	.651**		.623**	.615**	.495**
Instructor Evaluation	56	.601**	.712**	.694**	.638**	.623**		.856**	.903**
Instructor	56	.597**	.719**	.730**	.716**	.615**	.856**		.550**
Another Course	56	.475**	.552**	.513**	.435**	.495**	.903**	.550**	

** Correlation is significant at the 0.01 level (2-tailed)

Although it was not intended, a series of independent-samples t-test was conducted to examine the affects of gender on the learners' perceptions of task and social attractiveness as well as affective learning and instructor evaluations were also analyzed. As it was summarized in Table 3, there was no significant difference in the scores for almost all the variables except the instructor evaluations. There was a significant difference in the scores of the female learners (M=3.84, SD=0.285) and the males (M=4.07, SD=0.546) about the instructors evaluations; t (54)=-2.03, p = 0.048. In other words, the male learners expressed more satisfaction with the instructors then the females and the difference between these two groups is statistically significant. The male learners scored higher then the females in all the sub dimensions of the instructor evaluation scale as well as the affect toward class sub dimension of the affective learning scale. Meanwhile, the females scored higher in task and social attractiveness scales. However, these differences were not found as significant statistically. Moreover, it was interesting to notice that both gender groups scored almost the same for affective learning measure.

Table 3: t-Test Analysis about the Learners' Perceptions

Variable	Gender	N	M	SD	*df*	*t*	*p*
Social Attractiveness							
	F	29	3.35	.802	54	.11	.912
	M	27	3.32	.784			
Task Attractiveness							
	F	29	3.30	.654	54	.27	.790
	M	27	3.26	.651			
Affective Learning							
	F	29	3.99	.445	54	-.06	.951
	M	27	4.00	.625			
Content							
	F	29	4.07	.855		.29	.768
	M	27	4.00	.883			
Class							
	F	29	3.92	.251		-.64	.526
	M	27	4.01	.685			
Instructor Evaluation							
	F	29	3.84	.285		-2.03	.048*

	M	27	4.07	.546		
Instructor	F	29	3.97	.278	-1.22	.227
	M	27	4.13	.622		
Another Course	F	29	3.71	.487	-1.98	.053
	M	27	4.02	.683		

*$p < .05$

CONCLUSIONS

The primary purpose of this study was to examine the relationship between the learners' perceptions of affective learning, instructors' attractiveness and instructor evaluations in videoconference-based distance education courses in Turkey. According to analyses, the learners have scored higher then point average for all the variables. This may mean that in general the learners have positive attitudes towards their instructors, the content and the strategy implemented in the videoconference-based course sessions. They also found their instructors attractive regarding the tasks they carry out and socially. However, the learners scored a bit lower in the task and social attractiveness measures. This may be related to either the unattractiveness of the tasks the learners encountered during the videoconference sessions or time limitations for establishing better interactions or the cultural factors.

Furthermore, the study has shown that there are positive relationships between the learners' perceptions of task and social attractiveness of the instructor as well as their perceptions of affective learning and evaluations of their instructors. In other words, those ODL learners who have positive attitudes toward task and social attractiveness of their instructors perceives more affect toward the content and the strategy of the courses as well as more satisfied with the instructors. Based on the findings, it is possible to claim that instructors' task and social attractiveness can be used as predictors of the learners' affect toward content and the strategy of the videoconference-based courses, and their evaluations of the instructors.

Additionally, the study uncovered that gender might be a factor on the learners' evaluation of their instructors. However, since the number of the participants (56) was limited to conduct more generalizable results, it might be possible to find different results in similar studies conducted with more participants and/or in different settings.

The results of this study suggest that the instructors and the designers of the videoconference-based ODL courses should take task and social attractiveness in to considerations while implementing and designing these courses. For instance, the instructors may start the sessions with several icebreaker activities that might help them create a social class climate in their courses. Addressing the learners with their names during the lecture for some provocative, or attention getting prompts, questions, and so forth might help for creation of the same climate.

In terms of further research, there is a rich literature on educational communications in face-to-face learning environments, even by the Turkish researchers (e.g. Pekel, Demir, & Yildiz, 2006; Sahin, 2006), but very limited in open and distance learning environments. Investigation of the research in educational communication and replication of these studies by the researchers in ODL field might be quite beneficial for the field. For instance, shyness, communication apprehension, communication skills, homophily, innovativeness, intercultural communication, test anxiety and similar measures can be investigated in ODL settings to improve the effectiveness, efficiency and appeal of the ODL services.

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SECOND LIFE USERS' PROFILES AND VIEWS ABOUT EDUCATIONAL POTENTIAL OF SECOND LIFE: A CASE OF TURKEY

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ABSTRACT
This study aims to reveal Second Life (SL) residents' profiles, first hand experiences, opinions about SL and its potential as an educational environment. The members of 14 Turkish Island in SL answered a questionnaire including Likert-type, open ended and multiple-choice items and participated in interview sessions. Researchers collected 118 questionnaires and interviewed with 10 users. The results showed a general picture about the Turkish SL user profile. They agree on SL potential about providing better communication with people. Also, they keep their SL character in line with the one they have in real life, while changing their physical appearances. Many active SL users in this study do not have an apparent thought about the applicability of SL in education and most of them are not willing to participate in its educational applications in SL. This study concludes by offering suggestions to practitioners about how to use SL in e-learning.
Keywords: Second Life, social learning theory, e-learning, multi user virtual environments.

INTRODUCTION
Second Life (SL) has been one of the most popular social focused -general purpose- virtual worlds since its launch in 2003. However, it is not a game focused -purposeful- virtual world such as World of War Craft (Wagner & IP, 2009). SL presents its members a 3D virtual environment that users live in an avatar, which is a graphical image of the residents in this virtual world. The members can visit islands, purchase clothes, and construct furniture. Midura and Dede (2010) reported that SL and similar virtual environments have potential to enable people to achieve various important tasks such as doing experiments virtually, experiencing collaboration in virtual environments and adjusting their responses to the actions of other users. SL differs from other Multi-User Virtual Environments (MUVE) due to its open architecture which promotes Web 2.0 features of interaction and collaboration among users.

Second Life and Education
Although SL was not expressly developed as a learning environment, its potential for supporting learning has been recognized in many research studies (Inman, Wright & Hartman, 2010; Baker, Wentz & Woods, 2009; Bowers, Ragas & Neely, 2009; Atkins & Caukill, 2009; Deutschmann & Panichi, 2009; Helmer & Learning Light, 2007). Atkins and Caukill (2009) portray SL as offering "a unique environment for situated and experiential learning by providing for the creation of authentic tasks in an immersive environment" (p.81). A wide variety of subjects such as architecture, language, business, engineering, computer science, physics, law and science have been taught by using SL. Similarly, a review on research on using SL in K-12 and higher education showed that SL may be used as a constructivist tool (Inman, Wright & Hartman, 2010). Similarly, Franklin (2011) stated that learning in SL has meaningful since it let designers create problem based learning environments. Childress and Braswell's (2006) view about the potential of virtual environments such as SL and

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other MMORPGs was that they offer learning activities imitating the real-world learning experiences which are able to available owing to face-to-face interaction. Moreover, Wagner and IP (2009) stated that SL positively contributes students' perceived value of learning in a course designed as an action learning environment.

Teaching strategies that incorporate e-learning techniques are thought to be most valuable when they are situated in a theoretical perspective informed by practical results. The results of qualitative or quantitative research on learning in SL can therefore benefit from the application of theoretical foundations from the field of educational science. Januszewski and Molenda (2008) recommend that the field of instructional technology use reflective practice and authentic environments grounded in appropriate learning theory. The importance of SL for instructional technology was expressed by Cheal (2007) as "where it stands in the continuum of learning methodologies from lecture to active/experimental/problem-based/constructivist learning" (p.207). The practical results of this study were therefore showed in the frame of Bandura's social learning theory which can be seen as appropriate for SL with its convenient nature that is neither constructivist nor behaviorist. As Bandura (1997) stated observational learning in the social learning theory, which is encouraged in SL along with behavioral aspects such as imitation and behavior modeling of social learning theory (Wood, Bruner & Ross, 1976 cited in Smith & Berge, 2009).Furthermore, human potential is a factor in learning. As noted by Bandura (1999), "people have the power to influence their own actions to produce certain results" (p.154) and human control of the environment can be imposed, selected or constructed (Bandura, 1997). Smith and Berge (2009) identified three common aspects of social learning theory: observation of other learners for accomplishing learning; imitating the behaviors of encouraging others; and integration of the former two points with the aid of experiences (Foster, 2006 cited in Smith & Berge, 2009). Smith and Berge (2009) also supported the potential of SL as an example of social learning theory in action, but with some elements that have no applicability in real life. Moreover, interactions among individuals in SL compensates for the weaknesses encountered in the process of observing, as noted in social learning theory (Smith & Berge, 2009).

Second Life and E-learning
In recent years, higher education institutions have given high value to e-learning since its potential of reaching students at different locations. Specifically in Turkey, there is a big competition of offering online degrees among higher education institutions (Latchem, Simsek, Cakir Balta, Torkul, Cedimoglu & Altunkopru, 2009). According to Inman, Wright and Hartman (2010) 23 out of 27 SL studies were conducted by higher education faculties, or in higher classrooms or with higher education students (p.55). The preferences of 6504 students from four different universities according to their choice of the type of learning environment while attending any graduate program were explored. They preferred respectively blended programs (56%), traditional programs (32%) and online programs (12%) (Baran, Kilic, Bakar & Cagiltay, 2010). The most important reason not to prefer online education is that the students' willing to be involved in a learner community. That is, they think that e-learning has limitations on learner-learner and learner-instructor interaction (Gulbahar, 2010). However, SL can be thought of as an e-learning medium that can be used to support learner-learner and learner-instructor interactions as evidenced by tacit knowledge acquisition and dissemination among SL members. SL has also been considered as an e-learning tool which encourages communication, virtual teamwork and creativity in three-dimensional context that cannot be easily simulated in formal educational environments (Zhu, Wang & Jia, 2007; Wagner & IP, 2009). Mansour, Bennett and Rute-Parkins (2009) explored the perceptions of the e-learners on SL and indicated that SL affects learners in a positive way especially for the social interaction in their online experiences. They also remarked that learner-learner interaction was encouraged with the aid of SL in e-learning activities; the learners motivate each other to finalize the given task.

The purpose of the study
Second Life's significant user capacity and features have inspired several researchers to investigate its educational value (De Lucia, Francese, Passero & Tortora, 2009). Unlike other studies where SL is used as an e-learning environment, this study does not attempt to prove any ideas. Instead, it seeks only to describe the situation available to SL users in Turkey. In brief, this study aims to reveal Turkish SL residents' ideas about SL and their first hand experiences to SL. Specifically, this study presents; 1) The characteristics of active Turkish SL residents; 2) Their activities, and future plans in SL, and 3) Their thoughts about the value of SL as an educational medium.

METHODOLOGY
Participants
A total of 149 Turkish SL users responded to the online questionnaire. However the data of 31 participants were excluded as they had not responded most of the questions. Among 118 participants 43.2% (n = 51) were female while 56.8% (n = 67) were male. 44.9% (n = 53) were employed, 27.9% (n = 33) were students, 10.2% (n = 12)

were employers and 5.1% (n = 6) were unemployed. The remaining 11.9% (n = 14) selected the opinion 'Other' for the occupation field in the questionnaire.

In addition, semi-structured interviews were conducted with 10 interviewees from this sample. They were purposefully chosen to obtain in depth information about SL participants. Since, the participants were not willing to share their personal information and thoughts, the trust that the researchers built among participants is the main criterion during the data collection process. In addition, if the researchers found a qualified interviewer they asked her/him other friends who would be willing to participate to this study. The profiles of the interviewees are given under nicknames in Table 1. The nicknames were given by researchers.

Table 1: The profiles of the interviewees

Nickname	Gender	Age	ID in Real Life	ID in SL
Duru	Female	30	Employee	Island CEO
Bora	Male	35	Instructor	Academic researching simulations. Had many studies on these media. Not an active SL user
Irmak	Female	39	Stylist, TV broadcast supervisor	User, Researcher
Emrah	Male	35	Software operator, Team leader, Academic	Trainer, Island Manager, Production & Shops (Furniture,etc.), Design, Museum Founder
Ismet	Male	47	Employee	Island owner
Erkin	Male	27	Student	DJ, Island Manager, Design (Former) Shop Owner
Selim	Male	21	Employer Graphic designer	Island design, Advertisement, Stylist, Shop Owner
Aslihan	Female	38	Employer Graphic designer	Island design, Advertisement, Stylist, Shop Owner
Vega	Female	57	Housewife	Fashion designer (wedding and evening dresses, etc.) Owner of 10 to 20 famous chain shops
Buse	Female	41	Housewife	User

Instruments and Procedures

This study was implemented in the fall term of 2009. The researchers logged into the SL environment by creating their avatars and began to perform like other users in this environment. They gathered information from other users about their usage of SL (teleporting, searching, and clothing). In this way, the researchers were able to learn how to create and improve their avatars from experienced users (Figure 1). These avatars were subsequently used to administer the questionnaire and to conduct interviews with the selected participants.

Figure1. The avatars used in the study

Instruments

In this study, two different instruments were used to collect data. First, an online questionnaire was designed to determine the general views of SL users. Second, semi-structured interviews were conducted with the active SL users.

1. *Online Questionnaire*: The questionnaire consisted of 14 questions. The first two multiple choice questions were related to the personal information while five multiple choice questions were concerned with Internet, Facebook, MSN, Twitter and SL use amount of users. Three multiple questions were related with the number and gender of avatars. Two Likert type questions were related to user opinions about SL and educational activities in SL. Three open-ended questions were related to participants' opinions about SL, what they were doing in this environment, the value of SL for formal education, educational activities that can be presented in SL.
2. *Semi-structured Interview*: The interview consisted of three different parts. In the first part, the researchers asked the users about their personal information and avatar choice. In the second part, the participants were asked about their use of Web 2.0 technologies and the Internet. Finally, they were asked about their opinions about SL, specifically what they were doing in SL and their views on its educational use.

Procedures

The questionnaire data were gathered *via* the Internet from active users. To maximize the participation of active users, the researchers placed explanatory notices on the Facebook pages of Turkish SL user group. The purpose of the study was also advertised within SL and users were invited to complete the questionnaire. SL users were given the option of completing the questionnaire on the researchers' website or by responding to a "notecard" communication sent to them by the researchers.

The interview sample was deliberately selected so as to try and access the opinions of a diverse group of SL users. The researchers purposefully tried to identify active users to interview. As the users were in different cities in Turkey, the interviews were carried out in different media. The oral interviews took 18 minutes on average. Five interviewees participated in oral interviews conducted on the Internet *via* Skype and SL. Four of the interviewees expressed their time limitation for oral interviews and they preferred to put down the interview questions in writing. One participant who was living in the same city as the researchers agreed to be interviewed face-to-face.

Data Analysis

In the data analysis, the researchers analyzed Likert-type and multiple choice questions by a spreadsheet software. They also used content analysis technique while analyzing the data came from semi-structured interviews. During the analysis, the researchers first organized all the data, transcribed and controlled for any misunderstandings transcribe. Then, the researchers generated the codes and themes from the data. The researchers coded the data separately and then compared the results for ensuring the consistency.

Validity and Reliability

Expert opinions technique was used to ensure the validity of the data collection instruments. Based on their opinions, the questionnaire and semi-structured interview schedules were re-organized; some new items which seemed necessary were added while some others were removed. The qualitative data were audio-recorded and then transcribed. In addition, the field experience of the researchers and their effort to clearly introduce themselves and the aim of the study to SL users made it possible to obtain more reliable data from them. The results of the questionnaire, interviews and overall observations of the researchers were cross-checked for the purpose of triangulating the data prior to finalizing the findings of the study.

FINDINGS

Characteristics of Turkish Second Life Users

Internet, Web 2.0 Technologies and Second Life

The results showed that most of the participants (n = 77; 65.3%) used the Internet for more than 6 hours daily. The participants were also asked about average hours they spent on using SL, Facebook, Twitter, and MSN per day; most of them (n = 79; 67%) responded that they used Facebook 0 to 3 hours daily while 21 participants (17.8%) were not registered on Facebook. On the other hand, most participants (n = 109, 92.4) stated they had no Twitter account. Furthermore, most of the participants expressed they are using MSN for an average of 0-3 hours daily (n = 58; 49.1%), while some of them (n = 12; 10.2%) had no MSN account. Two of the participants explained their views as:

> The Internet is my life! As soon as I get to work I boot my computer and login to SL, Twitter, Gmail and Facebook. I am online at work for almost eight hours every day. When I am at home, I log into Facebook with my Iphone. I check what has been written. I can say I'm online for about nine hours a day, without exaggeration (Emrah)

For time spent in SL, it was found that most participants (n = 36; 30.5%) stay logged in for 0 to 3 hours daily. However, there were some extreme users who used SL for nine hours or more (n = 20; 17%). One user stated:

> I have been an SL user for three years. There were times I stayed logged in with no sleep. You can make your dreams come true in SL. You can disguise whatever you want and satisfy your secret desires. Some users don't respect others. That's why we are in SL. So you may wonder why we are still there. We are so addicted to the damn game that you feel empty when you are out, it's like loneliness (Buse)

Number and gender of avatars

Approximately half of the SL avatars, or personas, of the online questionnaire participants (43.2%; n = 51) were female while 56.8% (n = 67) were male. Only three participants had an avatar of the opposite sex. A considerable ratio of the participants had a second avatar (41.5%; n = 49). The gender distribution of the second avatar was 49% (n = 24) female and 51% (n = 25) male. 7.6% of participants (n = 9) reported that they had changed the gender of their avatar at least once.

The gender of interviewees was the same as that of their avatars (five male, five female). Six of the interviewees had a second avatar. Some opinions from users about their second avatars and gender change are given below:

> The first one was XXX. But I also have a YYY avatar. A second account registered to all my groups and islands as an owner. When you're banned from a group where you're an owner, it is impossible for you to come back as an owner. So there is a spare owner to deal with necessary arrangements (Aslıhan).

> I once started a female avatar to see how other users treat ladies. It was rather an avatar I used for trial purposes. Then the account was closed.
> *(Selim)*

Appearance and character of avatars

The participants were asked whether there were differences between their appearance and character and that of their avatars in SL. This question was answered by 81.4 % of the participants (n = 96). Some users noted differences only in their appearance; others mentioned differences only in terms of personality, while others voiced differences in both. The number of users who stated that their *character* in real life and in SL are the same was greater than those who said they are different (f_{same} = 43; 76.8% – $f_{different}$=13; 23.2%). However, the number of users who said that their appearance in SL is different from their appearance in real life was greater (f_{same} = 12; %19.7 – $f_{different}$ = 49; %80.3). Some participants expressed their choices as follows:

> To tell the truth, I tried to make my avatar look the way I did when I was younger. The character is slightly different but I think this difference is considerable. My avatar looks sexier than me. I have no relationships in real life but I do in SL. The clothes are similar to real life but thanks to virtual life, I can use strange things in SL. (Buse)

> The character of my avatar is the same as my real character. When it comes to appearance, of course the physical features we desire can be seen in our avatar. You're always young, beautiful and smart in SL. For example, although I'm a petite woman, my Avatar is 1.70 (meters) tall and has the body shape of a super model (Vega)

> Well, let me tell you that my new avatar looks like me. I'm bald, I have no hair on my head, and neither does my Avatar. I have a stubble beard. But my previous avatar didn't look like me. It was similar in character but wasn't like me in appearance (Erkin)

Activities and Future Plans in Second Life

Available activities in Second Life

The majority of the participants (f = 144; 60.2%) preferred to join entertaining activities which including travelling, chatting, meeting people, resting, shopping, getting a tattoo, having a party, musical activities, dancing, playing games & sports and flying. In addition, a group of participants were using SL for business purposes (f = 61; 25.6 %) such as real estate, management, disc jockeying, scripting, software programming and web design. There were also participants using SL for entertainment (f = 14; 5.8%), learning different languages (f = 10; 4.2%) and getting to know different cultures, and for educational purposes (f = 5; 2.1%). The participants who use SL for educational purposes were questioned deeper and it was found that they were using SL for examining university level research and for conducting general research. Furthermore, some users submitted general statements as a response to the question what they were doing in SL. These general responses were categorized as "I utilize all the opportunities of SL" (f = 4; 1.7%) and "I use SL to satisfy my curiosity" (f = 1; 0.4%). Parallel to questionnaire data, most of the interviewees also mentioned that they used SL for business purposes (f = 7) and for entertaining activities (f = 6). Some interviewees also explained their activities on SL as follows:

> I am a fashion designer in SL. I mainly design wedding and evening dresses. The number is not stable but I have 10 to 20 shops in general. I have built a famous brand. Courtesy of SL, after the age of 50, I found myself in the fashion design world, to which I used to be a perfect stranger. This contributed substantially to my life both materially and spiritually. (Vega)

> I meet my friends, explore new places, and generally wander in SL. But the most important thing for me is to meet different people, of course worthy people. I mean everyone has a value but I prefer those who can help on my issue. I meet with them. (Irmak)

> I try to travel and see different places. It's helpful in terms of foreign languages. I have opportunity to explore the imagination of different people (from online questionnaire).

Plans for the future

The results showed that most of the participants wished to join business-oriented activities (f = 24; 20%). They expressed an interest in activities such as creating a new brand, starting a business, and being a disc jockey. A similar number of participants also sought to join educational activities (f = 23; 19%) including tutoring, helping and supporting people, receiving language education, conducting research and receiving technical education. Some users also wanted to try all of the activities available in SL (f = 21; 17.2%) while others wished to use SL just for entertainment (f = 16; 13.1%). Users reported that they would like to create new things (such as cupboards, desks, etc.), own an island and build houses (f = 13; 10.5%) and socialize with other people (making friends, chatting, establishing groups and getting married) (f = 12; 9.5%) in SL. Finally, a smaller number of users stated that they were in SL for entertaining activities (f = 8; 7%), political activities (f = 2; 1.5%), experiencing sexuality (f = 1; 0.8%) and joining a group therapy (f = 1; 0.8%). Similar to the questionnaire data, seven of the interviewees indicated that they were interested in joining business related activities while six said they would like to join educational activities as well. The interviewees stated their opinions as:

> The educational activity I particularly want is a graphic design course. I think the medium is quite suitable for that. (İsmet)

> I am considering a group therapy, for example for addicted people. In real life, when you join a group you are taken into a twelve-step program. I mean you do not give your name but you see each other. However in SL it is impossible for participants to recognize each other. There is no risk of being recognized. It is just like speaking behind curtains. It can be useful in such cases. (Emrah)

> Lecturers at universities should obligate their students to participate in SL by informing their students about the existence of such an environment and telling them that they can make reasonable amounts of money out of SL. (Erkin)

Evaluation of SL and educational value of SL

User opinions about Second Life

The majority of the users (n = 91; 77.2%) said that *it is fun to use SL* while a considerable proportion of the users were uncertain whether *using SL makes me improve myself socially* (n = 44; 37.3% partially agree/partially disagree). An equal number of users agreed (n = 37; 31.3%) and disagreed with this statement (n = 37; 31.3%). The number of users agreeing that *SL made me communicate better with people* (n = 48; 40.6%) was greater than the number of users who chose the option partially agree/partially disagree for this idea (n = 44; 37.3%). Additionally, most of the participants (n = 71; %60.2) mentioned that *(not knowing) foreign languages hinder using SL*.

Table 2: The user opinions about Second Life

Items	Strongly disagree		Disagree		Partially agree/partially disagree		Agree		Strongly agree	
	N	(%)	N	(%)	N	(%)	N	Ratio (%)	N	(%)
It is fun to use SL.	5	4.2	1	0.8	21	17.8	37	31.4	54	45.8
Using SL makes me improve myself socially.	15	12.7	22	18.6	44	37.3	21	17.8	16	13.6
SL makes me communicate better with people.	10	8.5	16	13.6	44	37.3	28	23.7	20	16.9
(Not knowing) foreign language(s) hinder the use of SL.	43	36.5	28	23.7	29	24.6	11	9.3	7	5.9

Participants' responses were illustrated as follows:

> SL has helped me to enhance my relationships with my team, understand young friends, speak their language and investigate their world (Aslıhan)

> As I don't speak English at an advanced level, I've had difficult times with English media. I cannot deny this. For example, we had some preparations to protest the prime minister of the country X. The prime minister X had an office in SL and we opened banners and things. I do not know what was said about us there. I felt uncomfortable there, in fact. It was 2007 I guess. I do not know what was said and written at the time. I did not like being in that situation. (Erkin)

User opinions about educational activities in Second Life

In order to determine the opinions of users about educational activities in SL, two propositions were presented for their consideration. A large number of participants could not decide whether *it is a good idea to use SL in the educational process* (n = 46; 39% partially agree/ partially disagree). On the other hand, user number who agree (n = 39; 33%) and disagree with this idea (n = 33; f = %28) were similar. The majority of the participants (n = 61; 51.7%) did not agree with the statement "*I would like to join various educational activities formed in SL*" while 26.3% of the participants stayed neutral. Only 24% (n = 26) of them said that they wanted to join an educational activity.

Table 3. User opinions about educational activities in SL

Items	Strongly disagree		Disagree		Partially agree/partially disagree		Agree		Strongly agree	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
It is a good idea to use SL in the educational process.	19	16.1	20	16.9	46	39	14	11.9	19	16.1
I would like to join various educational activities in SL.	26	22	35	29.7	31	26.3	22	18.6	4	3.4

User opinions about the capacity of Second Life in formal education

SL users' opinions were obtained about the educational levels they consider most appropriate to educational activity in SL. Users stated that SL is appropriate for primary, secondary, university and adult education. The largest number of the users thought that the educational activities in SL are generally suitable for university level (f = 65; 41.2%). Moreover, some users think that educational activities in SL are suitable for adult education (f = 41; 26.7%), secondary education (f = 37; 23%) and primary school education (f = 15; 9%). Similarly, interviewees expressed that educational activities in SL are convenient for all educational levels but particularly appeal to students at university level and in adult education.

> Most of the islands of SL, as I know, are not accessible for underage. They say there is another grid for them. One may think that it's too complicated for children. On the other hand, they can adapt it very quickly. Do you know who have the biggest problem for adapting virtual environments? People whose ages varying between 35 to 55. It's very hard to make them accept or try. They resist learning. They find it difficult. (Emrah)

> Actually, we can use all of them; we can use SL at all levels. But I don't want to take my children directly into SL because you can control web content only to some extent. (Aslıhan)

User opinions about possible educational activities in Second Life
The participants were asked about their preferences concerning which educational activities might be possible in SL. Most of them replied that it could be used for tutoring certain courses (f = 45; 48.4%) such as technical and vocational training, foreign languages, social sciences, science education, architecture and builder- programmer training. In addition, some users noted that training related to daily life would also be possible (f = 23; 24.8%) such as special education, human affairs, sex education and healthcare. The users also listed distance education, applied education, training provided by experts, group work, travel and observation type training (f = 10; 10.7%). While some participants argued that no education would be possible in SL (f = 6; 8.6%), others claimed that any kind of educational activity would be possible (f = 7; 7.5%). Another group of users accepted that some training is possible in SL but they did not propose any examples (n = 20; 16.9%). At the same time, 19.4% of the users (n = 23) did not explain their views for this question. Similar to questionnaire data, most of the interviewees (n = 8) stated that it is possible to provide technical training, foreign language education, social sciences and science education, architecture and builder programmer training via SL. Some interviewees explained their the opinions as:

> Graphic designer training could be given here, for instance. I think it is very suitable. Apart from that, since it is graphic based, visually oriented education and training should be given I guess. (İsmet)

> Generally speaking, my English is enough when I am abroad or at work. Of course if I had much better English, I would do more things. As a matter of fact, SL is also a good platform to improve your English. (Aslıhan)

> There are numerous educational activities related to this. There are even symposiums on using SL for education. I think the main question is not 'what' it is; but 'how' educators will use it. (Bora)

DISCUSSION
After the idea of using Web 2.0 technologies entered in our vision, it seemed more likely that we would begin to encounter more active and interactive learners. As the popularity and the number of users in SL increase every day, a question arises as to whether or not it is applicable in educational platforms. Calongne and Hiles (2008) pointed out SL is a successful application of Web 2.0 that has the potential of enhancing our e-learning environments, particularly in terms of knowledge sharing in experimental, problem based and constructivist learning environments (Cheal, 2007). This was also supported by Wagner and IP (2009), SL has the advantage of being socially focused. SL provides users high level of interaction with other members owing to capability of moving their avatars. Similarly, learners in SL are able to make their tacit knowledge structure more explicit, owing to their ability to discuss it with other learners and by sharing this explicit knowledge with them (Wagner & IP, 2009). In recent years, there is a serious increase of the research studies on use of SL in education (Keskitalo, Pyykkö, & Ruokamo, 2011; Edirinsingha, Nie, Pluciennik & Young, 2009; Warburton, 2009). However, in these studies, the sample of SL learning environments designed by the research team was not real users of SL. Moreover, they were sign up SL on the implementation step of the research. In this respect, Turkish SL residents' first hand experiences and their opinions about the use of SL in education are a significant topic to investigate.

Characteristics of Turkish Second Life users & activities and future plans
This study found that almost all SL users prefer to present different physical appearances from the one they have in real life while still retaining their real life character in SL. Physical appearances, beliefs and language, which are some of the issues investigated in this study, may be important factors to increase socialization among the SL community. Socialization, which allows for opportunities such as observation, imitation of behavior and modeling, is the most distinctive feature of SL when compared to other Learning Management Systems (LMS), multimedia or Web 2.0 technologies which often are used to support e-learning (Smith & Berge, 2009). Verbal coding and observed events play an essential role in observational learning especially for the pace and long-term retention of behavior. Moreover, a verbal behavior has a more important role in the cognitive process than a visual one (Bandura, 1969). Mansour, Bennett and Rude-Parkins (2009) highlighted that utilizing learning environments provide opportunity to not only see others but also express their nonverbal behaviors which is a significant factor to enhance e-learners' perception of the quality of interaction.

In terms of educational value, two viewpoints can be discussed while considering design possibilities for e-learning. First, physical appearance selection opportunity in SL might remove physical appearance disadvantages of learner in classroom. Therefore, introvert learners may turn to be more active e-learners in a SL environment. The isolation and loneliness experiences of learners as an obstacle for learning were indicated in the literature (Löfström & Nevgi, 2007). Second, chance of changing avatars' character and physical appearance in SL might give e-learning adapters to use SL for role playing. Higher education began to require students to explore and articulate the others' viewpoints. Therefore, SL appears to have a big potential to be used as an online role playing environment (Inman, Wright & Hartman, 2010; Wills, Leigh & IP, 2011).

The findings also showed that SL users prefer to attend the activities which allow them to move their avatars actively. They expressed that these kinds of activities take their attention. Hence, e-learning designs should include these kinds of activities like role playing and future studies might explore effective online role playing design possibilities in SL. Moreover, the learning context may be enhanced with the various designs which could not be possible to actualize in real classroom settings. According to Mansour et al (2009), providing e-learners a communication environment which enables more realistic face-to-face interaction with others should be the focal point for designers and educators of the online courses. Furthermore, it is apparent that users are willing to attend activities related with learning a second language. In the literature, there are many research studies explored the potential of SL as a learning medium for language learning (Wang, Qi Wang, Hunt, Fikis, Nguyen & Page, 2010; Samur, Dannenberg & Evans, 2010; Li, 2006) and many people started to use SL for these kind of purposes. According to results of this study *not knowing a second language* could discourage SL users from communicating internationally. Given that SL provides unlimited opportunities for learners to interact with each other verbally, SL instructors employ all of the strategies which social learning theory proposes.

Evaluation of Second Life and the educational value

The main result of this study is that many active SL users do not have specific thoughts about the applicability of SL in education, or most are not willing to participate in the educational activities that are readily available. The results showed that most of the SL users were ambivalent about the educational applications in SL. This might be a consequence of not encountering educational applications in SL/perceiving SL as an educational setting and the common sense of SL is not designed for educational purposes. This finding is in opposition to some previous ones in the literature which support the use of SL in education (Helmer & Learning Light 2007; Calongne & Hilles, 2008; De Lucia, Francese, Passero & Tortora, 2009). This study showed that most active SL active users are more interested in the entertainment feature than its educational potential. Similarly, Baran (2010) found that university students were not ready to embrace the use of social networking tools in formal education as the primary aim of these technologies was not education. People use social networking tools generally making new friends and maintaining existent relationship (Mazman & Usluel, 2011). However, our results also showed that there exist a considerable number of users who have a positive attitude towards the educational use of SL and are willing to participate in educational applications. The response we obtained might be a result of special characteristics of the Turkish community in SL. Since they are generally adult users with a high level of education and are employed in various occupations, they may not identify a personal need for education in SL. Adults are generally known to prioritize education opportunities where the knowledge so obtained is directly applicable to their occupation or work situation. Therefore, this type of adult SL members should be presented with learning opportunities that are perceived to be directly relevant to their real lives. Another study revealed that SL students' perceived value of learning was high when the environment was designed according to action learning principles. That is, students passing the process of planning, action, experience and understanding and experiencing real life skills perceived value of learning in SL (Wagner & IP, 2009).

According to the results, most SL users agreed with the idea "SL makes me communicate better with people". This idea can be concluded that SL may reduce learner-learner distance in e-learning in addition to reducing teacher-learner distance (De Lucia, Francese, Passero & Tortora, 2009). As mentioned before, this study does not attempt to prove an idea about SL. Instead it opens a window to its use and potential from a Turkish point of view. If SL is to be used in e-learning, it should be remembered that SL is a recent innovation for e-learners and requires time and diffusion strategies for adaption to educational use. The main suggestions arose from this study is that the experiences of the users could be increased to disseminate the applicability of SL as an educational environment. According to results, active SL users were also using Web 2.0 technologies frequently; the designers can provide combination of these applications. Especially, SL could be a solution for introverted students who were not able to express themselves adequately in classroom. The main limitation for this study is the narrow participant number. This study may be replicated with a wider group of people from Turkey and beyond. In addition, international comparisons may be beneficial for examining possible similarities and differences among countries, education systems and e-learning communities and applications. Additionally, foreign language learning in SL differences between Turkish students and students from different cultures could be explored by using SL as a learning medium.

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TECHNOLOGY ACCEPTANCE IN EDUCATION: A STUDY OF PRE-SERVICE TEACHERS IN TURKEY

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ABSTRACT
The purpose of this study is to test a model that predicts the level of technology acceptance across pre-service teachers at the faculties of education in Turkey. The relationship among the factors that have influence on technology acceptance was investigated. Adopting a questionnaire developed by Timothy (2009) data was collected from 754 pre-service teacher education students attending five faculties of education. In addition to presenting descriptive statistics of the research variables, correlation, ANOVA, and regression analyses were carried out in the study. For the validity, confirmatory factor analysis (CFA) was used. The results indicated that there is a good fit between the model and data. A path analysis was also conducted to test the model. Contrary to the expectations, self-efficacy was not found to be very effective on technology acceptance levels of pre-service teachers.
Keywords*:* Technology acceptance, Pre-service teachers, higher education

I. INTRODUCTION

Technology acceptance issue has been occupying a central location in the literature concerning educational technology. This is mainly related to growing interest in integrating technology into classroom settings in an attempt to foster learning as well as advancing students' problem solving skills through utilizing technology. Towards this end, policy makers have set technology integration as the crucial part of educational reforms while beholding teachers as the major vehicles of this process who will carry technology into classrooms (Schlechty, 2001). Teachers' level of technology acceptance, therefore, has been regarded as one of the major determinants of such agenda. As Martin (2000) puts it, without teachers' acceptance of technology, it is almost impossible to develop educational technology projects. This is because teachers are both gatekeepers of technology and the most important sources of delivering information in the classrooms. The current study attempts to test a model that predicts the level of technology acceptance across pre-service teachers at the education departments in Turkey. It sets out to further our understanding about how perceived ease of use and perceived usefulness impact teachers' acceptance level of technology.

There have been various models developed for integrating technology into educational settings, one of which and the most popular is Technology Acceptance Model (TAM). TAM gained popularity across researchers rapidly with the help of empirical support particularly coming from the fields of business and education. However, this model couldn't find as much space in education as it did in the business field, possibly due to the nature of educational organizations which have more complex and undefined dynamics and have porous boundaries in comparison to clearly structured and well-defined business organizations. Besides, rather than scrutinizing organizational problems of integrating technology into educational settings, there exists a tendency towards blaming teachers' autonomy for almost all breakdowns of integration process (Hu, Clark, & Ma, 2003; Timothy, 2009). On the other hand, TAM provides an extremely useful theoretical tool in understanding how teachers' technology acceptance level impacts technology integration.

Davis, Bagozzi & Warshaw (1989) first introduced the TAM as a theoretical extension of the Theory of Reasoned Action (TRA). TRA congregates beliefs, attitudes, norms, intentions, and behaviors of individuals and asserts that these are all linked. According to this model, a person's behavior is determined by his/her behavioral intention of performing it. This intention is itself determined by the person's attitudes and his/her subjective norms towards the behavior (Ajzen & Fishbein, 1980). For instance, the TAM (see Figure 1) proposes that there are three main factors predicting computer use: Perceived Usefulness, Perceived Ease of Use, and Intention to Use (Milleri, Rainer & Corley, 2003). Perceived usefulness is a belief that if a person uses a certain technology, this will help increase his/her job performance. This is grounded on the proposition that people would tend to utilize an application when it is useful in performing his/her tasks. In the case for teachers, technology use in classroom settings would be perceived as useful when a teacher develop a belief that this will help him/her teaching and having more control over knowledge transaction (Hassan et al, 2011). On the similar background, Perceived ease of use refers to both intrinsic and extrinsic motivations towards using technology. People with high intrinsic motivations towards using a technology may underestimate the difficulties that the usage of a certain technology entails (Fagan,Neill, &Wooldridge, 2008).

Based on the Social Cognitive Theory of Bandura (1997), self-efficacy qualifies the confidence levels of individuals about handling a particular tasks and their capability of influencing events affecting their daily lives. "It is generally reported that individuals with higher self-efficacy perceive difficult tasks as meaningful challenges, despite the fact that others may find similar tasks discouraging (Tsai, Chuang, Liang, & Tsai, 2011, 223)." The notion "facilitating conditions" corresponds to the type of support that the individuals get with the aim of affecting their use of technology (Venkatesh et al., 2008). Facilitating conditions could be various in accordance with the settings and type of technology application. As for teachers, availability of technology training programs, knowledge, supporting services could be counted as facilitating conditions. Facilitating conditions play an important role on both infusion and adoption of new information systems. For example, in a study exploring WAP services adoption behavior in Taiwan, it is found that facilitating conditions are one of the critical factors influencing the adoption behavior (Lu, Chun-Sheng, & Chang, 2005).

2. THEORETICAL BACKGROUND

TAM suggests a causal relationship between perceived usefulness (PU), perceived ease of use (PEU), attitude towards computer use (ATCU), and behavioral intention (BI) to use computers. Perceived usefulness and perceived ease of use together lead to intention to use, and it results in usage behavior.

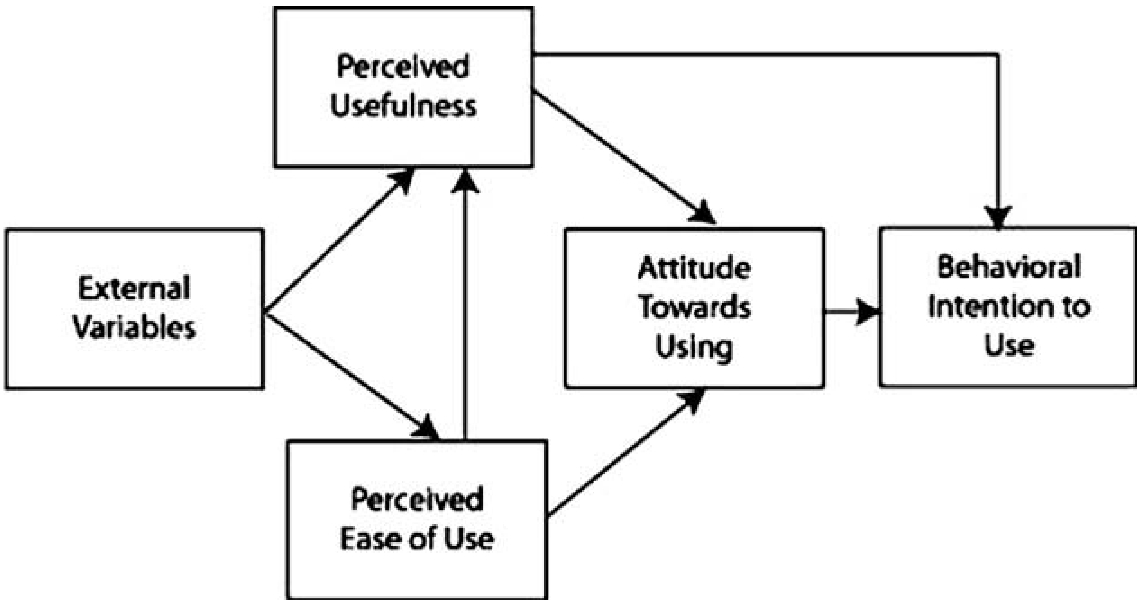

Figure 1. Technology acceptance model (TAM) (Davis, 1989: cited in Timothy, 2009).

On the similar aisle, studies concerning technology acceptance issues in education which are grounded on this model focus on various subjects including graphics, mainframe applications, accounting, and the internet (Timothy, 2009). Although all these studies conducted on the effects of integrating technology on teaching and learning suggest that technology brings about a positive transformation, in many cases, research results could not be translated into practices successfully. There could be numerous reasons for this unsuccessful translation such as organizational barriers, wrong policies, economic reasons, infrastructure problems etc. But, it would not be a mistake to claim that the level of teachers' technology acceptance also plays an important role on this outcome. In other words, teachers' use of technology is still very limited and technology is used minimally in teaching and learning processes (Lim & Khine, 2006). For example, in his research on the pre-service teachers in Singapore, Timothy (2009) grounded his work on TAM and found that the level of technology acceptance across teachers determines the extent to which technology could be integrated into classroom settings. Similarly, through using TAM, Dikbaş, Ilgaz & Usluel (2006) looked at the perceptions underlying the integration of technology into classrooms. They found in their qualitative study of 40 teachers in Turkey that Perceived Usefulness (PU) and Perceived Ease of Usefulness (PEU) are important for teachers in accepting technology. PEU is considered as the primary factor shaping teachers' attitudes towards technology acceptance because teachers tend to explore technical and practical characteristics of the technological products at the first hand. Teachers also tend to look for technologies that are easy to operate.

There is another body of research probing the ways of which teachers' social, demographic, and personal characteristics influence technology acceptance within educational settings. Bayhan, Olgun and Yelland (2002) found that 82 % of teachers do not use computers by any means in classrooms. They assert that teachers' low level of confidence and lack of professional development opportunities substantially contribute to this outcome. In another research using Woznew, Venkatesh and Abrami's (2006) framework, Aypay and Özbaşı (2008) investigated teachers' attitudes towards computers. They found that demographics, motivational factors, experience, teaching methods, and other in-school factors influence teachers' use of technology. An interesting finding of the same study pointed out that two-thirds of teachers whose computer literacy level is very low do not use computers in classrooms at all in comparison to teachers with a medium level computer literacy use computers commonly, indicating that the level of computer literacy directly relates to technology integration into educational settings.

Accordingly, research also documents that institutional and structural characteristics of educational settings have an impact on integrating technology into classrooms such as professional training opportunities, access to computers in schools, technical support, and providing computers to all teachers (Altun, 2003; Aşkar & Usluel, 2003; Aypay, 2010; Demiraslan & Usluel, 2005; Uşun, 2004; Akkoyunlu, 2002; Çağıltay, Çakıroğlu, Çağıltay & Çakıroğlu, 2001). Some researchers suggest that it is also an important factor to what extent one has been exposed to technology and/or used technological products throughout his/her life course. As Galloway (2011, p.1) puts it eloquently, one cannot integrate technology in education with a generation of non-computer-users. For Galloway (2001, p.1) integration of technology into education requires establishing a relational linkage between "(a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing."

In the current study, the notion Technological Complexity (TC) as it is used by Timothy (2009, pp.304-305) refers as to whether users perceive technology relatively difficult to understand and use. Computer Self-efficacy (CSE) indicates one's judgment of his/her capabilities of organizing and completing courses of action required to achieve specific tasks (Bandura, 1977). Facilitating conditions (FC) are environmental factors that affect one's desire to perform a task. For the definitions of other variables and items see Appendix 1.

3. METHODOLOGY

In this study, an instrument developed by Timohty (2009) was adopted as a data conducting tool. The instrument has 18 items (see Appendix 1). Data were conducted from 754 pre-service teacher education students attending five faculties of education in Turkey. Descriptive statistics, correlations, regression, Confirmatory Factor Analysis (CFA), Path Analysis to test the model and Cronbach Alphas to check the reliability were carried out. The reliability for the whole instrument was .90 and the reliabilities of constructs were as follows: PU=.89, PEU=.78, ATCU=.77, TC=.87, FC=.86, CSE=.75, BI=.78. All of the constructs were found to be reliable.

3.1 Sample

In the following, the results of the data analysis are presented. The order is sample of the study, relationships among the study variables, and testing the model respectively. The distribution of 754 students to universities is as follows: Eskişehir Osmangazi University (112), Gazi University (79), Kastamonu University (190), Mehmet Akif University (94), Siirt University (279). There are 12 departments and these departments are: Physical Education and Sports (23), Computer Education and Instructional Technology (47), Electrics and Electronics (69), Science Education (64), Math Education (126), Pre-School Education (43), Classroom Teacher Education (237), and History Education (18). The breakdown of the students based on their class levels are: 161 freshmen, 216 junior, 183 sophomore and 159 senior. The mean age of students is 21. The majority of students (75 %) indicated that they have computers at home. On average, students pointed out that they have been using computers for 6 years. They also indicated that they use computers on average 1.9 hours a day.

3.2. Relationships among the study variables

Table1 presents Pearson correlation coefficients among the study variables. All the correlations are significant and mostly positive correlations exist among the study variables except CSE. High positive correlations were found between PU and PEU (.72), ATCU (.71), BI (.73). Also a high positive correlation between PEU and ATCU (.71) was found. There is medium positive correlation exist between PU and FC (.43), TC (.30). Medium positive correlations were found between PEU and FC (.45), BI (.65), and TC (.47). Medium positive correlations were also found between ATCU and FC (.44), BI (.68), and TC (.33). A medium positive correlation was found between FC and BU (.44). However, a low positive correlation was found between FC and TC (.24). A medium positive correlation existed between BI and TC (.31). Negative low correlations were found between CSE and PU (.-.16), and BI (-.12). Low correlations were found between CSE and TC (.24). Contrary to the expectations, CSE either had negatively related, or since so low correlations exist, they cannot be interpreted. Even if the correlation was positive as in TC, they were at a low level. This finding was surprising.

Table 1. Pearson correlation coefficients among the study variables.

Variables	Perceived Usefulness (PU)	Perceived Ease of Use (PEU)	Attitudes Towards Computer Use (ATCU)	Facilitating Conditions (FC)	Behavioral Intention (BI)	Technological Complexity (TC)	Self-Efficacy (CSE)
PU	1						
PEU	.72**	1					
ATCU	.71**	.70**	1				
FC	.43**	.45**	.44**	1			
BI	.73**	.65**	.68**	.44**	1		
TC	.30**	.47**	.33**	.24**	.31**	1	
CSE	-.16**	.10**	-.09*	-.12**	-.13**	.24**	1

** p<.01, *p<.05

4. RESULTS AND DISCUSSION

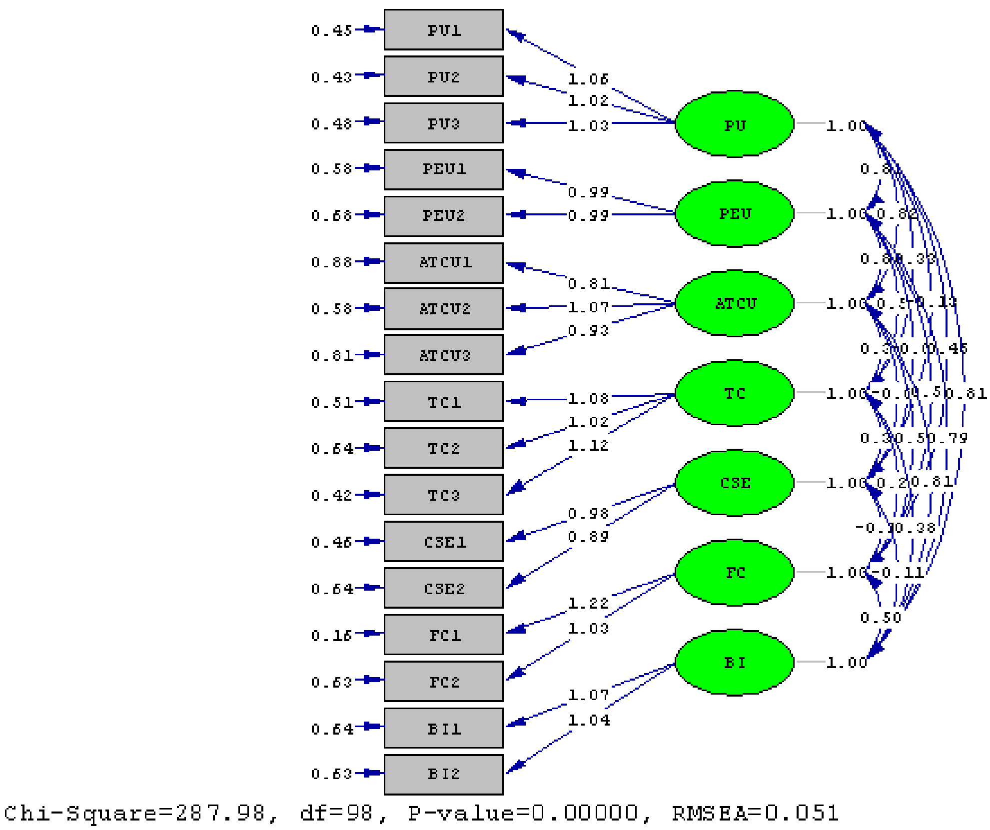

Figure 2. Results of confirmatory factor analysis.

The model fit in the study was tested with a Confirmatory Factor Analysis (CFA) with LISREL 8. An examination of the fit indices of CFA indicated a good fit. Chi square value (x^2=287.98 N=754, df=98, p=0.00) was found to be significant. When the chi-square ratio over degrees of freedom was lower than 3, one may argue that the model fit is quite well (χ^2 / df=287.98/98=2.93). If the ratio between chi-square over df (χ^2 / df) was lower than 3, it might be claimed as a very good fit (Şimşek, 2007; Çokluk, Şekercioğlu & Büyüköztürk, 2010). The root mean square error of approximation (RMSEA) was 0.099. When RMSEA value between 0 and 0.05 indicates a good fit, while it was between 0.05 and 0.1 indicates an acceptable fit. Thus, in this study, RMSEA value was 0.099 and standardized root mean residual (SRMR) was 0.044. These values indicated that there is an acceptable fit. The other fit indices were as follows: Normed fit index (NFI) was 0.98, comparative fit index (CFI) was 0.98, and incremental fit index (IFI) 0.98, relative fit index (RFI) was 0.90, Adjusted goodness-of-fit index (AGFI) was 0.91. When the goodness-of-fit indices are closer to 1, it indicates excellent fit (Şimşek, 2007; Çokluk, Şekercioğlu & Büyüköztürk, 2010). The results of analyses pointed out that all the indices were over 0.90 and this means the model fit was excellent.

A path analysis was conducted to see the standardized total effects. Table 2 shows direct and indirect effects of seven variables in the study. A path indicates a coefficient a direct effect from one variable to another variable and this is also named as a direct effect. An indirect effect indicates the effect of one on another variable through intervening variable(s). A total effect of less than 0.3 is considered a medium effect and the values equal or higher than 0.5 are considered large (Cohen, 1988 cited in Timothy, 2009). In this study, the only large effect is the path from PEU to PU (0.54). TC had no effect at all on PU. CSE had quite low negative effects on PEU (-0.12), PU (-0.08), and BI (-0.03). All the other effects were medium.

The indices of path analysis indicated that the chi-square value was significant (x^2=41.70 N=754, df=5, p=0.00). T-values among the variables were also significant except only CSE – BI and TC – PU. For the goodness-of-fit indices (See model fit section above) as the Table 3 indicates, out of thirteen hypotheses ten four of them are not supported.

Table 2. Results of hypotheses.

Hypotheses	Path	Path Coefficient	t-values	Results
H1	ATCU → BI	0.39	9.76	Supported
H2	PU → BI	0.42	11.30	Supported
H3	PU → ATCU	0.35	11.75	Supported
H4	PEU → PU	0.54	16.18	Supported
H5	PEU → ATCU	0.34	11.44	Supported
H6	TC → PU	0.00	0.11	Not supported
H7	TC → PEU	0.41	12.61	Supported
H8	CSE → PU	-0.08	-2.57	Supported
H9	CSE → PEU	0.12	-3.51	Not supported
H10	CSE → BI	-0.03	-0.90	Not Supported
H11	FC → PU	0.12	4.10	Supported
H12	FC → PEU	0.28	9.27	Supported
H13	FC → ATCU	0.11	4.47	Supported

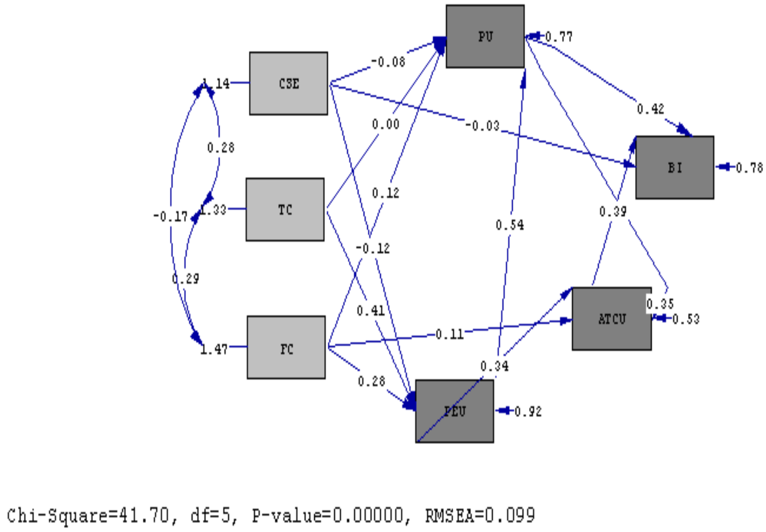

Figure 3. Path coefficients of the model.

A regression analysis in which the Behavioral Intention (BI) was set as a dependent variable was conducted. Table 3 shows the results of the multiple regression indicating that the independent variables explain 60 % of the total variance (R=,78, R^2=,60). Standardized regression coefficients (β) indicated that the relative importance of the independent variables and they are as follows: Perceived Use, Attitudes Toward Computer Use, Perceived Ease of Use, and Facilitating Conditions. Technological Complexity and Self-efficacy are not significantly related.

Table 3. Results of regression on the behavioral intention.

Variables	B	Std. Error	β	t	p
Constant	.355	.139	-	2.546	.011
1. Perceived Use (PU)	.455	.039	.428	11.557	.000
2. Perceived Ease of Use (PEU)	.133	.041	.128	3.267	.001
3. Att. Tow. Comp.Usage (ATCU)	.261	.041	.231	6.379	.000
4. Facilitating Conditions (FC)	.085	.026	.086	3.241	.001
5. Technological Complexity (TC)	.031	.029	.029	1.066	.287
6. Self-Efficacy (CSE)	-.31	.028	-.027	-1.102	.271
R=.78, R^2=.60, p=.05					

4.1. Discussion

The results of this study partially support TAM utilizing the model developed by Timothy (2009). Accordingly, the study showed that the two factors of the model, perceived usefulness and attitude towards computer use have direct effects on behavioral intention to use computers. Computer self-efficacy, on the other hand, is found to have a negative effect on behavioral intention to use computers. Technological complexity, perceived ease of use and facilitating conditions all have indirect effects on behavioral intention to use computers. If we evaluate the study in general terms, it could be said that confirmatory factor analysis results provided partial support for Timothy's (2009) model in Turkey. However, path analysis results indicate that computer self-efficacy does not have a direct effect on behavioral intention to use computers in this case.

Taking direct effects into account, the teachers participating in this study are more likely to use computers when they have positive attitudes towards computers and perceive computers useful. For the latter, it is well established in the literature that when individuals know how to use computers and/or become more comfortable with using them they are more likely to develop positive attitudes towards them as well (Timothy, 2009). One of the findings of this study, that is, the CSE has a negative effect on perceived usefulness, is different from what has been written in the literature. Hence, there is a need for conducting further studies exploring what lies behind this divergence. In the current study, such result might be related to low self-efficacy among teachers in terms of computer usage.

While, perceived usefulness has the biggest effect on behavioral intention to use computers, perceived ease of use has the same effect on perceived usefulness. These findings indicate that perception is very important for pre-service teachers to use computers. As it was expected, technological complexity plays the greatest role on perceived ease of use. In other words, when technological product gets simpler to operate, teachers tend to develop positive perceptions towards the usage of it, which in turn increases the likelihood of the usage behavior. On the other side, technological complexity has a negative effect on perceived usefulness. These results indicate that when technology is perceived complex, it may hinder technological acceptance. Facilitating conditions have positive effect on both perceived usefulness and perceived ease of use. Thus, if technological support is felt adequate, this might be leading pre-service teachers to develop a positive perception towards the use of computers.

Galloway's (2011) contention is once more relevant here: One cannot integrate technology in education with a generation of non-computer-users. Studies in Turkey concerning computer usage across teachers suggest that Turkish teachers are still struggling with using computers both in classrooms as well as their daily lives (Bayhan, Olgun & Yelland, 2002). However, more recent studies report that although computer usage is low among teachers, it shows a steady increase as the new generation of teachers with higher computer literacy skills enters into teaching profession (Aypay & Özbaşı, 2008; Dikbaş, Ilgaz, & Usluel, 2006). Thus one can claim that technology acceptance is also related to age as we are still in transition period from conventional to digital. Older generations without a formal education of computer usage, for example, might have more difficulties in adjustment than their younger colleagues during this period. In this sense, age ought to be integrated into studies as one of the variables impacting the perceptions towards technological products.

Findings of the current study point out that there is a need for carrying out more studies that would explore the relationship between computer self-efficacy and technology acceptance. This study also has implications for administrators and faculty members who work at teacher education faculties in Turkey. For example, helping teacher candidates with developing positive attitudes towards technologies would help future teachers adopting technological opportunities for their teaching practices. Getting them more familiar with technological products might be the most important step to take as this study suggests. Unfortunately, in the current system and because of various reasons such as infrastructure problems, lack of computer courses, and poor curriculum, pre-service teachers are not exposed to technology as much as they need.

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Appendix A

Data Collection Instrument

Construct	Item
Perceived usefulness	PU1 Using computers will improve my work PU2 Using computers will enhance my effectiveness PU3 Using computers will increase my productivity.
Perceived ease of use	PEU1 My interaction with computers is clear and understandable. PEU2 I find it easy to get computers to do what I want it to do. PEU3 I find computers easy to use.
Attitudes toward computer use	ATCU1 Computers make work more interesting. ATCU2 Working with computers is fun. ATCU3 I look forward to those aspects of my job that require me to use computers.
Technological complexity	TC1 Learning to use the computer takes up too much of my time. (R) TC2 Using the computer involves too much time. (R) TC3 It takes too long to learn how to use the computer. (R)
	CSE1 I could complete a job or task using the computer if I could call someone for help if I got stuck. (R) CSE2 I could complete a job or task using the computer if someone showed how to do it first. (R)
Facilitating conditions	FC1 When I need help to use the computer, someone is there to help me. FC2 When I need help to learn to use the computer, someone is there to teach me.
Behavioral intention	BI1 I will use computers in future. BI2 I plan to use the computer often.

R: Reverse coded items.

TECHNOLOGY INTEGRATION AND TECHNOLOGY LEADERSHIP IN SCHOOLS AS LEARNING ORGANIZATIONS

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ABSTRACT
The purpose of this study was to investigate technology integration in primary schools from the perspective of leadership in learning organizations. To that end, the study examines two groups: school administrators who play effective roles in technology integration in schools and computer teachers who are mainly responsible for schools' technology integration. In particular, this research focuses on the administrators' attitudes towards technology and the computer teachers' awareness of technological developments. Thirty-eight school administrators and thirty-five computer teachers who work in primary schools in Amasya, Turkey, participated in this study. The administrators completed a questionnaire regarding their attitudes towards technology integration, while the computer teachers were asked about their awareness of Web 2.0 technologies. In addition, interviews were conducted in order to thoroughly understand school administrators and teachers' opinions about technology integration and technology leadership. The questionnaire results showed that, although administrators' attitudes towards technology were largely positive, they gave negative responses for some items. On the other side, although teachers are aware of Web 2.0 technologies, few think to use such these technologies in the classroom.
Key words: Technology integration, computer teachers, technology leadership in learning organization

INTRODUCTION

Technological developments have found their way into almost every area of our lives, and it appears as if the integration of technology into education is inescapable. Given the important place that technology has come to occupy in our lives, schools have a great responsibility to educate individuals who are capable of effectively using technology. Today, educational leaders are making the necessary investments to ensure that technology is integrated into the teaching-learning process. Educators, teachers and researchers consider technology to be an indicator of high quality in education (Ajjan and Hartshorne, 2008; Barron, Kemker, Harmes, & Kalaydjian, 2003; Jonassen, Peck, & Wilson, 1999; Morrison and Lowther, 2004). For this reason, and in order to be able to raise individuals capable of finding and making use of information, teachers need to master the effective use of technology (e.g., computers, Internet, and so on).

While acknowledging that technology has, to a certain extent, been introduced into schools, researchers have stressed the need for teachers to continue to evaluate the possible uses of all available technologies in order to increase student academic achievement (Cradler, 1996; Hew and Brush, 2007). Recent studies provide information on the integration of technology into schools, including the use of desktop computers or laptops; word processing, spreadsheet and other software programs; and web technologies used for educational purposes (Cakir and Yildirim, 2009; Gülbahar, 2007; O'Dwyer et.al, 2005; Russell and Bebell, 2004). According to a study by Cuban et al. (2001), students' use of only basic applications, such as using the Internet to conduct a search, represents a low degree of technological integration, whereas developing multi-media presentations and completing projects that involve collecting and explaining data represent a high degree of integration. Moreover, Yıldırım (2007) has stated that consensus among academicians, decisionmakers and practitioners is a prerequisite for the effective use of technology in the classroom. In order to integrate technology into the school curriculum, it is necessary to identify student needs, existing resources, technology-related educational needs and technology design. It is also necessary to secure guidance and technical support for teachers in their use of technology.

Given the role of technology in student achievement, various national administrations have begun to develop projects to ensure the integration of technology into education (Cuban et al, 2001; Gülbahar, 2007; Yildirim, 2007). For example, in the United States during the 2003-2004 school year, school administrators spent 8 million dollars on technology integration (Quality Education Data, 2004). As a result of this and similar projects, the student-per-instructional-computer ratio dropped to 3.8:1 in 2004, and the student-per-Internet-connected computer ratio dropped to 4.1:1 in the United States (Education Week, 2005). Projects such as these promote students and teachers' effective use of educational technology in their learning and teaching activities.

In Turkey, information technology classrooms are being established in schools connected to the Ministry of National Education (MoNE). As the number of these classrooms increase, educational programs will also need to be strengthened in these schools. Accordingly, a joint project conducted by the MoNE and the World Bank aims to ensure that no school in Turkey will be without an IT classroom. Within the framework of this program, 4,874 IT classrooms have been established in 3,451 schools in Turkey with the aim of increasing the quality of primary schools' technology resources (Yildirim, 2007). These classrooms are equipped with computers, projection equipment and a variety of audio-visual equipment.

When looking at how these types of classrooms are operated in different countries, one notices that the individuals responsible for these classrooms are referred to by various names, including computer coordinator, media expert, and information and communication technology expert (Law and Plomp, 2003). Regardless of their titles, the individuals responsible for school technology classrooms have usually taken courses related to technology either as part of their university educations or as part of a post-university certificate program (Law and Plomp, 2003). The situation in Turkey is slightly different, because primary school IT classrooms fall under the responsibility of teachers who graduate from education faculties' computer education and instructional technology departments. These "computer teachers" play a lead role in the integration of technology into the schools. In addition to introducing students to computer technology for one hour per week, IT classrooms are open to students and to other teachers on an as-needed basis (Cakir, 2008; Göktaş and Topu, 2012).

Developments in information and communication technology are occurring at a dizzying pace, with new products appearing on the market every day, and computer teachers are responsible for closely following these technological developments and seeing that they are used effectively in the teaching-learning environment. Among the new developments that have recently begun to be used in the teaching-learning environment are Web 2.0 technologies such as blogs, wikis, RSS, and so on. Research shows that these technologies have just recently begun to be used for communication in the education environment and have opened up new possibilities in terms of collaboration and information-sharing that can be expected to expand over time (Bryant, 2007). In Turkey, the use of Web 2.0 technology in the teaching-learning environment is an extremely new phenomenon and educational applications include such areas as student workbooks, teacher blogs and more generally, classroom interaction and information management. As mentioned above, it is primarily computer teachers who are responsible for integrating these new technologies into the teaching-learning process in Turkey (Akbaba-Altun, 2004, Cakir and Yildirim, 2009; Seferoğlu, 2009).

In addition to teachers, school administrators also have a major responsibility to integrate technology into education (Bailey, 1997; Dawson and Rakes, 2003; Ertmer, et al., 2002; Testerman et al., 2002; Yee, 2000; Yildirim, 2007). In fact, rapid developments in technology and their increasingly widespread use in schools have led to a reappraisal of the roles and responsibilities of school administrators. According to a study by Hess (2003), the responsibilities of school administrators have changed as a result of the increased use of technology in the schools. Moreover, according to Don Knezek, President of the International Society of Technology Education (ISTE), since school principals have an influential role in the implementation of school reforms, their thoughts regarding technological integration are of crucial importance (ISTE, 2002).

Accordingly, this study aimed to evaluate the integration of technology into primary schools from the perspective of learning organization leadership. Given their important roles in the integration of technology in the schools, this study aimed to identify the attitudes of administrators (principals and assistant principals) towards technology and determine whether or not computer teachers responsible for integrating technology into education are following new technological developments and integrating them into the educational environment.

Learning Organization and Technology Leadership

The concept of the 'learning organization' was first used by Senge (1990) to describe educational institutions that, as organizations, provide individuals with ongoing opportunities for personal development in order to achieve their goals; support new methods of education and thinking that promote individual development; and cooperatively implement learning strategies. Senge (1990) identified five basic elements of a learning organization, namely, 'Systems Thinking', 'Personal Mastery', 'Mental Models', 'Building Shared Vision' and 'Team Learning'. In becoming a learning organization, the greatest responsibility falls on management (Ünal and Gürsal, 2007). In terms of technology integration, the main responsibilities of managers, as leaders (i.e. school administrators and computer teachers), in learning organizations include encouraging learning and securing the development of a rich learning environment in order to present opportunities for teachers and students to obtain new and correct information. Moreover, Senge (1990) highlights the need for leaders to agree to changes and share responsibilities if a school is to become a learning organization. According to Cullen (1999), managers are open to communication, continually involved in oversight and actively participate with employees in problem-solving processes. When administrators are involved in this manner, employees are more ready and willing to be engaged in the learning process. In line with this, it can be stated that school principals and computer teachers responsible for technology integration have a great deal of influence over whether or not technology can be integrated effectively in schools.

The integration of technology into the curriculum plays an important role in terms of creating a rich teaching and learning environment. In fact, the integration of new technological developments into education should enable students to make use of new technologies just as easily as they make use of other educational tools such as books, maps and pencils (Cakir and Yildirim, 2009; Hew and Brush, 2007). Researchers stress the need for sufficient numbers of computer teachers who embrace their profession and communicate well with other teachers (Cakir, 2008; Göktaş and Topu 2012; Seferoğlu, 2007), as well as the key role school administrators play in the integration of technology into the schools (Afshari et al., 2008; Brockmeier et al., 2005; Kearsley and Lynch, 1992; Seferoğlu, 2009). Whereas computer teachers have a particularly important role in integrating new developments into the educational environment, administrators are responsible for prioritizing the use of new technologies in the schools and ensuring that computer teachers are provided with the support they require.

From the perspective of a learning organization, computer teachers and administrators are in leadership positions with regard to the use of technology in schools. According to Fullan (2001), an effective school leader should possess characteristics such as an understanding of change, an openness to innovation and a willingness to encourage learning and teaching. Not only should administrators expect teachers and students to use technology in their teaching and learning activities, as leaders in innovation, administrators should also embrace technology and make use of it themselves as part of their school's investment in technology (Brockmeier, et al., 2005; Dawson and Rakes, 2003; Rogers, 2003). In other words, a technology leader should model the use of technology for other teachers and students.

Bailey and Lumley (1997) have identified eight important themes for leaders who want to integrate technology effectively: 1) change with developments in technology, 2) budget and planning for technology, 3) professional development of personnel involved in technology, 4) technological infrastructure, 5) technical support in the implementation of technology, 6) learning and teaching with technology, 7) a curriculum in which technology is integrated, and 8) individuals who consider themselves to be technology leaders. These researchers also stress that administrators cannot achieve technology integration without the cooperation of the teachers at their school, which is in line with Senge's (1990) description of 'building shared vision'—i.e, the formation of a common vision shared by everyone in the organization—as one of the important characteristics of a learning organization. Similarly, ISTE has pointed out that technology leaders need to develop a joint vision, secure cooperation and provide the necessary underlying conditions for the effective use of technology in the schools (Anderson and Dexter, 2005). By keeping an open mind regarding technology and innovation and making use of new technologies themselves, computer teachers and administrators will be better able to shape the effective use of technology in their schools.

METHODOLOGY

Recognizing the importance of leadership in learning organizations for technology integration, the study intended to provide answers to the following questions:

1) What are the attitudes of primary school principals and assistant principals towards technology?
2) How aware are computer teachers of new technologies (e.g., Web 2.0 technologies) and what are their attitudes towards them?
3) What are the thoughts of primary school administrators (principals and assistant principals) and computer teachers regarding technology leadership?

In order to answer the above questions, the study employed survey-based quantitative research to examine the attitudes of administrators and computer teachers towards the integration of new technologies in the schools.

Instruments

The attitudes of administrators were examined using a questionnaire which begins with a short explanation and is then divided into two sections. The first asks general demographic questions and the second queries administrators' attitudes about technology. This second section uses the questionnaire "Attitudes Towards Technology" developed by Akbaba-Altun (2002), which has a Cronbach-Alpha reliability of 0.91. This second part of the questionnaire consists of 37 items that are rated using a Likert-type scale from 1 to 5, where 1 represents 'totally disagree' and 5 represents 'totally agree'.

For the computer teachers, a second questionnaire was administered. Similar to the first questionnaire, it begins with a short explanation, followed by demographic questions and then questions about the teachers' awareness of and attitudes towards Web 2.0 technologies. This final section about awareness and attitudes was developed by Ajjan & Hartshorne (2008) and implemented by the researcher. This part of the questionnaire consists of 35 items that are rated using a Likert-type scale from 1 to 5, where 1 represents 'totally disagree' and 5 represents 'totally agree'. The questionnaire was translated into Turkish and reviewed by expert linguists. The reliability and validity of the questionnaire were tested in a pilot study and found to have a Cronbach-Alpha reliability value of 0.83. In addition, semi-structured interviews were conducted by the researchers to more deeply understand participants' views about technology leadership.

Participants

Questionnaires were administered to primary school administrators (principals and assistant principals) and computer teachers at primary schools in the province of Amasya after receiving permission from the Amasya Provincial Directorate of National Education. In total, 38 administrators (male: n=29, 76%; female: n=9, 24%) and 35 computer teachers (male: n=21, 60%; female: n=14, 40%) volunteered to participate in the study. In addition, interviews were conducted with 8 administrators (5 male, 3 female) and 10 computer teachers (5 male, 5 female). Interviews consisted of open-ended questions about administrators' and teachers' thoughts regarding technology integration in the schools and technology leadership.

Analysis of the Data

Questionnaire data was analyzed using SPSS (Statistical Package for the Social Sciences) version 15. For the data obtained from the questionnaires, mean and standard deviations, frequency distributions and percentiles were calculated, and variables were compared using t-test. Interviews were transcribed upon completion and coded and analyzed in three stages. These stages are open coding, axial coding and selective coding, according to Strauss and Corbin (1998).

RESULTS

Administrators' attitudes towards technology

Of the 38 participating administrators (21 principals and 17 assistant principals), six had been employed as administrators for over 20 years, fifteen for between 16-20 years, nine for between 11-15 years, five for between 6-10 years and three for between 1-5 years. Furthermore, the majority of administrators had previously worked as classroom teachers (n=20, 53%). All of the administrators reported that they had a computer at home, and all but two reported having internet access at home.

The amount of time spent using computers varied among administrators. The majority (n=21, 55%) reported spending between 1-5 hours daily using a computer, whereas eleven reported spending between 6-10 hours per day, two reported spending more than 10 hours per day and four reported spending less than one hour per day using a computer. Almost all of the administrators (n=36) reported using computers to send and receive email, thirty reported that they used Facebook and twenty eight reported browsing the internet. In addition, all of the administrators reported using word processing, spreadsheet and desktop publishing programs such as Microsoft Word, Excel and PowerPoint, and close to half (n=16, 42%) reported knowing how to use Flash and Photoshop. None of the administrators reported familiarity with Web 2.0 technologies (Blogs, Wikis, RSS, and so on.).

When administrators' attitudes towards technology were examined, in general it was found that administrators had a positive attitude towards technology. This was reflected in high mean scores for the questionnaire statements ($\overline{X}$ = 3.95). The highest mean scores were found for the statements, "It makes me happy to see new educational technologies being used in my school ($\overline{X}$ **=4.75)** and, "I want technology to be widely covered in in-service education programs." ($\overline{X}$ **=4.65).** Other statements received lower mean scores. For example, it was observed that administrators do not think that technology will take the place of human beings ($\overline{X}$ **=** 2.09) and that administrators are indecisive regarding whether or not using technology is the only way to obtain information ($\overline{X}$ =2.68). Assistant principals scored higher than principals; however, the difference between the two groups was not statistically significant ($\overline{X}_{principal}$=3.93, *SD* =0,91, $\overline{X}_{asst.principal}$=3.98, *SD* =0,88, $t(36)$ = 1,21, p>0.05). Similarly, although scores for male administrators were higher than those for female administrators, the difference between the two groups was not statistically significant ($\overline{X}_{male}$=3.97, *SD* =0,83, $\overline{X}_{female}$=3.90, *SD* =0,78, $t(36)$ = 0.96, p>0.05).

Table 1: Administrators' responses to some items from the questionnaire (means and standard deviations)

Statements	$\overline{X}$	**SD**
I encourage others to use technology.	4.40	.69
I enjoy talking to my colleagues about technology.	4.18	.85
I enjoy reading publications about technology.	3.77	1.04
I am happy to receive information about technological developments from teachers.	4.25	1.1
I think that technology reduces interactions between people.	3.42	1.03
I think that the use of educational technology increases learning.	4.5	.82
I like informing people about new technological developments.	3.95	.92
I think that technology will take the place of human beings.	2.09	1.04
It makes me happy to see new educational technologies being used in my school.	4.75	.92
I want technology to be widely covered in in-service training programs.	4.65	1.13
I think that using technology is the only way to obtain information.	2.68	1.09

Technology leadership and expectations

In the interviews conducted with school administrators, the most frequently referenced topics were leadership and expectations of computer teachers. Findings from the interviews indicated that administrators embraced technology and would like it to be more widely used in their schools. Administrators also clearly stated that while they considered themselves the leaders at their school with regard to technology integration, they felt that it was other teachers, particularly computer teachers, who would realize this integration. In the words of one administrator:

> "We have every type of technological opportunity, every classroom has a computer and a projector. We even purchased a SMART board using our own resources, and I ask if anyone uses it, but everyone appears to be uneasy about this. As an administrator I do what I can; the rest is up to the teachers."

Indeed administrators had certain expectations of teachers, particularly computer teachers. For example, the views of one administrator were expressed as follows:

> "We have an information technology classroom and a computer teacher in our school. I want our students to use this classroom. I think this classroom could be used more effectively if our computer teacher worked together with other teachers."

Further referencing expectations of teamwork among teachers, administrators stated that they wanted computer teachers to keep other teachers informed about new technologies and prepare training courses about the use of new technologies in education. As one school principal commented:

> "I would like it if from time to time the computer teacher at our school organized courses for the other teachers on how to use technology. We have every type of opportunity at our school, but, regrettably, our teachers do not make use of them. Computer teachers should encourage other teachers to use new technological developments in their classes."

Finally, administrators mentioned the need for computer teachers to work with students, encouraging them to use technology in their prepared projects. For example, according to one administrator:

> "Most of the time students play games in the computer classroom, whereas if the computer teacher would create a project with at least the most talented of the students, it would be very good for them in terms of their personal development."

Computer teachers' attitudes towards new technology

Of the 35 (21 male, 14 female) computer teachers who participated in the study, the majority (n=19, 55%) had been teaching for more than five years and the remainder for less than five years (n=16, 45%). All teachers reported having computers and Internet access at their homes. The majority (n=18, 52%) reported using the computer for more than 10 hours per day, and another significant proportion (n=13, 37%) for between 5-10 hours per day, whereas only four teachers (11%) said they used the computer for less than five hours per day.

All of the computer teachers noted they used the computer to prepare material for their lessons, browse the Internet, send and receive emails and chat using Facebook and MSN Messenger, and 15 (43%) stated they used the computer to conduct research outside of class. Moreover, all of the teachers reported being able to use word processing, spreadsheet and desktop publishing programs; 30 (85%) could use web programs like ASP.net; and 23 (65%) could use Flash and Photoshop. Only 12 computer teachers (35%) reported being able to use Web 2.0

technologies like Blogs, RSS, Wikis, etc., and while computer teachers were found to be aware of and have positive attitudes towards Web 2.0 technologies the mean for the questionnaire addressing this issue was not particularly high ($\overline{X}$ =3.16, SD=.72).

Among those statements with the highest mean scores were, "I think it is a good idea to use Web 2.0 technologies" ($\overline{X}$ =3.81), and, "I think using Web 2.0 technologies is better than not using them" ($\overline{X}$ =3.79). In spite of this, some of the lowest mean scores were found for the statements, "I can plan how to use Web 2.0 technologies in the classroom," and, "Administrators think it is important for me to use Web 2.0 technologies in my classroom" ($\overline{X}$ =2.7 and $\overline{X}$ =2.68, respectively).

Table 2: Teachers' responses to some questionnaire statements (means and standard deviations)

Statements	$\overline{X}$	**SD**
I can plan how to use Web 2.0 technologies in the classroom.	2.7	1.08
I am thinking of adding Web 2.0 technologies to my courses next semester.	2.85	1.07
Web 2.0 technologies are useful in teaching.	3.55	1.2
I think using Web 2.0 technologies is better than not using them.	3.79	.98
It is a good idea to use Web 2.0 technologies.	3.81	.93
Using Web 2.0 technologies will increase students' enjoyment of the class.	3.6	.94
Using Web 2.0 technologies will increase students' grades in the class.	3.25	.97
Administrators find it important that I use Web 2.0 technologies in my classroom.	2.68	1.13
I am knowledgeable about and capable of using Web 2.0 technologies.	3.5	1.15
Using Web 2.0 technologies fit well with the way I teach	3.15	1.18

Although the overall mean score of male teachers was higher than that of female teachers, the difference between the two was not statistically significant ($\overline{X}_{male}$= 3.18, *SD* =0,96, $\overline{X}_{female}$= 3.13, *SD* =0,81, $t(33)$ = 0,71, p>0.05) However, the attitude towards and awareness of new technologies was significantly higher among novice teachers (between 1-5 years' teaching experience) when compared to more experienced teachers (more than 5 years' teaching experience) ($\overline{X}_{1\text{-}5\ years'\ experience}$ = 3.19, *SD* =0,86, $\overline{X}_{5+\ years'\ experience}$ = 3.11, *SD* =0,99; $t(33)$ = 0,45, p<0.05).

Technology leadership and expectations

Interviews with teachers supported the findings of the questionnaire regarding technology integration and technology leadership. The findings from interviews emphasized that computer teachers considered the integration of technology into schools to be important and felt they had an important responsibility in this regard. In particular, the computer teachers focused on expectations—for themselves, for administrators, and for other teachers—and leadership.

Sometimes computer teachers fell short of their own expectations. For example, although computer teachers were generally aware of Web 2.0 technologies, they confessed that they did not know how they could be used in the IT classroom. One teacher's views were expressed as follows:

> "During my years in university I heard about Web 2.0 technologies, but we did not use them. I know that nowadays they've become popular, but I worry about using them. I don't know how I'll be able to use them. Other teachers at school who are interested in the subject ask questions, but frankly, I brush them off. I think that in-service courses should be organized on such new topics."

The interviews also highlighted computer teachers' expectations of and need for support from other teachers and, more importantly, from administrators in implementing new technology. In the words of one teacher with four years of teaching experience:

> "The computer room at my school is equipped with enough computers, and it is open to students, but occasionally I clash with administrators. For example, when I want to purchase a new program that I think will benefit students, or when I want to give seminars to students and teachers, I don't get support from the school administrators."

Computer teachers also think that schools have too many expectations for them and that school administrators and classroom teachers need to embrace technology and use it in the classroom just as much as they do. As one teacher stated:

> "There are unreasonable expectations that as the school's computer teacher, I need to do everything that has to do with computers, especially the technical things. However, other teachers

> know how to use computers, too, and so they should be using computers in the classroom as part of the teaching process. I keep the computer laboratory open for everyone's use, but I can't say that there is a lot of demand."

Regarding technology leadership, computer teachers consider themselves to be technology leaders at their schools and feel that they should take leadership positions regarding the dissemination of technology in their schools. However, they also stress that school administrators have as great a role as themselves in the effective use of technology in education. They view administrative support as necessary for the effective integration of technology in the schools. For example, as one female teacher, who has been teaching for five years, put it:

> "I see myself and the school administrators as the people responsible for closely following technological developments and making sure that technology is used at school; however, I also think that the first people who need to attend in-service training on technological developments are the school administrators."

DISCUSSION

The findings of this study clearly showed that school administrators, who have the primary responsibility for technology integration in the schools, and computer teachers, who play an important role in the integration of technologies in the classroom, have a high degree of interest in and a positive attitude towards technology. Previous studies in Turkey and in other countries have also found that school administrators have positive attitudes toward technology (Akbaba-Altun, 2008; Bailey, 1997; Dawson and Rakes, 2003; Flanangan and Jacobsen, 2003; Maxwell, 2001; Serhan, 2007). Given the importance of leadership for learning organizations, when schools are considered as learning organizations, these findings have important implications for the effective integration of technology in the schools, since it is the administrators and computer teachers who are the schools' technology leaders. A study by Ertmer et al (2002) states that being a technology leader should entail responsibilities such as acting as a role model, providing encouragement and direction and sharing knowledge and information. In other words, not only are technology leaders expected to have positive attitudes towards technology, they are also expected to be highly proficient in using technology. Ultimately, as technology leaders, school administrators and computer teachers share a large part of the responsibility for adopting and using new technologies in the schools. As previous studies have pointed out, school technology leaders are responsible for ensuring that as schools make significant investments in technological infrastructure, hardware and software, this equipment is installed appropriately and is made available in line with the needs of teachers and students (Dawson and Rakes, 2003; Maxwell, 2001).

Administrators are not only managers, but they are also teachers, and as such, as previous studies have shown, their support to teachers, position as role models, and progressive attitudes are important factors in the effective integration of technology in the schools (Baylor and Ritchie, 2002; Hasselbring, et al., 2000). According to ISTE standards, as leaders, school administrators should be sources of inspiration and leadership in the implementation of the organization's shared vision and the effective integration of technology for personal development (ISTE, 2009). It is not considered enough for those in positions of responsibility to maintain a positive attitude towards innovation; rather, they must also encourage teachers and students to incorporate innovation into the teaching-learning process. In terms of a 'learning organization', this type of involvement may be interpreted as developing the school's vision and providing students with a more effective learning environment.

The findings of this study also highlighted mutual expectations of administrators and computer teachers with regard to their roles in integrating technology in the schools. In line with Seferoğlu's (2009) study that specifically mentions administrators' expectations from computer teachers regarding technology integration, this study found administrators expected computer teachers to organize training courses at school, create projects with students, follow cutting-edge technology and work together with other teachers to integrate technology into the classroom. On the other hand, computer teachers expected administrators to become familiarized with new technology through in-service training, facilitate the use of technology at the school, purchase new technology, as necessary, and encourage students and other teachers at the school to use technology. However, in a study that evaluated the perceptions of primary school administrators regarding learning organizations, Ünal and Gürsal (2007) stressed the need for management (school administrators) and employees (teachers) to work together cooperatively. These observations highlight two of the five basic principles of the learning organization, namely, 'building a shared vision' and 'team learning' (Senge, 1990). According to Senge, participating in a 'work team', identifying a shared vision, and sharing information through group discussions lead to self-development. Not only does a learning organization make learning easier for all members (Balay, 2004), the process of team learning is essential, given that it is the team, not the individual that is the basic unit of learning in the modern organization; in other words, if the team doesn't learn, the organization doesn't learn (Senge, 1990). Moreover, the findings of the present study stressed the important roles that administrators and computer teachers have in the dissemination of technology. Because of their roles as leaders in the effective use and integration of technology, school administrators and computer teachers are closely watched by students and other teachers at the school and may be called upon for assistance, when necessary. For this reason, it is important that school administrators and computer teachers work in a coordinated manner and make joint decisions if technology is to become more widely and effectively used in the schools. Administrators should encourage teachers to use new technologies, and computer teachers should keep other subject teachers informed regarding technological developments.

Finally, previous studies have stressed the need for computer teachers, who are responsible for integrating technology into school, to keep up with innovations and adapt them for use in the educational environment in order to provide students opportunities to use new technologies (Cakir and Yildirim 2009; Göktaş and Topu 2012; Seferoğlu, 2007). Computer or ICT teachers should be able to keep up with cutting-edge technology by receiving regular inservice trainings (Göktaş and Topu 2012; Seferoğlu, 2009, Watson, 2001). Similarly, in order for school administrators to be technology leaders, they need to keep up with technological developments as well (Afshari et al., 2008, Brockmeier et al., 2005; Davis, 2008). For this to happen, administrators need to be supported with in-service training seminars that provide information about how new technological developments can be integrated into the schools and stress the need for administrators to be prepared for their roles as technology leaders in the schools (Flanagan and Jacobsen, 2003). In this regard, the MoNE and/or universities can develop in-service training programs to familiarize administrators and computer teachers with new technologies and help them to integrate them into the educational environment.

In conclusion, it should be noted that the generalizability of the results of the present study was limited by the small number of participants and the use of a self-reporting questionnaire. It is recommended that additional studies with larger populations be conducted in order to be able to generalize the results and provide a more detailed understanding of the factors that underlay effective technology integration in terms of leadership in the schools.

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THE EFFECT OF APPLYING ONLINE PBL CASE SYSTEM TO MULTIPLE DISCIPLINES OF MEDICAL EDUCATION

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ABSTRACT
Teaching cases in medical education are often exhibited through various professional angles, but for patient-centered teaching cases, the division of labor among different specialties is even more important. However, general medical education platforms cannot provide such mechanisms for physicians. Thus, this study adopted a clinical medical education platform "HINTS" to establish a patient-centered interdisciplinary medical/clinical education mechanism for medical students to obtain a more holistic thinking process in practical training for clinical medicine. Additionally, rule-based and document-view methods were administered to successfully establish methods to edit and present teaching cases, installing them on "HINTS." The results of the preliminary experimentation show that applying online PBL case system can be very beneficial for the learning effects of medical students.
Keywords: Multiple Disciplines, PBL for medical education, integrated teaching case

INTRODUCTION

Recently many medical schools and centers have adopted a variety of Web-based application systems in an attempt to establish e-learning environments (Holzinger, Kickmeier-Rust, Wassertheurer, & Hessinger, 2009; DxR, 2008; Green, Jenkins, Potter, & Davies, 2000; Richards, 2002; Wong, & Hoo, 1999) for medical education purposes (Alpay, & Littleton, 2001; Dev, 1999; Norris, & Brittain, 2000; Zollo, Kienzle, Henshaw, Crist, & Wakefield, 1999). One such approach has been to introduce Web-based, Problem-Based Learning (PBL) strategies into their training curriculum (DxR, 2008; Maudsley, 2003; Norman, Schmidt, 1992; Oubenaissa, & Giardina, 2002). In the medical field, PBL involves the presentation of clinical cases as a means of learning basic medical and clinical science. In combination with PBL techniques, computers and computer networks can be successfully applied as training tools for physicians or students in medical schools such that they gain the required knowledge and experienceto make accurate diagnoses in their actual clinical practices. In the Web-based PBL systems, students are presented with a challenging medical problem and then retrieve the relevant supporting information from the computer system in order to work their way progressively towards a correct diagnosis. This teaching strategy appears to be reasonably effective, and has been adopted by many website-based teaching case systems available on the Internet (Dornan, Maredia, Hosie, Lee, & Stopford, 2003; DxR, 2008).

However, in this type of teaching system, each teaching case is compiled by an individual instructor working independently. Therefore, the teaching materials can only reflect their particular view of the learning points and may only represent a small portion of the complete picture of the teaching case. As a result, although students experience many different teaching cases from different clinical disciplines during their training, these teaching cases may not be necesary associated with each other. Consequently, it is difficult for the students to relate the learning points gained from one single teaching case to the knowledge acquired from another. Hence, they may struggle to fully develop an integrated multi-disciplinary view and understanding of the clinical knowledge, which they will require in the future clinical practice. Therefore, this study aims to explore how an Web-based PBL teaching case can be presented to the medical school students in such a way that provides an integrated, effective, and efficient mechanism for them to acquire an overall perspective and knowledge of patient care problems.

A prototype system referred to as "HINTS" (Health Information Network Teaching-case System) (Cheng, Chen, Weng, Chen, & Lin, 2009; Chen, Cheng, Weng, Chen, & Lin, 2009) is implemented in this study. This system is an Web-based Problem Based Learning (Web-based PBL) system, which incorporates many actual clinical teaching cases so as to enable the students to acquire an integrated view of the typical clinical cases they will encounter in their future medical practice (Seila, 2000). The basic approach of the proposed system is to take one particular clinical case and to have the various domain experts from the different clinical disciplines edit the related teaching material such that the users can explore the clinical case from a variety of different perspectives. The concept of document-view architecture and a rule-based mechanismare are used in the teaching case system to provide an integrated clinical view of the medical school students' medical e-learning, which is followed by the method of providing an integrated view of clinical teaching cases and introduction to the concept of the document-view architecture for the system implementation. The plain mode and interactive mode of the system operations are also briefly introduced. Then, the system implementation from an author's perspective and an engineer's perspective are discussed. Finally, the reports of the users' experience and the authors' in using and developing the prototype system and conclusion are presented respectively.

BACKGROUND

The Integrated View of Clinical Teaching Cases

Based on our previous argument, if the same Web-based PBL teaching case is explored from the perspectives of different disciplines, students should be able to learn in a more effective and efficient way because the overall picture of the case will be seen in a more integrated fashion. In other words, if all the basic subject materials of a teaching case are related to the same patient case, and different domain experts edit the clinical data from the perspective of their own disciplines, the students can understand how a case is viewed from different perspectives. For the sake of argument, we define some terminologies here. If a teaching case is edited by an internal medicine viewpoint, it can be referred to as "an internal medicine view". Furthermore, the term "a department view" refers to any general view of a teaching case. That is, an internal medicine view is a department view of a teaching case which views the case specifically from the perspective of internal medicine.

Concept of Case Templates and Document-View Architectural Pattern

Case templates

In order to explain how our prototype system was implemented, first of all, the PBL teaching case template concept used in the system is introduced. The PBL teaching case system is essentially a multimedia Computer Aided Instruction (CAI) system (Cheng, Chen, Lin, & Chen, 2003) with knowledge database containing the knowledge of specific topics, which an expert in that particular domain would reasonably be expected to possess. In the system, the knowledge model (Clancey, 1987) contains data related to the many different clinical cases, which are to be taught. Since many teaching cases in the system share similar scenarios, it is possible to use a number of "case templates" (Cheng et al., 2003) to form an abstract model of the domain knowledge. In other words, a template outlines the main contents of a teaching case, and serves as the directory of the case. A template for a typical medical teaching case might include the following sections: (1) basic personal information such as age and gender, (2) brief case history, (3) reported complaints, (4) physical examinations, (5) findings, (6) diagnoses, (7) relevant associated cases, (8) discussions, (9) comments, and (10) learning points.

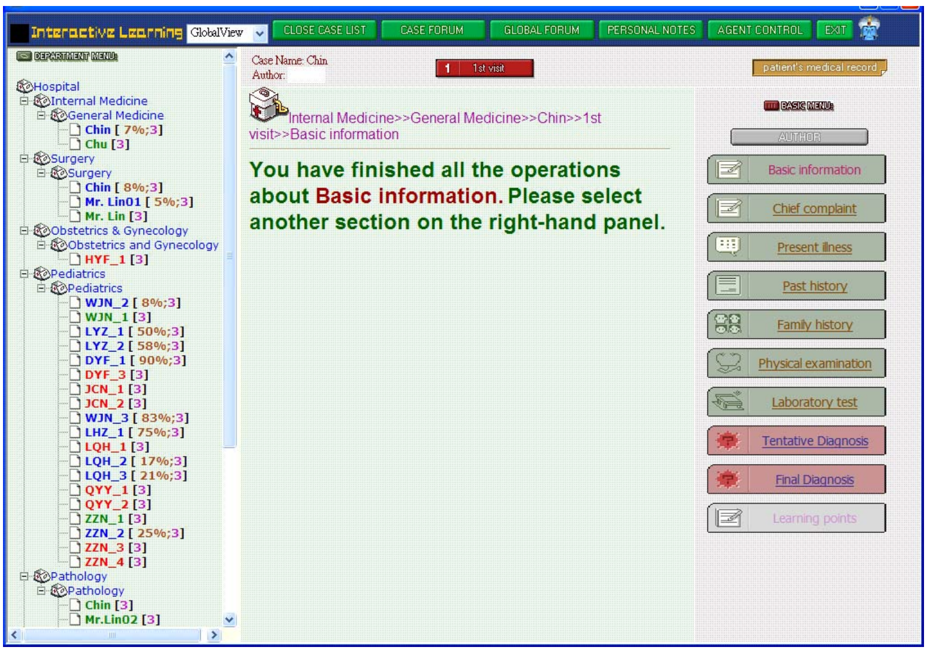
The concept of the document-view

Each department in a hospital has its own clinical data representation semantics for its teaching cases and can be edited to its own teaching case templates, which are suitable as the teaching materials of the department. For instance, for the radiology department, the system has the MRI, CT, or X-ray images (Huang, 1999; Wong, & Hoo, 1999), the basic patient information, such as age, sex, and the patient's chief complaints, etc. Each department has its own emphases and case templates, each of which has specific meta-data to present a specific semantics of a teaching case for the teaching purpose. In general, there are many different department views (perspectives) to look at a teaching case. Within these different department views for the same teaching case, some parts of the case are shared among some department views while some other parts may be used by only one department alone. From a more abstract point of view, the situation is well fitted into the "document-view" architectural pattern (Chang, Chen, & Lai, 1999) in which a document in an interactive system may have many different views depending on what the user wants to be able to visualize the data in hand. The document-view architectural pattern divides an interactive application system into two components. The document component contains the core functionality and data of the object of interest while the view component displays the data of the object of interest to the user and handles user interaction. It can be multiple views of the same document. If the user changes the data of the document, all the views depending on this document should reflect the changes.

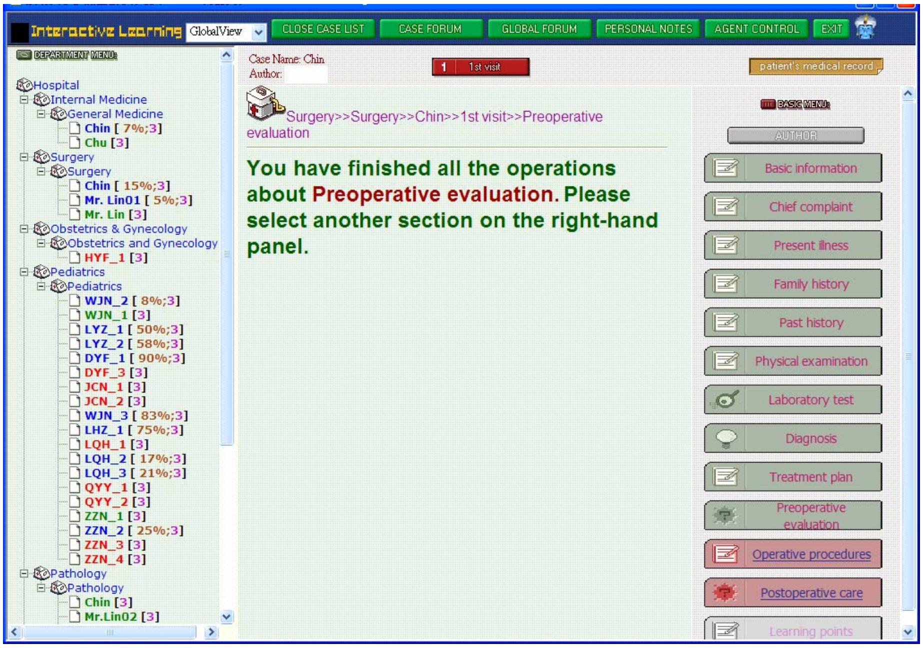
In the implementation, a rule-based mechanism is used to support the document-view concept of the teaching case system. When the user enters the case template into the system using the template-authoring tool, the sections that will be used by at least one department view will be entered into the case template. The user can make use of a rule database for specifying which sections in the case template will be included in a given department view of a teaching case so that when the user browses the case latter, the system can respond accordingly. The rules are encoded in a data format and stored in a database as opposed to some specific rules executed by an inference engine as some expert systems do. The rule database and the implementation details are described in section 3.2.

The Plain Mode and the Interactive Mode of the System Operations

The proposed system makes available two different modes of operation for any given department view. Different students using the system have different academic backgrounds and different learning objectives. The system meets these diverse requirements by providing two different operation modes, namely (1) the interactive mode, and (2) the plain mode. Each mode has its own particular strengths and weaknesses. In the interactive mode, the system provides various datasets to challenge the student, who is then given the opportunity to work his way progressively through the appropriate clinical procedure towards a final diagnosis. This style of interactive learning is both interesting and challenging for students who already possess sufficient knowledge to be able to develop correct answers. However, students who have only recently been introduced to the material covered in the teaching case are unlikely to possess sufficient knowledge to successfully complete the training task. It is little value to oblige these students to guess randomly at the required answers, and they will likely become frustrated if required to operate in such a challenging learning environment. In this case, it is probably preferable to present the necessary teaching materials descriptively so that the students can simply read through the teaching materials. This approach is referred to as the “plain mode”, and in some senses can be regarded as the equivalent of an electronic book where the teaching materials are presented directly. In summary, the interactive mode is more appropriate for advanced users, while the plain mode is designed more with the needs of novices in mind, or for users who are not specialists in that particular knowledge domain.



(a) the view of the internal medicine



(b) the view of the surgery

Figure 1. The system screen layout

SYSTEM IMPLEMENTATION

The system was implemented in Microsoft Internet Information Server using both Microsoft "ASP (Active Server Page).Net", and SQL database technologies. The students can simply use the WWW (World Wide Web) browser to login the "HINTS" system and browse the teaching cases at the computer center in the medical school or at home where wide bandwidth Internet connection is available.

The Authors' Perspective

For a given patient case, we asked several domain experts to edit the teaching case material from their own perspectives. This involves the following steps.

(1)The generation of a case template that can accommodate the needs of all the perspectives. Each domain expert should define his own case template first. All the templates of all the perspectives will be put together to form the overall template of the teaching case. This is because some sections are shared by many different templates of different department views and the system needs to keep only one copy of each section for the consistency control instead of making several copies of the same data and complicating the maintenance work. Therefore, at this step, an overall teaching case template was set up.

(2)Set up a "department-view-rule" database that specifies which sections belong to which department views so that the system can present the teaching case material to the students properly. Each department view has its own case template, which is a subset of the overall case template. All the case templates are recorded in a database called the case template database. For instance, for a case in the system, the sections for the internal medicine case are the basic information, chief complaint, present illness, past history, family history, physical examination, laboratory test, tentative diagnosis and Final diagnosis section while the sections for surgery are Basic information, Chief complaint, present illness, past history, family history, physical examination, laboratory test, diagnosis, treatment plan, preoperative evaluation, operation procedure, and postoperative care. Note that they share the basic information, chief complaint, present illness, past history, family history, physical examination, laboratory test, and diagnosis sections.

Figure 2 illustrates the steps involved in developing a teaching case using the implemented "HINTS" system. Each participating department lists the core topics, and one senior attending physician from that department is then designated as the coordinator of the project.

1. The coordinator identifies the teaching cases and assigns responsible authors for establishing the learning objectives and collecting the information for each case.
2. The coordinator instructs a research assistant to log in to the data-collection process and to register a patient ID, hence triggering the data collection process.

3. The data-collection website automatically sends the data collection request message to four separate units, namely (1) the Computer Center at NCKU hospital, (2) the Department of Radiology, (3) the Endoscopy Laboratory, and (4) Department of Pathology. The proposed system is obliged to inform these individual units since patient data are not integrated within a single large database system. This is because that in almost all hospitals in Taiwan, and in fact throughout the world, patient data tend to be distributed geographically in this way, although this situation is far from the perfect case where all the patient data are integrated into a single large database system. The current implementation has shown that the proposed arrangement functions very effectively in terms of accessing the requested data.
4. Once the messages are received, the assigned research assistant in each unit collects the necessary patient data and then uses “ftp” to transmit them to the data-collection website under a particular directory for each patient.
5. The research assistant retrieves the data from the particular directory, and uses the authoring tools in the “HINTS” system to edit them for the particular teaching case.
6. When the research assistant completes the preliminary draft of the teaching case, it is reviewed and analyzed by the author. The draft is then reviewed by other specialists with specific domain knowledge and modified as necessary according to the learning objectives.
7. If the author is not satisfied with the case template or the presentation model, he can modify them by specifying some new requirements.
8. The research assistant and the engineers develop the software to meet the requirements of the presentation model or the case template. The workflow then returns to Step 5. The research assistant uses the new version of the software and modifies the teaching case such that it can be browsed as planned. The authoring process iterates around Steps 5, 6, 7, and 8 until the authors are completely satisfied with the results.
9. The final approval committee, which includes all the relevant coordinators and authors, reviews each case, and makes joint suggestions for further modification if required. The teaching case is modified accordingly, and Steps 5, 6, 7, 8, and 9 are iterated once more until all parties concerned are satisfied with the results.
10. The teaching case is then piloted on a focus group of students in order to collect their opinions and to make further modifications if necessary. Finally, the teaching case is implemented in the curriculum in the medical center for the use of students, or in educational programs for the use of residents and specialists.
11. To enable the authors to assess a student’s performance, his interactions with the “HINTS” system are recorded and then analyzed in order to compute relevant performance statistics. The teaching cases and the “HINTS” system can be further modified to meet any new requirements as a result of this assessment. Therefore, the feedback inputs to Steps 5, 6, 7, 8, and 9 for the further development of the system.

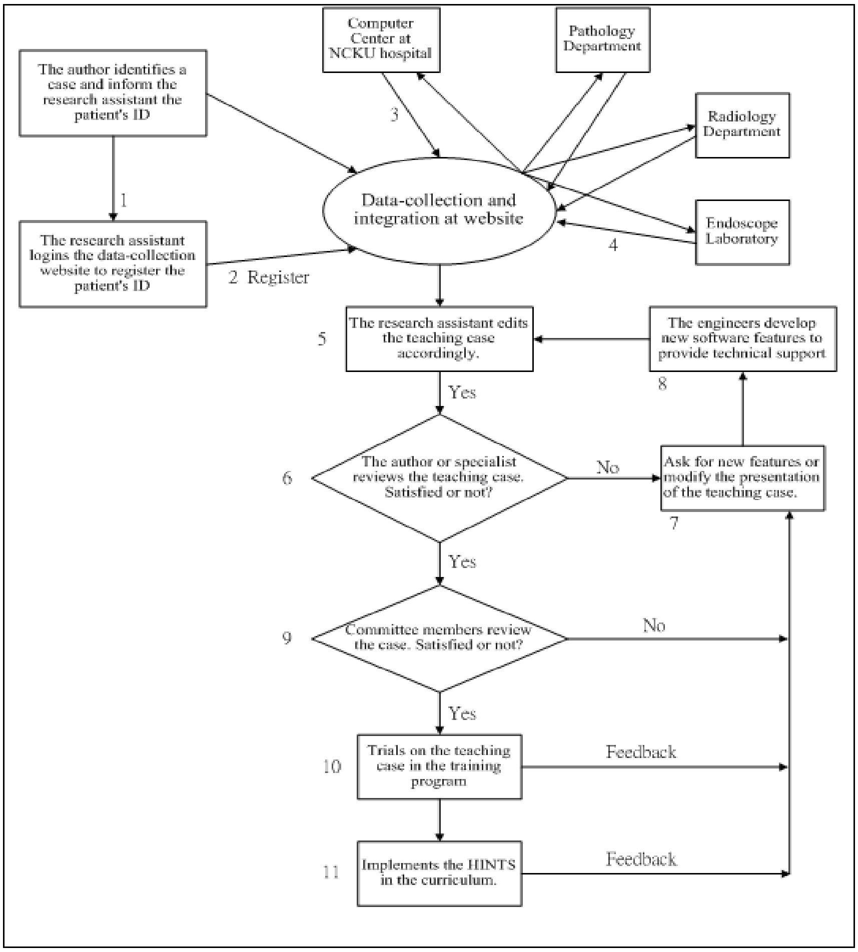


Figure 2. Flow of teaching case development

The Engineer's Perspective

The prototype system contains three databases to implement the document-view architecture, including (a) a user profile database which includes data related to each user, including name, major (e.g. internal medicine), level of sophistication (e.g. intern, specialist, or student in medical school), etc. (b) a department-view-rule database (briefly described in the author's perspective subsection) which stores the case template information and has a number of fields, including department name (or student major, e.g. internal medicine), case template ID, section names in the case template for this department. (c) a presentation database having a number of fields, including user level, department name (or student major, e.g. internal medicine), section name, operation mode, e.g. interactive mode or plain mode, and a presentation function which implements how each section in a teaching case should be presented based on the user level and major. The above mentioned information is used as indexes to retrieve the presentation function which implements how a particular section in a teaching case is to be presented. Using the provided tools, the user profile database is populated by the system administrator, and the other databases by the authors and engineers, before the case is made available on the website. The architecture of the system is shown in Figure 3. In order to ease the management of all the multimedia documents associated with the teaching cases in the system, all the multimedia documents are stored in a teaching case database.

Figure 1 show how the process works. (1) User profile process: when a user uses the web browser and logs-in into the system, the system first accesses the user profile database to retrieve the relevant user major and user level; (2) View-rule process: when the user activates a particular teaching case for interactive browsing, the system retrieves the corresponding case template and the section names for the particular department view stored in the department-view-rule database. At this point, the system is ready to present the teaching case to the user in the particular department view. On the right-hand side of the browser window shown in Figure 1, the system shows all the section names in the case template for this particular department view; (3) Decision of the presentation process: when a section is clicked, the presentation function for this section is retrieved from the presentation database by using the first four fields of the presentation database as the key. The system retrieves the contents of the section from the teaching case database, and uses the presentation function to present the section to the user.

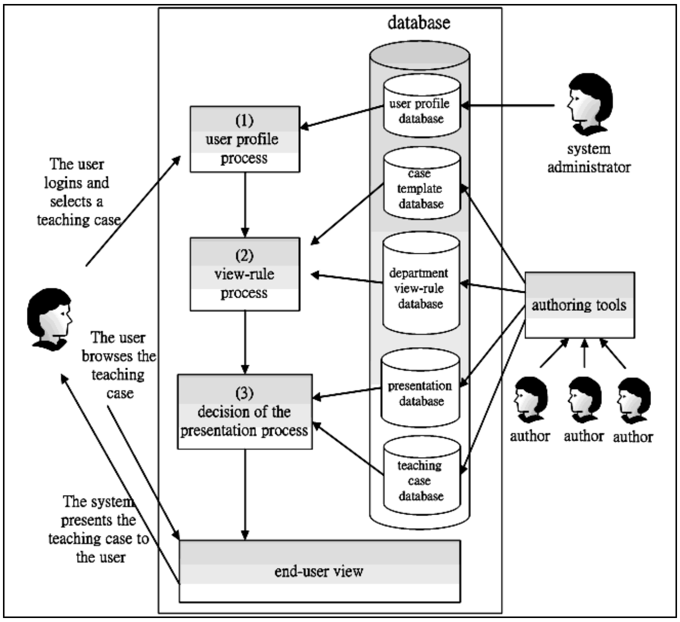


Figure 3. The architecture of the system

RESEACH METHOD

Research Design and Research Structure

This study is an exploratory research based on cross-sectional research design, and uses structural questionnaires as the research tool for data collection. The proposed system has been installed in the medical center, Taiwan for trial purpose. More than 150 students ranging from the 5^{th} to 7^{th} grade (equivalent to 1st to 3rd grade students in a medical school of the American medical education system) have had experience in using the system. For this particular study, the research subjects were 5^{th}, 6^{th}, and 7^{th} year medical students at a medical university in Taiwan. Stratified random sampling was conducted based on the number of ratios of the medical students for each year, to extract 17 fifth year medical students, 12 sixth year medical students, and 11 seventh year medical students for a total of 40 medical students. All of them have enough basic medical science background to conduct the clinical diagnoses and currently have many practical training courses in the medicine department. Thus, 40 medical students underwent a four-week PBL Multiple Disciplines for Medical Education instruction experiment. The “PBL Multiple Disciplines for Medical Education system and learning satisfaction questionnaire” was administered to explore the satisfaction of medical students in using PBL multiple disciplines for medical education. The questionnaire design was based on the research objectives, literature review, and many years of instructional experiences of medical educators and experts. The framework is shown in Figure 4. In the instruction experiment, in order to control the intervention of unrelated variables, according to the experiment control method by Best and Kahn (2006) and Van Dalen (1979), the five items of 1) initial behavior; 2) class hours; 3) instructional scope; 4) instructional tool; and 5) instructors were listed as the “control variables” for avoiding affecting experiment results. After the experiment instruction, the teaching medical doctors in four subjects (internal medicine, surgery, radiology, and pathology) were interviewed in order to understand the efficacy of this system in clinical medical education, as well as the improvement opinions.

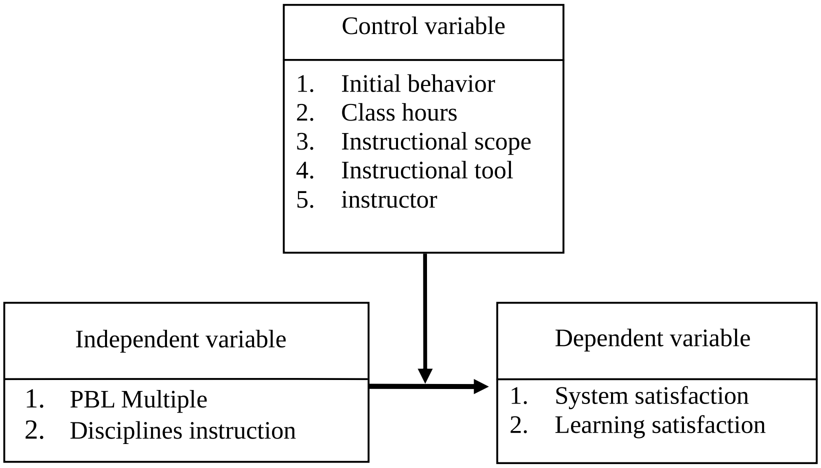


Figure 4. Framework of PBL Multiple Disciplines for Medical Education learning satisfaction

The PBL Multiple Disciplines of Medical Education System Learning Satisfaction Questionnaire
The questionnaire uses a Five-point Likert scale, ranging from 5 (highly agree), to 1 (highly disagree). In the first draft, there were 13 items. After reviewed by experts in the medical education field, and repeated modification for readability, one item was deleted, and the content of one item was revised. After expert validity testing, the formal questionnaire contains 12 items in total.

Pilot study
In terms of testing validity, expert content validity was used. Experts carefully tested whether the items could represent the behavioral aspects to be tested (Gronlund and Linn, 1990). Purposive sampling was used to extract 30 medical students for pre-test, and the data were analyzed with item analysis and factor analysis. Based on the results, one item was deleted. The final questionnaire contained 12 items, which was used to establish the construct validity of the scale. After expert validity and construct validity evaluation, the scale underwent reliability testing by Cronbach α coefficient to analyze internal consistency of items in the same dimensions. The Cronbach α coefficient is 0.905, which reaches the requirement of reliability of over 0.7 (Nunnally, 1978).

RESULTS AND DISCUSSIONS

The objective of the courses is to help medical students learn the skills of how to face a real patient, order laboratory test, make a diagnosis, and give treatment to the patient. At the beginning (the first classroom lecture for a case), the instructor gave the students some background knowledge about the particular case in the classroom. Then, the students browsed through the case including reading through the basic information and chief complain sections in the HINTS, specifying which part of the patient body should be examined, what questions should be asked, and what laboratory test should be ordered to get more information and insight about the patient's status from the HINTS, and finally gave their final diagnoses for the exercise. The following survey data were collected right after the students finish their browsing of the teaching cases. In the second classroom lecture, the instructor and students discussed their results computed by the HINTS and experiences about the teaching case.

After administering the questionnaires, the retrieved questionnaires were coded, encoded, input into a computer. SPSS 12.0 for Windows was used for descriptive statistics to evaluate the satisfaction of medical students in three grades after receiving the PBL Multiple Disciplines for Medical Education instruction. The results are shown in Table 1.

Table 1. Summary of respondent feedback

Grade / Questions	5^{th}		6^{th}		7^{th}	
No. of students	*N*=17		*N*=12		*N*=11	
M (Mean Value) and *SD* (Standard Deviation)	*M*	*SD*	*M*	*SD*	*M*	*SD*
The system operational interface is relatively easy	4.18	0.18	4.5	0.27	4.55	0.27

The teaching cases in the system are beneficial to your learning in clinical practical training	3.65	0.26	4.4	0.27	4.63	0.25
You are satisfied with the learning flow designed in the system	4.06	0.18	4.25	0.22	4.45	0.27
After learning, you have better understanding of the learning objectives of clinical practical training	4.4	0.23	4.4	0.27	4.55	0.27
In the future you are still willing to use this system for the learning of clinical practical training	4.47	0.26	4.6	0.30	4.64	0.25

Table 1 shows that medical students agreed on the user-friendliness of the system operating interface. The 6th and 7th year medical students show greater agreement than 5th year medical students that the teaching cases in the system are helpful to the learning of clinical practical training. All medical students are satisfied with the learning flow design in the system, and believe that after learning, they have clearer understanding of the learning objectives of clinical practical training. For instance, Student A stated in interview, "generally, medical students identify with the system, and everyone thinks that this system is instrumental in clinical practical training. After all, it is impossible to face so many cases in actual courses, and these teaching cases have important learning points, and have important referential value for future patients as well." Students are willing to use this system for clinical practical training in the future. However, this system is not perfect. For instance Professor B indicated that "even though this system cannot fully simulate the patient context, this is a very important platform for cases that have learning value, and can be seen as a knowledge bank for clinical medicine."

Then, descriptive statistics are used to evaluate students' satisfaction after receiving PBL Multiple Disciplines for Medical Education instruction. The results are shown in Table 2. Table 2 summarizes the student responses to a series of questions posed by the current researchers. The students have also made a variety of comments after using the various teaching cases in the system. The results of this study are summarized as follows (some of the results are provided by the instructors):

As we expected that all the students felt that the teaching cases with multiple views are much more interesting and give them more integrated view of the cases than the isolated teaching cases. The responses from the students in different grades do not show any significant difference about the "HINTS" system.
All the students agree that the system can significantly improve the skills for real clinical cases as shown in the Table 1. The standard deviation values are very small. This implies that the students do have consensus on the responses about the system.

This research work also provides an opportunity for the experts (authors) in various medical disciplines to get together and discuss how the teaching material should be presented to the students. The authors also get an opportunity to learn more about how other experts view the same case and to further sharpen their medical knowledge in general.

Table 2. Summary of respondent feedback

Questions \ Grade	5th		6th		7th	
No. of students	*N*=17		*N*=12		*N*=11	
M (Mean Value) and *SD* (Standard Deviation)	*M*	*SD*	*M*	*SD*	*M*	*SD*
The practice can help the individual's learning	4.35	0.48	4.33	0.47	4.27	0.45
The practice can simulate the real clinical environment	4	0	4	0	4	0
The operation of the teaching cases was straightforward	3.88	0.47	3.91	0.49	4	0.43
The system can improve the capability of the clinical service	4.11	0.32	4.08	0.28	4.18	0.39
Using the "HINTS" to present all the teaching cases in the clinical training courses	4.18	0.38	4.08	0.28	4.18	0.39
The teaching cases with multiple views are much more interesting, and give users a more integrated view of the cases than standalone teaching cases	4.53	0.5	4.5	0.5	4.63	0.48

Finally, after the experimental instruction, professors from four specialties were interviewed, including internal medicine, surgery, radiology, and pathology. The interview inquired their opinions after using the system and their suggestions on improvement. Medical education in the first four years is foundational medical education, and the last three years is clinical/medical practical training. Clinical/medical practical training primarily focuses on how to face patients and how to make correct diagnoses and treatment, and especially the thinking process involved. However, when doctors face patients, they frequently need the assistance of doctors in other specialties to make the correct diagnosis. For instance, if the patients need imaging (X-ray, CT/MR, etc.), they need the help of radiologists to read the data. When patients need surgery, surgeons need patient histories and related testing (examinations) data for pre-surgery evaluation to plan for the surgical process and post-surgical care. Thus, the training of a doctor requires not only professional clinical knowledge, but also the ability to understand the diagnosis of other specialties and the processes in involved, but current medical education platforms tend to lack these learning mechanisms.

The Multiple Disciplines mechanisms constructed by this study can supplement and strengthen these shortcomings. In the interview, internal medical Professor C affirmed the effect of Multiple Disciplines mechanism on the learning of clinical cases, suggesting that “medical education is based on a doctor-patient relationship that is patient-centered. Doctors need to have full understanding of the diagnosis process and method of different specialties, before they can make the correct medical treatment. The Multiple Disciplines mechanism designed in this study should be able to enhance the abilities of medical students in this regard. After the clinical courses, medical students do have better understanding of the teaching cases.” Surgeon Professor D also approved the Multiple Disciplines mechanism and the processing flow, suggesting that there should be more multimedia interactive functions for even better results. He said “this is a good mechanism. Medical students can understand the process of case patient treatment, especially the clinical treatment of different specialties. I suggest that in the future the surgical plan and process should have more lively multimedia interaction, such as computer surgeries and videogame interactive mechanisms. This should be more helpful to medical students.” In the trend of emphasizing patient privacy, radiology Professor E expressed that “in the context of emphasis for patient privacy, providing this PBL learning system is an important contribution to clinical/medical education. If radiology can make 3D reconstruction of the CT/MR imaging, learning effect would be better.” Pathologist Professor F made the following suggestions for the teaching cases in this system, that they should be matched with the needs of medical students in different years and levels, “editing of teaching cases can use the document-view mechanisms to present teaching cases in different disciplines, and can indeed elevate the effects of clinical learning. It is suggested that in the future there should be major editing of these integrated teaching cases, dividing them into easy, medium, and difficult. Students from different years and levels (4, 5, 6, or interns and specialty doctors) can learn differently.”

Thus, the interview results show that the professors all affirmed the effects of clinical case learning for this system. The Multiple Disciplines mechanism can indeed enhance medical students’ overall understanding of the diagnosis and treatment in different specialties. Suggestions on strengthening multimedia interaction or teaching case can be used as a reference for future system updates.

CONLUSIONS AND SUGGESTIONS

In order to carry out the concept of integration of various department views of Web-based PBL teaching cases, an interactive PBL teaching case system is implemented through using the document-view technique, which allows one document with many different views. The system was implemented with a rule-based mechanism that is different from those documented in the literature. According to the results of the study, the system turns out to be very successful and efficient. The users would indeed feel strongly about the way the cases are presented to them. Additionally, the users show great interest in using the system. The system also gives the students stronger feeling about how medical knowledge is integrated into the real clinical settings. The findings of this study can also benefit the medical school professors and clinic physicians in terms of teaching activities as well as research on medicine.

The process of collecting and editing teaching materials of multiple disciplines is very complicated. Thus, it is very important to establish a feasible and effective online system for collecting case teaching materials from different disciplines. This system will enable the medical school professor’s assistant to gather and compile useful teaching materials for them to verify. This process will ease medical professors’ teaching loading as well as increase their willingness to compile teaching case materials. In doing so, the case teaching and learning transaction will become more effective and efficient. Finally, participants suggest shortening the learning time of each case from average 44 minutes to 30 minutes. That is, in the future, the content of teaching materials should be simplified as long as the learning point is reached in order to enhance the participants’ learning motivation.

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THE EFFECTS OF USING WEBQUESTS ON READING COMPREHENSION PERFORMANCE OF SAUDI EFL STUDENTS

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ABSTRACT
This paper is a report on the effects of using WebQuest on Saudi male EFL students reading comprehension performance. WebQuests expose students to several online resources and require them to gather information about a specific topic. The experimental group received traditional teaching plus WebQuests as supplementary activities. The control group received the traditional teaching only. The students' comprehension performance in the post-test was compared for both groups in order to determine whether there were significant differences between the groups in relation to the treatment. Significant differences occurring in the experimental group's post-test comprehension performance when compared to the pre-test indicate that using WebQuest can improve students' reading comprehension performance. The results indicate WebQuests have potential for use in promoting reading comprehension. Teachers and students do, however, need to be trained in order to use WebQuests more effectively.

INTRODUCTION

Computer Assisted Language Learning (CALL) has attracted the interest of many educators and researchers in order to facilitate learning a foreign language (Alshumaimeri, 2008; Kern, 2006). Many educational institutions use computers and the internet as part of a language classroom. Computers provide students with access to a large number of authentic learning resources and opportunities to interact with other speakers of the language (Alshumaimeri, 2008; Kern, 2006). In order for students to find useful information on the Web, they need to read extensively, evaluate content of texts, select relevant information, and synthesize materials to construct meaning (Crawford & Brown, 2002). They also have opportunities to use the target language through reading, writing presentations, listening to peers' opinions, and discussing ideas on interesting issues.

However, EFL teachers may find difficulties in designing a web-based syllabus that promotes language learning skills. A well-structured web-based activity, such as WebQuest, provides teachers with a pre-defined activity that they can adapt to suit their students and syllabus objectives. The effect of WebQuest on promoting language skills is little researched through empirical study (Abbitt & Ophus, 2008). This study focuses on investigating the use of WebQuest in an EFL reading class in terms of its potential to enhance students reading skills.

Abbitt and Ophus (2008) indicated that although WebQuests have been around for more than ten years and received popular reception among K-12 teachers, little research has been conducted on the effects of this technology-based activity on learning. Many studies focus on the design of WebQuest rather than curricular aspects of the design (Sox & Rubinstein-Avila, 2009). Most of these studies focus on students in first language (L1) settings while research on the second language (L2) learning context is limited. Those studies that have been conducted are often more theoretical than empirical (Laborda, 2009; Luzon, 2007). Other studies focused on the perceptions of WebQuest users (Noordin, Samed, & Razali, 2008; Prapinwong & Puthikanon, 2007) and few on English language learning (Chuo, 2007; Tsai, 2006). Very little research has been conducted on WebQuest use in the EFL classroom to investigate its potential in promoting language skills and reading skills in particular. This study will try to shed light on the possible effects of WebQuest on the comprehension performance of tertiary level male students in a Saudi EFL context. This study is hopefully significant for teachers, students, EFL and CALL fields, in that it provides language teachers with information about teaching reading skills using WebQuest.

Research Questions

This study aims to investigate the effects of using WebQuest on Saudi male EFL students reading comprehension performance. It seeks to answer the following questions:

1. Will there be a significant improvement in the students' (of both control and experimental groups) comprehension performance in the post reading test?
2. Are there any significant differences between the control and experimental groups in the post-tests in relation to the use of WebQuest?

LITERATURE REVIEW

Overview of WebQuest

WebQuest was designed by Bernie Dodge and Tom March in 1995 in an effort to integrate the World Wide Web into classrooms. Exposed to several online resources, students are required to gather information about a specific topic (Dodge, 1997). Sometimes these resources are supported with video conferencing in order to enhance understanding (Koenraad, 2002). WebQuests are designed to provide an opportunity for students to exchange real information and thus trigger meaningful communication. A WebQuest involves team work among groups of students accessing the web in order to gather information and reproduce it in different forms (March, 2004). As described by March (2004), the main element of a WebQuest is "a scaffolding structure that encourages students motivation and facilitates advanced thinking with integration of enriched learning resources" (p. 02). Samuda and Bygate (2008) consider WebQuest a web-based task and link it to task-based learning and teaching as tasks on a broad range of topics are used throughout the curriculum.

Using WebQuest gives students the opportunity to be exposed to many resources while they are in the classroom. As such, Dodge (2006) suggests students engaging with the method develop a deeper understanding of the content when compared to the usual way of learning. Similar conclusions have also been found in studies of other web based learning tools, such as online training courses, wikis, discussion forums, and videos (Bravo, Enache, Fernandez & Simo, 2010; DeWitt & Siraj, 2010; Limniou & Whitehead, 2010). Dodge (1997) recommends that a WebQuest include the following basic structure: introduction, task, process, evaluation, and conclusion. In order to complete a WebQuest task, students search through links provided on the WebQuest. These links are relevant to the topic and are thus efficient and focused learning tools. The students do not need to use general search engines as their primary source, so they do not run the risk of accessing inappropriate materials (March, 2007). The WebQuest task requires student analysis, synthesis, evaluation, judgment, problem solving and creativity (Dodge, 2006; Perkins & McKnight, 2005). WebQuest, being a technological innovation, was found by teachers to be an up-to-date strategy that provides knowledge to students in an interesting way (Vidoni & Maddux, 2002).

WebQuest and Learning

Motivation, considered to be an important psychological element in learning, plays an important role in students' ability to accomplish long-term goals (Guilloteaux & Dörnyei, 2008). Dudeney (2003) suggests WebQuests are motivating, authentic tasks that require students to concentrate. Students in all grades, when questioned, indicate they prefer WebQuest to traditional teaching methods (Abbitt & Ophus, 2008; Halat & Peker, 2011; Noordin, Samed & Razali, 2008; Prapinwong, 2008; Puthikanon, 2009). Students may enjoy and remember lessons far better via WebQuest than through the traditional way of learning (Hassanien, 2006). The teacher's role is to guide students on how to use WebQuests in ways that elicit positive educational results. Teachers, by embracing WebQuest technology, can heighten student interest in diverse subject matters while concurrently heightening the educational benefit to their students in a blended learning classroom. Blended learning can be an effective teaching method that is not only viewed positively by students, but that also supports successful learning outcomes (Tavukcu, Gezer & Ozdamli, 2009). As such, teachers continue to play an important role in the blended learning classroom, as students do report having a positive view of face-to-face learning interaction in addition to online learning tools (Tuncay & Uzunboylu, 2011).

According to Torres (2007), using WebQuest in learning has many advantages. Initially, it promotes the effective use of time; students use the links given by the teacher and search for information in a structured efficient manner. A further benefit of WebQuest use in learning is that it supports higher-order thinking. Students are required to read, think, analyze, synthesize, and evaluate (Halat & Peker, 2011; Torres, 2007). Chang, Chen, and Hsu (2010), in demonstrating the impact of different teaching strategies on the learning performance of environmental education, found WebQuest fostered students' critical thinking skills by encouraging different learning tasks and expression of opinions. In a study identifying the underlying constructs of WebQuests as perceived by teachers, Zheng, Perez, Williamson and Flygare (2007) found three constructs to be critical to WebQuests: constructivist problem solving, social interaction and scaffolded learning. This finding suggests that instead of focusing on critical thinking skills, emphasis could be placed on constructivist learning that incorporates critical thinking and knowledge application (Zheng et. al., 2007).

Segers and Verhoeven (2009) suggest WebQuest can be seen as a method that helps organize the learning process in line with the theory of dialectic constructivism. Investigating the effects of WebQuest on learning in elementary school classrooms in the Netherlands, Segers and Verhoeven (2009) found the effect size of learning from a WebQuest was moderate to high, as it offers a structured method by which students can engage with the Internet. This structure particularly benefited boys who learned more using WebQuest as opposed to a free-search environment.

Many studies have found that using WebQuest enhanced vital cooperation and collaboration among students (Gorghiu, Gorghiu, González, & García de la Santa, 2006; Lara & Repáraz, 2007; Murray & Mcpherson, 2009; Torres, 2007). By working collaboratively, students improve speaking skills through verbal interaction with peers. When students work in groups they discuss assignments thereby exchanging vocabulary. According to Torres (2007), the use of WebQuest has the ability to promote collaboration and cooperation among students while using the target language. This interaction in turn fosters responsible and independent learning.

Gorghiu, Gorghiu, González, and García de la Santa (2006) found the greatest gain of WebQuest was pupils' motivation and cooperative work. Students, as actors in the learning process, assume different roles in the WebQuest team. Pupils displayed greater enthusiasm playing specific roles and relaying information to group partners. Working in groups is beneficial in that it gives students the opportunity to teach each other and to correct each other's mistakes. It makes them feel mature and responsible for the group as a whole in addition to building social skills (Strickland, 2005).

WebQuest and EFL

WebQuests can be an effective tool to promote different foreign language skills. As discussed by Torres (2007), students are exposed to a large number of resources through the web. They read in the target language and then provide a written report of what they learned in the target language. As many EFL students do not enjoy reading in a second language, it is useful to employ motivational learning tools such as WebQuest in the second language classroom. Although Gaskill, McNulty and Brooks (2006) found no discernable difference in learning outcomes when WebQuests were compared to conventional methods, they did find that both teachers and students enjoyed and spoke highly of WebQuest instruction. Similar to the findings of Zheng et al., Barros and Carvalho (2007) found WebQuest to be a valuable environment for teaching extensive reading as it can enhance motivation and promote constructivist learning.

"TalenQuest", or LanguageQuest in English, was developed as a tool for foreign language instruction (Koenraad & Westhoff, 2003). It is an adaptation of the WebQuest format designed to meet the needs of second language learners (Samuda & Bygate, 2008). It encourages scaffolding activities by incorporating focus guides, text tools and strategy guidance. Koenraad and Westhoff (2003) suggest that the task should encourage use of the target language either in the form of language instruction, or of the language used in the LanguageQuest end products, or a combination of both. Koenraad and Westhoff (2003) suggest that the material used should be authentic and reflect what learners would apply in their real life. The task should promote collaboration and meaningful communication.

Furthering research on the use of WebQuests in the EFL classroom, Researchers (Luźon-Marco, 2010; Sen & Neufeld, 2006) found that WebQuest, being a web-based task oriented tool, helps students engage with texts related to their discipline, prepare for autonomous learning, and become accustomed to the methods of meaning construction needed in digital learning. Reporting similar conclusions, Noordin, Samed and Razali (2008) suggest that WebQuest techniques, with a solid pedagogical foundation, make use of global communication by sharing information and fostering discussion while contributing to the integration of the internet in EFL learning. These authors surveyed a group of Malaysian student teachers in a TESL program. A questionnaire was administered to elicit their perceptions on the practicality and potential of WebQuest in EFL classrooms. The findings suggest that the majority of the student teachers found WebQuest beneficial to English learning. Students were found to work and interact with one another using English while engaging with reading materials, taking part in discussions, and presenting written work. These activities, as encouraged by WebQuest, improve the students' level of language ability.

In addition to the acculturation to the digital age that students gain from WebQuest, the effectiveness of WebQuests in second language learning also has been the subject of various empirical studies. Laborda (2009) investigated the effectiveness of WebQuest in English for Specific Purposes (ESP) classes (such as tourism). Laborda (2009) noted that in completing the WebQuest assignment, students read different materials and then come up with their own. This process gives students opportunities to explore how the target language is used and then spontaneously use the language in its correct way. Students are provided with interactive opportunities which make the learning experience meaningful. In a similar classroom environment, Luzon (2007) supported WebQuest use in ESP classes. She suggested that WebQuest is beneficial in ESP classes because it helps students use background knowledge from their discipline to assess the problem, evaluate information from different sources and synthesize a response to the main WebQuest problem.

Specifically investigating the effects of a WebQuest Writing Instruction program on Taiwanese EFL learners' writing performance, Chuo (2007), found that students in the WebQuest class improved their writing performance significantly more than those in the traditional writing class. Also investigating writing apprehension and perception of web-resource integrated language learning, Chuo (2007) found the participants had a favorable perception of the WebQuest program and reported recognizing more advantages than disadvantages. These findings suggest the integration of web resources, such as WebQuest, into EFL writing instruction can be effective in enhancing students' writing performance and providing a positive learning experience. However, a comparable study on the integration of WebQuest in Turkish EFL university classrooms found the experimental group and the control group scored equally on writing tests (Kocoglu, 2009).

In addition to WebQuests effectiveness in improving writing skills, research suggests the tool can be effective in promoting critical thinking skills. Puthikanon (2009) investigated the use of WebQuest by EFL university students in Thailand. Two WebQuests were used as supplementary reading activities in a reading course. The results showed that students used critical thinking during the WebQuest at a high level. They actively analyzed, synthesized, evaluated, and reflected on information pertaining to the topic of the WebQuest. However, low proficiency students struggled to transfer their thoughts and opinions in the end products of the WebQuest. Nonetheless, findings suggested that WebQuest can be a useful activity to promote critical thinking in an EFL reading course.

In relation to WebQuest’s usefulness in promoting reading skills, Tsai (2006) investigated, in a quasi-experimental study, the effects of WebQuest use on reading vocabulary acquisition and reading performance of Taiwanese EFL university students. The WebQuests were used to enhance the normal reading instruction practice in EFL reading courses. The results showed that the students in the treatment group (using WebQuests) significantly outperformed those in the control group (traditional reading class) in both their vocabulary learning and story reading comprehension. However, there were no significant differences in student thematic reading comprehension. The finding suggested that integrating WebQuest in EFL reading instruction can be useful in increasing students’ story reading comprehension and vocabulary acquisition.

While the above mentioned research supports the position that WebQuest can be an effective learning tool, students’ perceptions of the tool are equally important in considering its widespread use. Prapinwong and Puthikanon (2007) investigated students’ perceptions of WebQuest in a college-level reading course in Thailand. The findings showed that students had mixed opinions toward WebQuest. Some students showed positive attitudes and experienced WebQuest as a fun activity that helped them to learn English. However, some students found the materials in the WebQuest to be overwhelming and felt frustrated when completing the WebQuest task. However, in a similar context, Prapinwong (2008) used two WebQuests with a group of students in a reading course at a university in Thailand. The findings showed that the teacher and students felt very positively toward the WebQuest experience. Additionally, the use of WebQuest in Prapinwong’s (2008) study showed statistically significant positive effects in vocabulary learning among students.

WebQuest is one of numerous ways to integrate technology in learning. Technology is proliferating rapidly and teachers can improve classroom education by embracing different teaching methods that make their classes interesting and beneficial. WebQuest has been studied in terms of its effectiveness in language learning as discussed above, but few studies have been conducted in the Saudi context that investigate its impact on promoting EFL language skills. The lack of published EFL literature in the Saudi context could be attributed to a demanding administrative and technical workload on teachers (Al-Issa & Al-Bulushi, 2011). To address this gap in the literature, this study sheds light on the possible effects of WebQuest use on Saudi EFL university students reading comprehension.

METHODOLOGY

Research Design

The design of this study is a quasi-experimental (field experiment) since it was not feasible to randomly assign subjects to treatments (Cohen, Manion & Morrison, 2007). It uses a pre-test/post-test quasi-experimental non-equivalent control group research design. This type of design is often used in educational research as it is not possible to assign subjects randomly to groups (Ary, Jacobs, & Razavieh, 2002). That is, the groups were naturally assembled through their class sections. The experimental group received the traditional teaching plus WebQuests as supplementary activities. The control group received the traditional teaching only. The students' comprehension performance in the post-test was compared for both groups in order to determine whether there were significant differences between the groups in relation to the treatment.

Participants and Context

The study was conducted in a university first year preparatory program. The participants were 83 level three male students in the science and engineering track in the Preparatory Year (PY) in King Saud University (KSU), Saudi Arabia. Students were enrolled in the Intensive English program with 20 weekly contact hours for two semesters and a summer. The program aims to develop students' English language proficiency and equip them with the essential language skills needed for academic study and future professional life. There are six levels of proficiency in the program where level six is for advanced learners and level one is for false beginners. Level three is considered pre-intermediate. The students were selected using a simple random selection and two sections were chosen to participate. There were 42 students in the experimental group and 41 students in the control group. The two sections were used for a total of 10 sessions (50 minutes each) over a seven week period in June-August 2011. The sections' teacher is a native speaker of English and has taught English for seven years. He has experience with using WebQuest, therefore, no training was needed.

In order to ensure that the subjects in this study were at the same proficiency level in reading comprehension, a reading comprehension pre-test was assigned to both groups. The results of the pre-test show that the mean averages of the subjects' grades on the pre-test were very similar (see Table 1). These results were computed through Independent Samples Test (t-test) and revealed at the $p<.05$ level in scores for the two groups [$t = 0.35$, $p= 0.972$].

Table 1. T-test Results for the Groups' Equivalence

Group	No.	Mean	St. Deviation	t Value	Sig. (2-tailed)
Control	41	13.9024	5.91526	.035	0.972
Experimental	42	13.8571	5.85004		

Instruments

Pre- and post-reading comprehension tests were used in this study in order to measure the students' performance before and after the treatment. The tests were Standardized Reading Part 4 from the Preliminary English Test (PET) of the University of Cambridge ESOL examination (Cambridge University ESOL Examination, 2010). The full exam is usually taken during the final exams for the students of this study in this level. In this test, the students are provided with a passage to read carefully in order to discern the topic and general meaning of the text, the writer's purpose and the meaning of the text as a whole. Then, the students answer five questions with four-option multiple choice answers. The focus is on reading for detailed comprehension: understanding attitude, opinion, and writer purpose as well as reading for gist, inference and global meaning (Cambridge University ESOL Examination, 2009). A reliability analysis was computed for each test using the test/retest method (Cohen, Manion, & Morrison, 2007). The reliability results were (Pearson coefficient) 0.698 for the first test and 0.725 for the second test. The reliability estimates were acceptable because the tests contained only five items.

Materials

The four WebQuests used in this study were designed by the researchers. The WebQuests designed were sent to three experienced EFL teachers to check for appropriateness for the students' level of proficiency and topic. Also, they were reviewed by two educational technology professors for its face validity. In each WebQuest there are two main pages, the teacher's and the student's. The student's page includes five parts. The first part is the introduction which gives general information in a motivational way about the whole WebQuest. The second part is the task which is a description of what the students should do. The third part is the process and it includes detailed steps describing what exactly the students are required to do. The fourth is the evaluation part which includes a rubric that shows the students how they will be evaluated. It includes the certain points they should accomplish at the end of the task. The final part is the conclusion which provides the students with further websites if they want to read more about the topic. The other page is the teacher's page which includes instructions for teachers who will use the WebQuest.

The WebQuests topics were chosen according to the students' level. The researchers tried to use various topics interesting to university level students. Those students interested in technology were expected to enjoy the 'Google It' WebQuest while those with an interest in sea animals might prefer 'The Killer Whales' WebQuest. Also included in the study was a 'Physical Activity' WebQuest which encourages students to integrate physical activity in their daily routines. The last WebQuest included in the study was an awareness raising WebQuest on Alzheimer's disease. Students need two to three sessions to complete the task in each WebQuest, depending on the students' level and motivation. Each session is 50 minutes.

The teachers displayed the WebQuests on the white board and assigned students into groups. Each group worked on one computer. First, the teacher presented the WebQuest's homepage on the class white board explaining every part clearly in order to help students complete the task carefully and answer the questions. Following this instruction, students worked alone. The teacher's continued presence was, however, important as he is often called on to answer questions and address technical problems.

Data Collection Procedures

In the first week, both the experimental group and control group received the pre-test before the treatment and instruction. The data collected was analyzed using SPSS and a t-test was computed to ensure the groups equivalence. The treatment period was four weeks. During the treatment period, the experimental group received researcher-designed WebQuests embedded as supplementary materials in the traditional way of instruction. Each WebQuest took two sessions a week. The control group received only the traditional instruction. In week six, both the experimental and control group students received the post-test. The data collected was again analyzed using SPSS. Then, paired sample t-tests were computed for the results of both groups in order to investigate the differences between the pre-test and post-test in comprehension performances. An analysis of covariance (ANCOVA) was conducted, partialling out the pre-test scores, in order to investigate the differences between the experimental and control group in the post-test. The ANCOVA test was viewed as being more appropriate for comparing why there may be differences between the effects (Wright, 2006), and for being a more powerful procedure (Oakes & Feldman, 2001). As Wright (2006) stated, ANCOVA is appropriate more often than t-test for analyzing differences. Next, the results of the study are presented.

THE RESULTS

This study investigated the effects of using WebQuests on students' reading comprehension performance. The scores obtained from the participants' reading comprehension pre- and post-tests were compared. The results are presented in accordance to the research questions, beginning with the first research question.

In order to answer the first research question (Will there be a significant improvement in the students' (of both control and experimental groups) comprehension performance in the post reading test?), descriptive analysis and paired samples t-tests were used to investigate any statistically significant differences in the results of the post-test compared with those of the pre-test for both groups. For the control group, Table 2 below reports the paired samples t-test results for comprehension scores.

Table 2. Paired t-test results for control group (differences between pre- and post-test)

Group	Variable	Test	No.	Mean	St. Deviation	t value	Sig.(2-tailed)
Control	Reading Comprehension	Pre	41	13.9024	5.91526	3.354	0.002**
		Post	41	15.2195	5.86307		

**significant at 0.01 level

Table 2 shows that the performance of the students in the control group improved significantly in reading comprehension scores [t = 3.354, p=0.002]. There are significant differences between the two performances in favor of the post-test scores at the level of p<.01. These results might be due to the period of conducting the study as it came at the end of the semester. The students who participated in this study, as mentioned before, study in an intensive English course twenty hours per week. Also, the post-test was conducted one week before the final exams period. Figure 1 below shows the overall look of the mean scores of the control group in the pre- and post-test.

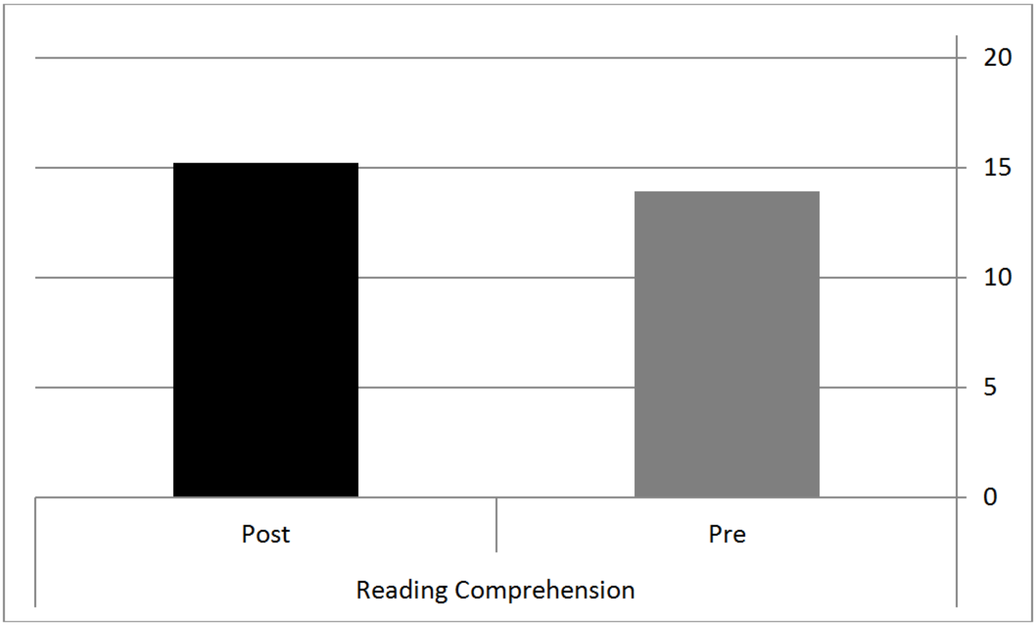

Figure 1. Mean scores of the control group's performance in the pre and post-test

For the experimental group, Table 3 below reports the paired samples t-test results for comprehension scores.

Table 3. Paired t-test results for experimental group (differences between pre- and post- test)

Group	Variable	Test	No.	Mean	St. Deviation	t value	Sig.(2-tailed)
Experimental	Reading Comprehension	Pre	42	13.8571	5.85004	12.600	0.000**
		Post	42	20.1429	5.74911		

**significant at 0.01 level

Table 3 reveals that the experimental group improved significantly in reading comprehension performance [t = 8.567, p=0.000] at the level of p<.01 in favor of the post-test results. These results also might be due to the period of applying the study and the intensive program. However, the margin of the mean scores between the mean scores in the pre-test and the post-test is higher in the experimental group than in the control group. An overall look at the above results of the experimental group can be seen below in Figure 2.

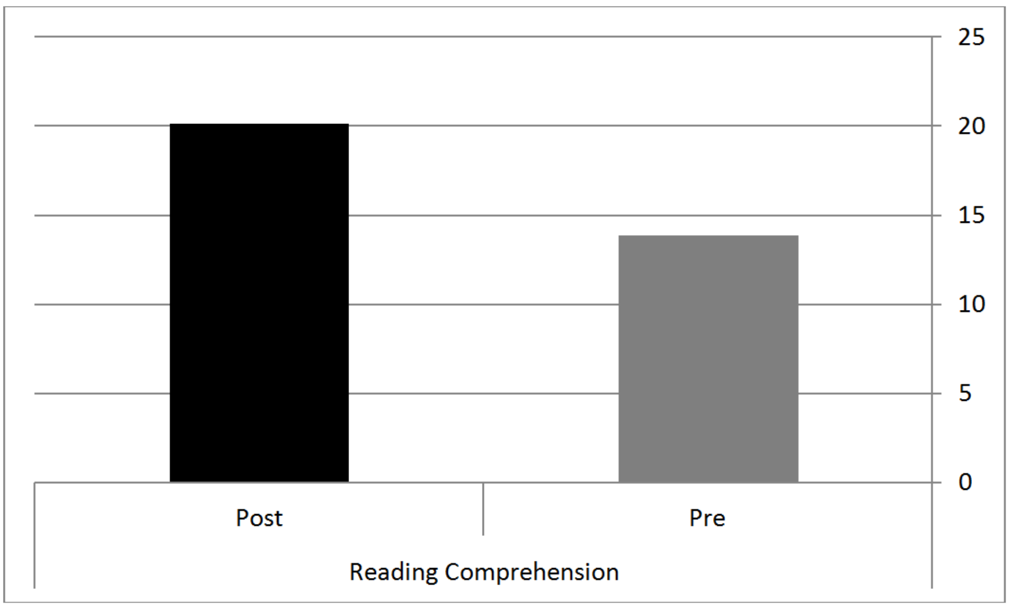

Figure 2. Mean scores of the experimental group's performance in the pre and post-test

The results of both groups showed that there were significant improvements in students' reading comprehension performance over time. However, the treatment effects were investigated in relation to the second research question (Are there any significant differences between the control and experimental groups in the post-tests in relation to the use of WebQuests?). In order to answer the second research question, an analysis of covariance (ANCOVA) was conducted partialling out the pre-test scores.

Table 4. ANCOVA tests for the groups post-test results after controlling the pre-test effects

Item	**Group**	**No.**	**Mean**	**St. Deviation**	**F**	**Sig.**
	Control	41	15.2195	5.86307	64.804	0.000**
	Experimental	42	20.1429	5.74911		

**significant at 0.01 level

Table 4 shows that there were significant differences between the experimental and control group in the post-test controlling the pre-test scores [F=24.286, p=0.000] at the level $p<.01$. The strongly significant differences occurring in the students' post-test comprehension performance support the claim that using WebQuest can improve students' reading comprehension performance. Figure 3 below shows the differences in post-test mean scores of both groups.

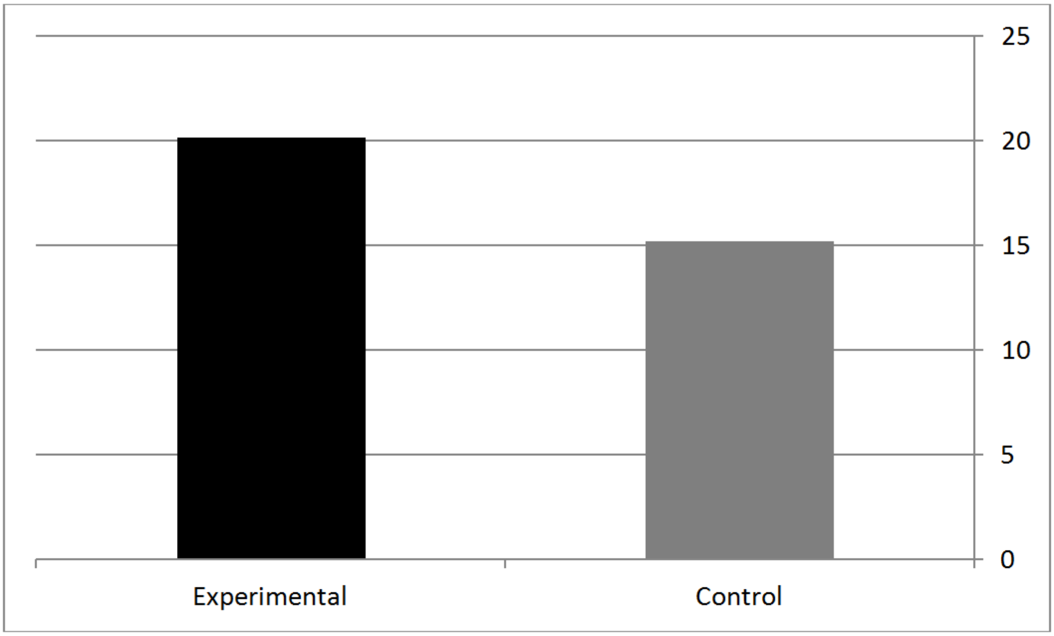

Figure 3. Mean scores of both groups comprehension performance in the post-test

The figure shows that the experimental group's mean score is higher than the control group in the post-test. The results will be discussed next in relation to the literature.

DISCUSSION

In investigating the effects of using WebQuest on Saudi male EFL students' reading comprehension performance, this research found that the performance of the students in the control and the experimental group improved significantly in reading comprehension scores. However, the strongly significant differences occurring in the experimental group's post-test comprehension performance when compared to the pre-test indicate that using WebQuest can improve students' reading comprehension performance.

This research supports the findings of Tsai (2006) who investigated the effects of WebQuest use on the reading vocabulary acquisition and reading performance of Taiwanese EFL university students. Using WebQuests to enhance the normal reading instruction practice in EFL reading courses, Tsai (2006) found that students engaging with WebQuests significantly outperformed those in the control group in both their vocabulary learning and story reading comprehension. Although Tsai (2006) found WebQuest in EFL reading instruction may be useful in increasing students' story reading comprehension but not thematic reading comprehension, this research found that thematic WebQuests also can be effective in improving reading comprehension.

As discussed, previous research on the efficacy of WebQuests suggests that the task supports reading comprehension because it requires student analysis, synthesis, evaluation, judgment, problem solving and creativity (Dodge, 2006; Perkins & McKnight, 2005). The three underlying constructs found by Zheng et. al. (2007) to be critical to the design and related benefits of WebQuests are constructivist problem solving, social interaction and scaffolded learning.

Scaffolding teaching, in which a knowledgeable teacher provides individualized support for students, is a method that aims to build on prior knowledge while internalizing new information or skills. Such as with WebQuest, the task utilized in a scaffolded teaching activity should be just beyond the current ability level of the student. Important to the concept of scaffolded learning is the notion that the support mechanisms of the learning intervention should easily be taken away as the student gains proficiency at the given task. The goal of the teacher is, therefore, to support the student to be an autonomous learner. WebQuests well support this method as the task is designed to motivate students in a blended learning environment by using simple directions to accomplish an activity with clearly defined learning expectations.

Furthermore, as suggested by Zheng et al. (2007), the emphasis of learning via WebQuest could be placed on constructivist learning that incorporates critical thinking and knowledge application. Luźon-Marco (2010) found that WebQuests help students engage with texts related to their discipline by supporting autonomous learning and helping the students become accustomed to the methods of meaning construction needed in digital learning. Similar to the findings of Zheng et al., Barros and Carvalho (2007) found WebQuest to be a valuable environment for teaching extensive reading as it can enhance motivation and promote constructivist learning. Similarly, this study supports the theory that WebQuest can be a useful tool in constructivist learning as the method does create an environment in which learning seems relevant, supports the acquisition of skills that are needed in real-world scenarios, and encourages students to analyze information using multiple tools and perspectives.

Reading comprehension, the subject of this research, is dependent on the student’s ability to analyze and interpret text. Employing critical thinking skills in order to meaningfully draw connections between newly introduced text and previous knowledge is a crucial step in the development of reading comprehension. Finding that WebQuest supports the development of critical thinking, Puthikanon (2009) reported that students actively analyzed, synthesized, evaluated, and reflected on information pertaining to the topic of the WebQuest. Although Puthikanon found that low proficiency students struggled to effectively communicate their thoughts in the final products of the WebQuest task, this difficulty does not necessarily reflect the student’s ability to comprehend the text or analyze it critically.

Although the teacher’s role is to provide the support, or scaffolding, for the learning activity, student engagement in cooperative learning can effectively further the learning process. An environment such as created by WebQuest in which students work in small group settings with teacher assistance can help in reducing the support required from the teacher by the students. Many studies have found that using WebQuest enhanced vital cooperation and collaboration among students (Gorghiu, Gorghiu, González, & García de la Santa, 2006; Lara & Repáraz, 2007; Murray & Mcpherson, 2009; Torres, 2007). This aspect of the learning process, and its role in reading comprehension, was not the specific topic of this research, but should be noted as an area in need of further research.

While this study specifically focused on 10th grade male students, previous research has found that students in all grades indicate they prefer WebQuest to traditional teaching methods (Abbitt & Ophus, 2008; Noordin, Samed & Razali, 2008; Prapinwong, 2008; Puthikanon, 2009). Gaskill, McNulty and Brooks (2006), while finding no difference in learning outcomes when WebQuests were compared to conventional methods, did reveal that both teachers and students enjoyed WebQuest instruction and the learning environment it created. Although student perceptions were not the focus of this research, general impressions suggest that in agreement with the findings of Vidoni and Maddux (2002), WebQuest can be viewed as an up-to-date strategy that provides knowledge to students in an interesting way.

CONCLUSIONS

The results showed the potential of WebQuest use for promoting reading comprehension. Teachers and students do, however, need to be trained in order to use WebQuests more effectively in the blended learning classroom. The students of this study, only needed help to get started on the task and then managed to continue on their own with no difficulty. Although the teachers who participated in this study were experienced with WebQuest, teachers in general need to be provided with training to explore the usefulness of WebQuests and to master its integration in their classrooms. There are challenges inherent in the implementation of WebQuests due to the changing pedagogical principles and practices arising from the use of the tool. Teachers need support in understanding and adjusting to the new way of teaching, especially when they are used to the transmissive mode of instruction. Therefore, it is crucial for the teachers to understand the changing role from an authoritative figure to the role of facilitator or mentor as required by the WebQuest design. Also, the use of pre-designed WebQuests in this study may have constrained the teachers in implementation and in choosing interesting topics that meet the needs of the students. The authors suggest that the teacher's experience of the WebQuest tool, and the challenges to its integration in the blended learning classroom, should be investigated further.

The use of WebQuest seems to be motivating for students as indicated by the teachers in the study. Although this is anecdotal evidence, teachers should invest in the potential of WebQuests as a motivating activity. However, more research is needed. Moreover, the topic and difficulty level of materials are important issues that the teacher should consider when selecting or designing a WebQuest. March (2004) suggests the teacher choose a topic that the students find compelling and then build an authentic learning task around it. If more than one WebQuest is to be used, the teacher may design topics that seem likely to draw diverse student interest. The type of task should also be designed carefully. If for example, an information gathering task is to be included, it should be used as a step to a more complex task rather than an end in itself. However, the teacher needs to be careful about the level of difficulty of the tasks and its appropriateness for the students.

One limitation of the study was the time constraint of the summer semester (10 weeks) which made it difficult to implement a larger number of WebQuests. Only four WebQuests were used in eight class sessions in four weeks. Future research should consider longer implementation over one semester, or four months, in order to allow more exposure to WebQuests as well as the possibility to test comprehension at a point other than the end of the semester. Also limited by gender, grade level, and level of language ability, this study can be considered a starting point for additional research addressing the use of WebQuests in other educational settings.

Additionally, the study was limited in using a comprehension test as the predictor of reading comprehension. This limitation made it difficult to generalize the results to other classroom contexts. As the study suggested that WebQuests have positive effects on reading comprehension, more qualitative investigation is needed into the processes that students followed that helped enhance reading comprehension.

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THE INFLUENCE OF SELECTED PERSONALITY AND WORKPLACE FEATURES ON BURNOUT AMONG NURSE ACADEMICS

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ABSTRACT
This study aimed to determine the influence of selected individual and situational features on burnout among nurse academics. The Maslach Burnout Inventory was used to assess the burnout levels of academics. The sample population comprised 94 female participant. The emotion exhaustion (EE) score of the nurse academics was 16.43±5.97, the depersonalization (DP) score was 4.83±3.62, and the personal achievement (PA) score was 22.27±4.27. Thirty years and below of the academics reported a lower level of PA than 31 and above of academics ($p < 0.05$). There were no significant differences in EE and DP according to age. Single academicians indicated a higher level of DP than married ($p < 0.05$). However, no significant differences were observed for EE and PA scores according the marital status. Professors and research assistans reported a lower level of PA than instructors ($p < 0.05$). There were no significant differences in EE and DP scores according to the academic position of nurse academics. There were no significant differences in three dimensions of burnout scores according to the weekly work hours and education model of nurse academicians ($p > 0.05$). Future studies should investigate the relationship between roles of the nurse academics and burnout.
Keywords: Faculty, academician, lecturer, burnout, problem-based learning

INTRODUCTION
The problem of burnout in academics is of great concern because it reduces worker health and productivity (Dorman, 2003; Maslach, Schaufeli & Leiter, 2001). Burnout stems from an individual's perception of the instability between demands and resources over a long period of time. Clinically-defined burnout is a multidimensional syndrome arising from chronic stress in the workplace (Maslach, 1976).

Burnout often afflicts workers in occupations requiring face-to-face communication (Dorman, 2003; Ergin, 1995; Maslach & Jackson, 1981). Teaching involves intense, sometimes adversarial, interactions with students, coworkers, and administrators. Nurse educators carry great responsibility as teaching, counselling to students, working on committees and engage in clinical practice in their organizations. Therefore, nurse academics are a group that has the risk of being burnout.

Burnout reactions are graded along three dimensions-emotional exhaustion (EE), depersonalization (DP), and sense of personal achievement (PA). EE is a chronic state experienced by the overstressed individual that is manifested as low physical energy and reduced emotional tolerance. DP is a state of detachment characterized by low emotional engagement in work; in this state, individuals perform duties mechanically. Sonnentag (2005) has argued that DP is an ineffective coping strategy used to fight EE. A sense of PA results from successfully coping with problems and challenges (Maslach, 1976); however, the person experiencing burnout tends to ignore PA. These states are self-reinforcing; DP directly decreases the sense of PA (Taris, Blanc, Schaufeli & Schreurs, 2005), while EE interferes with PA (Dorman, 2003; Maslach & Jackson, 1981; Maslach et al., 2001). A sense of low PA may, in turn, contribute to increases in DP and EE.

The case of an academic's being burnout is an important problem as besides him/herself, it will also affect the education and the results of the students. Because, being burnout not only causes inadequecies and illnesses in individuals, but also gives harm to the other workers and the foundation as a result of their underperformance, psychological destruction, resignation and retardation. (Hasting & Bham, 2003; Kaçmaz, 2005; Maslach et al., 2001). The consequences of burnout in nurse educators have serious implications for students, educational institutions and ultimately profession. For this reason, it is necessary to realise the case of being burnout, be aware of the risks and prevent them.

LITERATURE REVİEW

Burnout is an individual experience that is specific to the workplace. Individual and situational factors are predictor of burnout. Individual factors include demographic characteristics, personality characteristics and job attitudes. Situational factors include job characteristics, occupational characteristics and organizational characteristics (Maslach et al., 2001). In the literature regarding the burnout of academicians; the relations between individual and situational factors were examined and discussed. It is seen that are frequently discussed in these studies are individual factors such as age, gender, marital status, childbearing, academic position, professional experience and situational factors as stress, workload, support, job satisfaction and agreement with decisions (Alpöz, Güneri, Sürgevil & Çankaya, 2008; Ardıç, Polatçı 2008; Azeem & Nazir, 2008; Barut & Kalkan, 2002; Bilge, 2006; Budak & Sürgevil, 2005; Çam, 2001; Dericioğulları, Konak, Arslan, & Öztürk, 2007; Dick 1986; Dick 1992; Eker, Anbar & Karabıyık, 2007; Ergin, 1995; Gezer, Yenel & Şahan, 2009; Otero-Lopez, Santiago & Castro, 2008; Maslach & Jackson, 1985; Mo 1991; Sarmiento, Laschinger, & Iwasiw, 2004; Serinkan, & Bardakçı, 2009; Toker, 2011). In all of the studies individual and situational factors of academicians were assessed according to three dimensions of the burnout, which are EE, DP and PA. While it is observed in a study that a variable is related with three dimensions of the burnout, it is observed in other studies that it is related with 1-2 dimensions or none.

Considering the studies regarding the variable of age and burnout of the academician, different results are observed. While Alpöz et al. (2008), Barut & Kalkan (2002), and Toker (2011) indicate that young academicians experience more EE compared to older academicians, the relation between the age and EE was not found significant in other studies (Ardıç, Polatçı 2008; Dericioğulları, et al, 2007; Eker, et al, 2007; Gezer, et al, 2009). In a group of studies, the DP scores of young academicians were also found to be higher compared to older academicians (Alpöz, et al., 2008; Barut & Kalkan, 2002; Ardıç, Polatçı 2008). In majority of studies, it was determined that the PA perceptions of young academicians are significantly lower compared to other academicians (Alpöz, et al., 2008; Ardıç, Polatçı 2008; Barut & Kalkan, 2002; Dericioğulları, et al., 2007; Toker 2011).

In the studies, it is observed that female academicians generally experience higher levels of EE and DP compared to men, and their personal success perceptions are lower. In addition to this, there are also different findings. While Lackritz (2004), Budak & Sürgevil (2005), Dericioğulları, et al. (2007), Ergin (1995) and Gezer et al. (2009) indicated that gender is a factor related with the burnout of academicians, other researchers found that gender is not associated with experiencing burnout (Alpöz, et al, 2008; Barut & Kalkan, 2002; Bilge, 2006; Eker, et al., 2007; Toker 2011). While Dericioğulları, et al. (2007) and Eker, et al., 2007) indicated that women experience more DP, Lackritz (2004) and Bilge (2006) found that men experience more DP. The relation of the gender factor with PA was found significant only in two studies; personal success perceptions of men are higher compared to women (Barut & Kalkan, 2002 Dericioğulları, et al., 2007). In majority of studies, the PA score was found similar for both women and men (Alpöz, et al., 2008; Bilge, 2006; Budak & Sürgevil, 2005; Eker, et al., 2007; Ergin 1995; Gezer, et al., 2009; Toker 2011).

In studies performed in Turkey, marital status was approached as a factor related with burnout. Çam (2001) found that single academicians experience higher levels of EE and DP, compared to married academicians. While Barut & Kalkan (2002) and Toker (2011) indicated that single academicians experience more DP compared to married academicians, Dericioğulları, et al. (2007) found that married academicians experience more DP and single instructors experience more EE. Ardıç, Polatçı (2008) indicated that married academicians have higher levels of personal success perceptions. In majority of studies, PA perceptions of married academicians were found higher compared to single academicians (Barut & Kalkan, 2002; Dericioğulları, et al., 2007; Ardıç, Polatçı 2008; Toker 2011). Burnout levels of academicians with children were similar with the married academicians. While the DP levels of academicians with children were lower compared to those without children, their PA perceptions were higher.

Title or position is defined as one of the major factors affecting the burnout of academicians. In almost all of the studies, it is indicated that research assistants experience more EE and DP and have lower levels of PA perceptions, compared to professors (Alpöz, et al., 2008; Ardıç, Polatçı 2008; Azeem & Nazir, 2008; Barut & Kalkan, 2002; Bilge 2006; Eker, et al., 2007; Ergin 1995; Serinkan, & Bardakçı, 2009; Toker 2011). In addition to this, no relation was found between the academical position and burnout in the studies of Budak & Sürgevil (2005) and Dericioğulları, et al. (2007).

Working time was also determined to be one of the factors related with burnout. It is seen that as the working time increases in the profession, the experience of EE and DP decreases and the personal success perception increases (Ardıç, Polatçı 2008; Çam, 2001; Dericioğulları, et al., 2007; Eker, et al., 2007).

The burnout experiences of academicians are related not only with personal, but also situational factors. In the studies being performed, it was determined that factors such as stress, workload, support, job satisfaction and agreement with decisions are effective upon the burnout experiences of academicians (Ardıç, Polatçı 2008; Barut & Kalkan, 2002; Çam, 2001; Budak & Sürgevil, 2005; Dick 1986; Dick 1992; Otero-Lopez, et al., 2008; Ergin 1995; Sarmiento, et al., 2004; Eker, et al., 2007, Bilici, Mete, Soylu, Bekaroğlu & Kayakçı, 1998). It was determined that the inconsistency between the workload/workplace environment and academicians increases the burnout level (Bilge, 2006; Budak & Sürgevil, 2005). Bilge (2006) determined that the decrease in job satisfaction increases the emotional burnout. Schwab, Jackson, & Schuler (1986) found that the lack of organization, chaos of role, high expectations, career targets and rarity of support groups increase the risk of burnout. Lack or abundance of lesson load (Ardıç, Polatçı 2008) increased the experience of EE and DP (Budak & Sürgevil, 2005; Lopez 2008).

It is important to prevent the burnout. Because it not only causes inefficacies and diseases in the individual, but also harms the institution as a result of the low performance, depression, psychological destruction, job release and job failure of the individual (Kaçmaz 2005; Hasting and Bham, 2003; Schwab, Jackson, & Schuler, 1986). Burnout experience of academicians is an important problem, since it will influence her/him, the education and student outcomes.

It is observed in the relevant literature that the burnout of academicians are examined at universities, or different occupational groups or some professional groups. The studies regarding the burnout of nursing academicians are limited. In the studies, it was determined that factors such as being young, woman, single, research assistant, having no children, having a duty term of less than five years, abundance of workload, stress and disagreement with decisions generally increase the level of burnout. According to these results; nurse academicians, who are consisted of female and young groups, have a great number of students at the levels of bachelor's degree, post graduate and doctorate, and who constantly perform the studies of developing programs in parallel with the rapid changes in health services, have a higher risk of experiencing burnout.

Majority of factors causing burnout could be changed or removed and the burnout could be prevented. The first step of deciding on improvement studies on a subject is to determine the effectiveness of the available condition. Thus, the research objective is to determine the influence of age, marital status, academic positions, weekly work hours and educational models on burnout among nurse academicians.

METHOD

Participants: The research was conducted in two Turkish nursing schools, one applying PBL (for the past eight years), and the other offering more traditional instruction. There were 42 academicians and 346 students in the PBL school, and 73 academicians instructing 963 students in the traditional school. Both schools have undergraduate, graduate, and doctoral programs. We excluded senior administrative faculty (Deans and Assistant Deans; n = 8) and invited all 107 remaining academics to participate in the study.

Material and Instruments: The researchers prepared a questionnaire on personal information that contained basic questions like age, marital status, academic position, weekly work hours, and the instruction method of the school. Weekly work hours included classroom preparation and presentation, participation in the laboratory or practice sessions, student advising, and hours spent conducting and supervising research.

The Maslach Burnout Inventory (MBI) was devised by Maslach & Jackson (1981) to quantify worker burnout. The MBI was adapted to Turkish schools by Ergin (1992) and Çam (1992). In this study, the Turkish version of MBI translated by Ergin (1992) was used. Test reliability was evaluated by analyzing the internal consistency of each of the three dimensions, and by the test/re-test method. The Cronbach's alpha coefficient values of the dimensions were 0.82, 0.60, and 0.80 respectively, and the test/re-test reliability coefficients, obtained from 99 subjects 2–4 weeks later, were 0.83, 0.72, and 0.67 (Ergin, 1992). In the present study, Cronbach's alpha coefficients were 0.76 for the total inventory, 0.86 for EE, 0.78 for DP, and 0.82 for PA.

The MBI evaluates three dimensions: EE is evaluated with nine items, DP with five items, and PA with eight items. The 7-point Likert type scale in the original instrument was changed to a 5-point Likert type scale by Ergin (1992). In the burnout inventory, the academicians were asked to state the frequency with which they were affected by the given statements and to choose one of the following options: "never," "a few times a year," "a few times a month," or "every day". The answers ranged between 0 (never)–4 (every day). High scores on EE and DP and low scores on PA are accepted as indicative of burnout (Maslach & Jackson, 1981).

The questionnaire and the Maslach Burnout Inventory were distributed by the researchers to volunteer academicians and then collected on specified dates.

Data Analysis: Personality and workplace features were specified by calculating frequencies, burnout levels were determined by mean scores and standard deviations. The influences of marital status, weekly work hours and education models on the level of burnout were analyzed by student's t test because there were two independent group and each group size is more than 30. The influences of age and academic position on the level of burnout were analyzed by Kruskal-Wallis test because there were three independent group and each group size is fewer than 30. SPSS for Windows statistical package was used in analysis. In all statistical analysis, p was set as 0.05.

Ethics approval: We obtained consent from the ethics committees of both nursing schools. The individuals included in the study were informed about the research and all participants gave their oral consent.

RESULTS

Demographic Findings: The sample population comprised 94 female participants (88% response rate). The majority of the nurse academics were married (57.45%) and under 40 years of age (77.66%). All respondents were full-time faculty members. Most of them stated that they worked 51 hours and more in a week (58.51%). The majority of academics in both schools were working as Research Assistants (54.25%), wherein they were completing their masters /doctoral thesis and providing classroom and clinical instruction under the guidance of a professor. The second largest group was Professors (Assistant, Associate or Full) (32.98%). Professors provide classroom instruction to undergraduate and graduate students, participate in their own research, supervise graduate student research, and offer clinical instruction. The third category of academics was Instructors (12.77%), who have a master's degree, but are not pursuing doctoral education. They provide clinical and classroom instruction to undergraduate students. Of these, 37 were from the school applying PBL and 57 were from the school applying traditional instruction (Table 1).

Table 1. Personality and workplace features of nurse academicians

	n	%
Age		
30 and under	43	45.75
31–40	30	31.91
41 and above	21	22.34
Marital status		
Married	54	57.45
Single	40	42.55
Academic position		
Research Assistant	51	54.25
Professor	31	32.98
Instructor	12	12.77
Weekly work hours		
50 hours and less	39	41.49
51 hours and more	55	58.51
Eğitim yöntemi		
PBL	37	39.36
Traditional	57	60.64

Burnout Scores: The EE score of the nurse academics was 16.43±5,97, the DP score was 4.83±3,62, and the PA score was 22.27±4,27 (Table 2).

Table 2. Burnout scores of nurse academicians

	n	Mean±S.deviation
Duygusal Tükenme (EE)	94	16.43±5.97
Duyarsızlaşma (DP)	94	4.83±3.62
Kişisel Başarı (PA	94	22.27±4.27

There were no significant differences in EE and DP according to age ($p > 0.05$). However, 30 years and below of the academics reported a lower level of PA than 31 and above of academics ($p < 0.05$) (Table 3). Single academicians indicated a higher level of DP than married ($p < 0.05$). Whereas, no significant differences were observed for EE and PA subscale scores according to marital status ($p > 0.05$) (Table 3). The means of EE and

DP score for professors was higher than research assistans and instructors. But, there were no significant differences in EE and DP according academic position (p > 0.05). However, professors and research assistans reported a lower level of PA than instructors (p < 0.05) (Table 3). There were no significant differences in EE, DP and PA scores according to the weekly work hours and education model of nurse academics (p > 0.05) (Table 3).

Tablo 3. Personality and workplace features and burnout scores of nurse academicians

		EE score±SD	Test/ p value	DP score±SD	Test/ p value	PA score±SD	Test/ p value
Age							
30 and below	43	16.46±6.34	*.965	5.39 ±4.07	*3.944	20.86 ±4.37	*9.534
31–40	30	17.30±5.98	.617	5.06 ±3.39	.139	23.26± 3.94	**.009**
41 and above	21	15.09±5.08		3.33±2.49		23.71± 3.73	
Marital status							
Married	54	15.92±5.44	**.943	4.00±3.18	**2.667	22.25 ± 4.36	**.018
Single	40	17.10±6.60	.348	5.95±3.90	**.009**	22.27± 4.18	.986
Academic position							
Professor	31	15.61±5.00	*.887	3.74±2.85	*3.67	24.00 ±3.69	*6.985
Research assistant	51	17.03 ±6.65	.652	5.49±3.95	.159	21.31±4.28	**0.030**
Instructor	12	15.91 ±5.19		4.83±3.45		21.83 ±4.50	
Weekly Hours of Work							
50 hours and less	39	16.00± 5.91	**-.581	4,89±3.73	**.152	22.84 ± 3.55	**1.112
51 hours and more	55	16.72 ±6.03	.563	4.78±3.56	.880	21.85 ± 4.69	.269
Education Model							
PBL	37	15.45±5.70	**-1.270	4.43±3.27	**-.857	21.40±5.15	**-1.589
Traditional	57	17.05±6.09	.207	5.08±3.82	.394	22.82±3.51	.116

*Kruskal Wallis H Test
**Student T testi

DISCUSSION

The findings of the study indicate that there were no significant differences in EE according to the personality and workplace features. However, single academics indicated a higher level of DP than married. Professors and research assistans reported a lower level of PA than instructors. Younger academics reported a lower level of PA than 31 and above. There were no significant differences in EE, DP and PA scores according to the weekly work hours and education model of nurse academics.

Previous studies have produced conflicting results about this issue. In a series of research studies conducted in Turkey, the academicians' marital status had no relationship with burnout (Alpöz, et al, 2008; Eker, et al, 2007; Gezer, Yenel & Şahan, 2009). Our result was congruent with studies conducted elsewhere, with single academics reporting a significantly higher level of DP than married ones (Barut & Kalkan, 2002; Çam, 2001; Ergin, 1992; Maslach & Jackson, 1985; Mo 1991) while married persons demonstrated a higher level of PA (Barut & Kalkan, 2002; Ardıç & Polatçı, 2008). In the previous studies, it was postulated that married academicians experienced a lower level of DP and a higher level of PA because of the social support provided by the family institution. This might also be the experience of the participants in our study, where married academics experienced a lower level of DP in comparison with the single ones.

We also found differences with regard to age among the nurse academics, with significantly lower PA scores in the younger academics. This finding is supported by other research. Alpöz et al. (2008) demonstrated that those aged 25–30 experienced a higher level of EE, DP and a lower level of PA when compared with the 31 and above age group. Barut & Kalkan (2002) also found that the 20–30 age group experienced higher levels of burnout than those in the 40 and above age group. PA scores of the academicians older than 30 are also lower when compared with those academicians who are older. Moreover, it is observed that academicians aged 30 and below experience higher levels of burnout when compared to older academicians in the areas of EE and DP. These results are compatible with the results of previous studies and this situation may be accounted for by the increase in experience with age, the development of internal capabilities, and coping (Ergin, 1995).

In the present study, we found that Research Assistants and professors had a lower level of PA than instructors. Lackritz (1994), Budak & Sürgevil, (2005), Dericioğulları (2007) found that there were no significant differences in all burnout subscales among academicians according to the academic position, and Çam (2001), Gezer et al. (2009) found no difference between the EE and DP scores in terms of academic position. However, in several studies conducted in Turkey, where the Research Assistant position is common, this group has the highest level of burnout (Alpöz et al 2008; Ardıç & Polatçı, 2008; Barut & Kalkan, 2002; Bilge (2006); Eker (2007); Serinkan, Bardakçı (2009), Toker (2011); Bilici et al. 1998). In these studies, the fact that research assistants experienced a higher level of burnout when compared to other faculty members were accounted for by the fact that they are inexperienced about both relationships with students and class management and at the same time, they attempt to pursue their academic studies, not to mention the high authority exerted over them. In this paper, unlike the results of other studies, the professor's experiencing low personal achievement like the assistants can be explained by the features, complexity and the workload of the nursing education program. In the both nursing schools where the study has been carried out, the professors are responsible for the practicing in the bachelor's degree, master's degree and doctor's degree programs in the fields of education, research, and practicing nursing with students. Due to multiple roles and responsibilities, their having difficulties in achieving their goals can cause the nurse academics to experience the sense of low personal achievement. Also Sarmiento et al. (2004) stated that nurse educators have multiple roles and responsibilities, and these broad expectations may increase the risk of burnout. In this study, the instructors whose sense of personal achievement is higher than the professors, don't have the responsibility to do graduate education and research; they have less workload than the professors and research assistants. These results support the relationship between the burnout and the workload and complexity, which was stated by Maslach & Leiter (1997).

In this study, the academicians' weekly work hours were not associated with the level of burnout. This finding is not compatible with the results of previous studies. Ardıç & Polatçı (2008) found that a work load greater than 36 hours per week leads to DP. Otero-Lopez, et al. (2008) and Budak & Sürgevil, (2005) found out that weekly work hours are associated with high levels of EE and DP. In the present study, the fact that burnout level did not differ in terms of weekly course load might be related to organizational factors like a positive work environment. In this survey, the working hours are decided by the nurse academics who set the sample, appropriate for their mission and values to be able to discharge their responsibilities and improve their personal achievement. The management does not impose an overwork span. This result supports the importance of an individual's controlling his own work in preventing the case of being burnout, which was stated by Maslak &Leiter (1997). Neither in Dick's (1986) survey, there is a relationship discovered between nurse academics' working hours and the level of their burnout.

In the present study, burnout scores of academicians were similar whether they were employed in PBL schools or schools offering traditional instruction. Prior to our research, it was anticipated that academicians who used PBL would experience more burnout. Previous researches demonstrated that role conflict, role ambiguity, extra work load, and job satisfaction are associated with academician burnout (Budak & Sürgevil, 2005; Çam, 2001; Dick, 1986; Otero-Lopez et al., 2008; Sarmiento 2004; Ergin 1995) and these factors have been described as issues for academics using the PBL approach in education (Berkson, 1993; Davis & Harden, 1999; Harden & Crosby, 2000). Research on the PBL process has revealed that educators often believe the approach is superior to traditional methods, resulting in increased satisfaction (Harden and Crosby, 2000; Neville, 1999; Rideout and Carpio, 2001). Kaufman and Holmes (1996) reported that the PBL academics are pleased with their role as a guide rather than lecturer, and that the new knowledge and skills acquired with this role increases their job satisfaction.

CONCLUSION

Academic burnout is a significant problem, since it has been shown to be associated with decreased work performance, increased health problems, and decreased job satisfaction. Consequently, the burnout awareness of university managers and academics is important.

We found that marital status affects DP, age and academic position affect PA among nurse academics. In this survey, "that the level of the personal achievement of the professors and the assistants are alike" is different from the results of the surveys that are made about the other academics' burnout and this difference is considered to be possibly related to classroom education and laboratory work of the nurse academics and their multiple roles like practicing in clinical environment. Therefore, it is possible to suggest that the burnout of nurse academics should be examined with the other variants of burnout in higher populations and qualitative studies should be made about the reasons of burnout.

There is a wealth of research examining studies of burnout among academics who work in schools delivering traditional instruction. However, this is the first reported study focusing on academician burnout in schools delivering PBL. Although we surmised that burnout levels of academics applying PBL would be higher, we found the PBL model does not exacerbate burnout, which lends support for the PBL approach to nursing education. A study incorporating academics providing PBL education in faculties other that from nursing would also be valuable.

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THE QUESTIONNAIRE OF LIFESTYLE CHANGE IN REGARD TO PROBLEMATIC INTERNET USE: FACTOR STRUCTURE AND CONCURRENT AND CROSS-YEAR PREDICTIVE UTILITIES

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ABSTRACT
This study constructed a questionnaire, named “Lifestyle Change in Regard to Problematic Internet Use (LC-PIU),” for helping school psychologists detect early indications of PIU-related lifestyle changes in university populations. Our focus is on all university students who use the Internet, not users who already show dependent symptoms. The lifestyles that we concerned include physical/social activities and dietary/sleep patterns that are notable consequences of excessive Internet use (Lam et al., 2009; Choi et al., 2009). With 708 university students recruited in 2009 (Time 1), we tested the factor structure of LC-PIU and determined the concurrent and cross-year predictive utilities with the same participants in 2010 (Time 2). The 2009-sample was randomly split into two independent subsamples for calibration and validation using exploratory and confirmatory factor analyses. The calibration and validation results, along with convergent and discriminant tests, confirmed that the LC-PIU is composed of five distinct subscales: problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change. All Time-1 LC-PIU subscores were positively correlated with depression, loneliness, and weekly Internet use at Time 1 and Time 2. Only a negative correlation was found between gender and social activity change at Time 1 and Time 2.

INTRODUCTION

The long-term, excessive use of the Internet, often coined problematic Internet use (PIU), resembles the DSM-IV definition of impulse control disorder (Shapira et al., 2000) or pathological gambling (Young, 1996). Various names associated with Internet addiction include cyberspace/online/net addiction, high Internet dependency, Internet addicted disorder, pathological Internet use, problematic Internet use, excessive Internet use, and compulsive Internet use (Davis, Flett, & Besser, 2002; Hur, 2006; Widyanto & Griffiths, 2006).

Previous studies suggest that PIU leads to the disregard of crucial daily responsibilities such as work, academic, family, or social obligations (Morahan-Martin & Schumacher, 2000; Aboujaoude, 2010; Tutgun, Deniz & Moon, 2011, Şahin, 2011). Because the majority of university students live away from home with minimal parental monitoring and easy access to the Internet, we sought to observe whether the initial emergence of PIU alters university students’ daily routines, including changes to their dietary, sleep patterns and physical activities. We were also interested in less-visible (because of their dynamic nature) changes to their social relationships. Lifestyle factors are critical in adolescence because an adequate amount of quality physical/social activities as well as healthy diet/sleep habits facilitate adolescent physiological growth and psychological development.

Young (1998a) was a pioneer researcher who developed the Diagnostic Questionnaire for Internet Addiction as a tool to identify maladaptive Internet users. Following her suggestion, some related research based on the mental disorder view to distinct additive users versus normal users. YDQ and some relevant questionnaires (Beard and Wolf, 2001; Shapira et al., 2003; Ko et al., 2005) have been used to select a small percentage of online users with severe dependent symptoms. Their findings mostly contribute to the secondary and tertiary prevention perspectives. In contrast, our motivation was to construct a questionnaire that we named “Lifestyle Change in Regard to Problematic Internet Use (LC-PIU)” for helping school psychologists and educators detect early indications of PIU-related lifestyle changes in university populations.

Primary prevention regarding the promotion of health and the prevention of illness is evolving in the fields of public health and psychiatry. Wallace (2002) proposed that primary prevention generally involves the prevention of diseases and conditions before their biological onset. Using concepts from the fields of epidemiology and psychiatry, Caplan (1964) defined primary prevention as lowering of the incidence (i.e., rate of new cases) of a specified mental disorder; the aim of primary prevention is to reduce incidences of a problem or disorder before it forms. Accordingly, our focus is on all university students who use the Internet, not users who already show severe dependent symptoms. The PIU is a cause for great concern in Taiwan, a country with more than 1.3 university students comprising 5.8% of the total population (Ministry of Education, 2011). We believe that a significant percentage of these students are facing challenges in terms of managing their Internet usage at some point during their college careers.

In this paper we describe how we tested for a conceptually meaningful factor structure using both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The EFA was applied to a calibration sample, and the CFA was tested using a validation sample. We also examined the concurrent and predictive cross-year utilities of the LC-PIU on depression and loneliness as well as the relationships among LC-PIU scores, gender and weekly Internet use. In addition, the internal consistency reliability of the total scale and each subscale were tested.

Research of Problematic Internet Use and measurements

Because Internet addiction is not yet recognized in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revised (DSM-IV-TR; American Psychiatric Association, 1994) most research in this area has adapted the diagnostic criteria of pathological gambling. Recently, some experts have supported the inclusion of Internet addiction in the upcoming DSM-V. For example, Block (2008) proposed including the term “Internet addiction” in the DSM-V as a diagnosis of compulsive-impulsive spectrum disorder that involves online, offline, or both types of computer use. He also believes that at least three subtypes should be included: excessive game playing, sexual preoccupation, and e-mail/text messaging. All three are marked by excessive usage, withdrawal, tolerance, and negative repercussions.

Many different diagnostic criteria have been suggested for the identification of Internet addiction. First introduced by Goldberg (1995) and made popular in subsequent empirical research, Young (1996) adopted the DSM-IV criteria for substance dependence to describe the impairment of an individual with “Internet addiction.” Later, Young (1998a) adopted the DSM-IV criteria of pathological gambling, an impulse-control disorder, into her Diagnostic Questionnaire. DQ consists of 8 items. If a participant answers “yes” to more than 5 of the 8 criteria, then the participant is classified as Internet dependent. Young (1998b) also created the 20-item Internet Addiction Test (IAT) with six factors: salience, excessive use, anticipation, lack of control, neglect of work, and neglect of social life. Likewise, Brenner (1997) generated the Internet-Related Addictive Behavior Inventory (IRABI) that uses 32 true-false questions. He extracted three factors from the IRABI: tolerance, withdrawal, and craving. Moreover, Morahan-Martin and Schumacher (2000) developed 13 yes-no questions to assess the problems due to Internet use by adapting Young’s Internet addiction criteria.

Young (1996) proposed the first set of “Internet addiction” diagnostic criteria by adopting the substance dependence criteria from the DSM-IV due to similarities she observed with regard to the states of tolerance and withdrawal. Subsequently, Young (1998a) updated her diagnostic questionnaire using the DSM-IV definition of pathological gambling, an impulse control disorder often described as a behavioral addiction. However, many studies admitted that the term “Internet addiction” is confusing and lacks scientific evidence. For example, Murali and George (2007) suggest that the nosological and conceptual ambiguity surrounding Internet addiction has led many researchers to question its untested validity. These opponents propose that the term “Internet addiction” be replaced by those such as excessive, maladaptive or problematic Internet use. Some researchers avoid using the term “Internet addiction”, while others criticize its definition as being too narrow to capture the population of problematic Internet users. This limitation leads to premature conclusions regarding a new disorder and the patients who have related symptoms (Aboujaoude, 2010). Specifically, Beard and Wolf (2001) as well as Shapira, Lessig, Goldsmith, Szabo, Lazoritz, Gold, and Stein (2003) have suggested using the less controversial term “problematic Internet use” rather than “Internet addiction.” Shapira, Goldsmith, Keck, Khosla, and McElroy (2000) stated that problematic Internet use is characterized by an individual’s inability to control their urge to use the Internet without concern for the consequences. This lack of will power results in feelings of distress and the functional impairment of daily activities. Shapira et al. (2003) conceptualized problematic Internet use as an impulse control disorder. An individual should be diagnosed with problematic Internet use if he or she exhibits three phenomena (a) maladaptive preoccupation with Internet use, such as experiencing an irresistible use of the Internet and using the Internet more than the amount of time intended; (b) clinically significant distress or maladaptive functioning in social, occupational, and other critical areas due to excessive

Internet use; and (c) overuse of the Internet that does not occur during a phase of mania or hypomania and is not otherwise explained by an Axis-I disorder.

Similarly, Caplan (2002) constructed the Generalized Problematic Internet Use Scale (GPIUS), which included seven factors: mood alteration, perceived online social benefits, negative outcomes associated with Internet use, compulsive Internet use, an excessive amount of time spent online, withdrawal symptoms and perceived online social control. Moreover, Demetrovics, Szeredi, and Rozsa (2008) modified Young's (1998b) Internet Addiction Test and added additional questions to create the Problematic Internet Use Questionnaire. This questionnaire measures the problems associated with Internet use, which resulted in a three-factor model that included obsession, neglect, and control disorder. The obsession subscale was defined as mental engagement with the Internet as well as the anxiety, worry, and depression caused by a lack of Internet use. Items about the decreasing typical activities (e.g., work, studies, and partner relations) because of an increased amount of Internet use were named as neglect scale. The control disorder subscale measured the inability to decrease the amount of time spent on the Internet and self-perceptions of Internet use as problematic. The current study adopted the term "problematic Internet use" to describe the core maladaptive behaviors related to excessive Internet use.

The Lifestyle-Related Factors of Problematic Internet Use

Classical sociological theorists originally viewed the concept of lifestyle as a component of stratification systems. For example, Weber emphasized lifestyle as a means for social differentiation. Lifestyle is composed of two basic elements including structured conditions (or "life chances") and personal choice (or "life conduct") (Backett & Davison, 1995). Lifestyle denotes the relationship between an individual and a particular group in which the individual has a sense of belonging to the group due to his or her choice and some suggestions of structured life changes (Abel & McQueen, 1991).

The concept of lifestyle then has been refined and is comparable to the biomedical risk factor and the psychological approaches of major health behavioral research. Lifestyle became a central concept in the development in health promotion theory and practice. Lifestyle provides the loosely defined link between the epidemiologically designated health-risk factors at the individual level (e.g., diet, drinking, exercise level and smoking) and the preventive medicine or health promotions at the population level. In addition, Coulson, Eiser, and Eiser (1997) proposed that the focus of lifestyle includes both the presence of health-damaging and health-enhancing behaviors. Lifestyle can be seen as the distinctive mode of living defined by a set of expressive and patterned behaviors of individuals occurring with some consistency over a period of time.

Ha, Kim, Bae, Bae, Kim, Sim, Lyoo, and Cho (2007) mentioned that adolescents are more at risk for problematic Internet use than adults, and the former group's lifestyle habits are easily affected by the excessive use of the Internet. Some research indicates that adolescents who develop problematic Internet use might have adverse consequences and changes in several lifestyle-related factors including physical inactivity, extended time spent on the Internet, increased use of alcohol and tobacco, short durations/lack of sleep, and irregular dietary habits/poor eating patterns (Gunnell et al., 1998; Lam et al., 2009; Kim & Chun, 2005; Choi et al., 2009).

The present study constructed a new questionnaire to include lifestyle-related factors of problematic Internet use (physical activities, social activities, dietary and sleep patterns). The validation procedure is the focus of this paper. Our specific research questions are:

1. Does the exploratory factor analysis of the calibration sample demonstrate a conceptually meaningful factor structure?
2. Based on the factor structure of the calibration sample, does the factor structure of the validation sample fit the data using a confirmatory factory analysis?
3. Are the alpha reliability coefficients of the LC-PIU factors acceptable?
4. Do the correlations among the LC-PIU scores, depression, loneliness, weekly Internet use and gender support the concurrent and cross-year predictive validity of this measure in 2009 (Time 1) and 2010 (Time 2)?

METHOD

Participants

Participants were drawn from the respondents of a national panel survey funded by the National Science Council, Republic of China which aimed at collecting adolescent Internet use and physical-mental development data. The sample consisted of 708 freshmen (360 male, 348 female) enrolled in Time 1. We randomly divided the sample (n=708) at Time 1 into two independent groups for the purpose of validity examinations. One year later, we collected data regarding depression, loneliness, and weekly Internet use of the same participants. There were 540 participants at Time 2 to allow for missing data in the panel study.

Measures

Weekly Internet use. Participants were asked to estimate their average weekly use of the Internet on a seven-point scale ranged from "one day" to "every day." Next, participants estimated how much time they spent on the Internet on a thirteen-point scale ranged from "less than one hour" to "more than twelve hours." Most respondents (59.75%) used the Internet 7 days a week (male, 63.89%; female, 55.46%). The majority (48.30%) of the participants spent 2 to 4 hours on the Internet each day (male, 46.39%; female, 50.29%). A composite amount of weekly Internet use was calculated by multiplying the frequency of a week by the daily time. Higher scores indicate that participants Internet use longer.

Questionnaire of Lifestyle Change in Regard to Problematic Internet Use (LC-PIU). The LC-PIU partially consisted of items concerning preoccupation with/irresistible Internet use, tolerance and withdrawal selected from Lin and Tsai's (1999) Internet Addiction Scale for Taiwanese high school students (IAST). Examples from the LC-PIU include "Though I plan to use the internet for just a while, I stay online longer than originally intended" and "When I try to cut down or stop my Internet use, I feel anxious."

Additional items were constructed by considering different lifestyle changes described in the problematic Internet use literature. Participants must estimate how much a given statement describes the influence of Internet use on the changes of lifestyle on a 5-point scale. Examples of the physical activity change items include "I neglect exercise due to spending time online" and "I remain seated longer than two hours when I am online." Examples of the social activity change items are "I reduce face-to-face contact with others because of the Internet" and "I would rather spend time online than attend activities with friends and family." The dietary pattern change items state "I spend time online such that I ignore regular meals and eat whatever is available" and "While using the Internet I forget to drink water for a long time." Lastly, the sleep pattern change items include "I have reversed sleep patterns because of the Internet" and "I would rather spend time online than go to bed at night." The LC-PIU has 23 items in total.

Beck Depression Inventory (BDI). The Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979) is a 21-item, self-report measure of depression severity. Each of the 21 items is rated on a 4-point scale. The ratings are summed and yield a total score that ranges from 0 to 63.

Chinese Version of the Loneliness Scale (LS). Lin and Lin (2007) revised the Loneliness Scale (De Jong Gierveld & Kamphuis, 1985) into Chinese. This scale is composed of two subscales: "emotional loneliness" and "social loneliness." The former includes six negatively worded items related to aspects of exclusion. An example item states, "I often feel rejected." The latter subscale includes five positively worded items related to feelings of belonging. An example statement includes "There are plenty people who I can rely on when I have problems." Each of these 11 items is rated on a 2-point scale. The total score ranges from 0 to 11. In the present study, the Cronbach's alpha reliability was 0.76 for the total scale.

Statistical analyses

Statistical analyses were conducted in several stages using SPSS 13.0 and LISREL 8.80. The data were randomly divided into two independent subsets for the purpose of examining validity. First, an exploratory factor analysis (EFA) using principal axis factoring with promax rotation was adopted for Subsample 1. Factors were identified as those with eigenvalues greater than 1.00. A value of 0.30 was used as a viable cutoff for judging the saliency of factor loadings. Second, we tested the validity of the factor structure derived from the results of the EFA with Subsample 1 using confirmatory factor analysis (CFA) on Subsample 2 within the framework of structural equation modeling.

In CFA, several criteria are used to determine the overall fit between the data and the hypothesized structure. These include the Comparative Fit Index (CFI), which must meet or exceed 0.90 (Bentler & Bonett, 1980); the Root Mean Square Error of Approximation (RMSEA) in which values less than 0.05 are indicative of good fit and those between 0.05 and 0.08 are indicative of a reasonable fit (Browne & Cudeck, 1993); and the Standard Root Mean Square Residual (SRMR) in which values less than 0.08 indicate acceptable fit (Hu & Bentler, 1999).

RESULTS

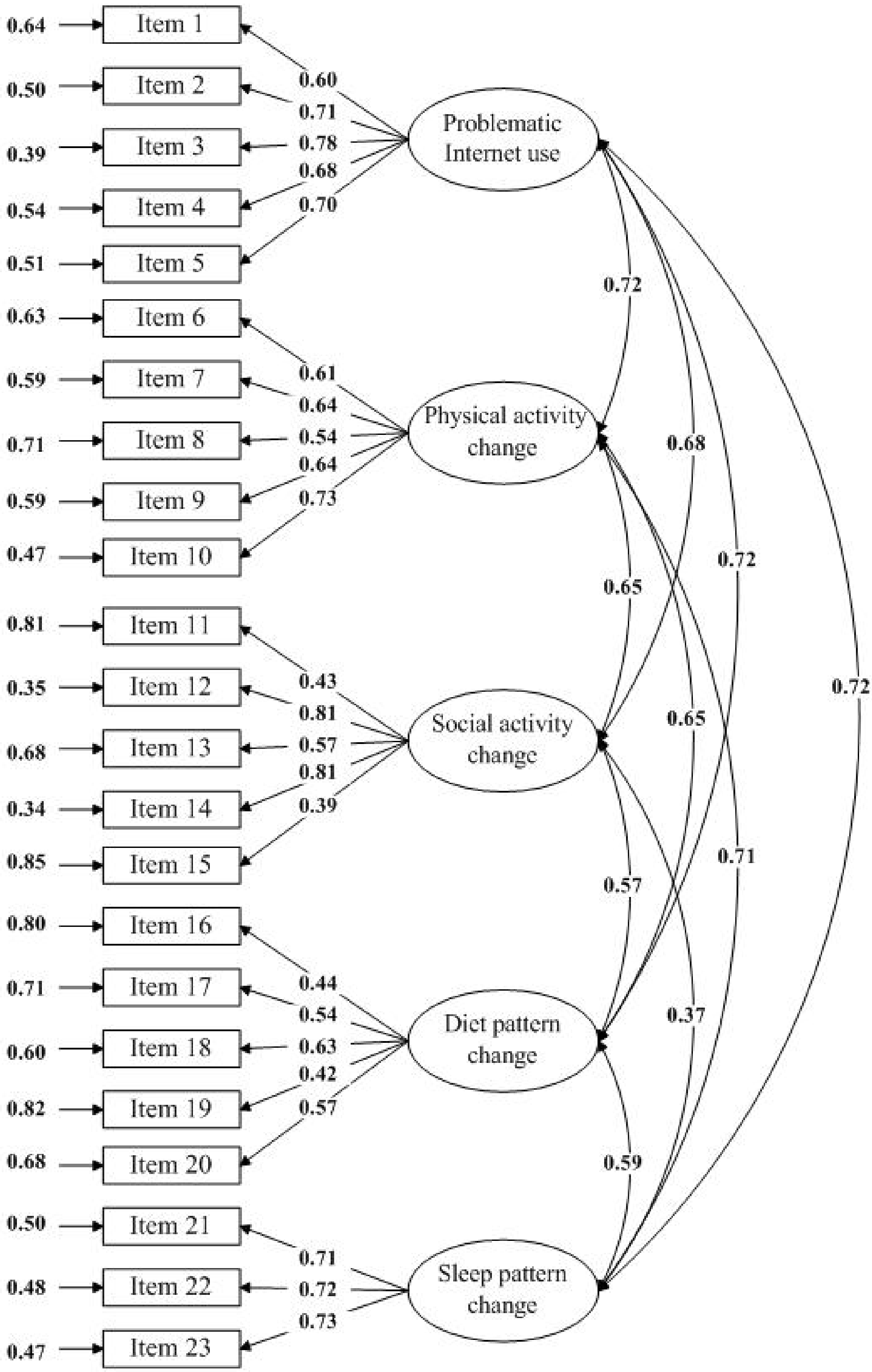
Exploratory Factor Analysis

To generate the factor structure of LC-PIU, a principal axis factoring with promax rotation was conducted for the 23 items in Subsample 1 (calibration sample, n = 354) selected from the random split-half of the whole Time 1 sample. This analysis resulted in a five-factor solution that explained 59.75% of the total variance. The first factor included 5 items regarding preoccupation with Internet use, tolerance and withdrawal; thus, this scale was labeled "problematic Internet use." The second factor, the "physical activity change scale," included 5 items that described reductions to participants' exercise schedules due to Internet use. The third factor included 5 items about the reduction in the frequency/quality of participants' interpersonal relationships including offline friends, family members, and relatives; thus, this factor was labeled the "social activity change scale." The fourth factor, the "dietary pattern change scale," included 5 items related to decreases in maintaining a regular diet due to Internet use. The fifth factor, "sleep pattern change scale," included 3 items about delaying sleep or changing sleep patterns due to Internet use.

Confirmatory Factor Analysis

Based on time-1 Subsample 2 (validation sample, n = 354), we conducted a CFA to retest the LC-PIU's five-factor structure derived from the EFA calibration of time-1 Subsample 1. The results revealed a model that obtained an adequate fit to the data ($\chi^2_{(220, N=354)} = 317.16$, $p<.01$; CFI = 0.97; RMSEA = 0.050; SRMR = 0.061). Anderson and Gerbing (1988) suggest that examining the convergent and discriminate validities are two approaches to further assess fit. Convergent validity is evaluated on the measurement model by determining whether the estimated coefficient of each indicator on its accordingly underlying latent factor is significant. The standardized coefficients shown in Figure 1 are all statistically significant. The factor loadings of problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change ranged from 0.60 to 0.78, 0.54 to 0.73, 0.39 to 0.81, 0.42 to 0.63, and 0.71 to 0.73, respectively. These results reveal that these five factors have an adequate convergent validity.

To examine the discriminant validity among the five factors, we adopted Anderson and Gerbing's (1988) approach in which the correlation between any two latent factors was constrained to 1.0, allowing a researcher to perform a chi-square difference test on the values obtained for both constrained and free-estimate models. The chi-square differences of the constrained and free estimated models were $\Delta\chi^2 = 69.59$ (df = 1, $p<.001$) for problematic Internet use and physical activity change, $\Delta\chi^2 = 101.75$ (df = 1, $p<.001$) for problematic Internet use and social activity change, $\chi^2 = 34.2$ (df = 1, $p<.001$) for problematic Internet use and dietary pattern change, $\Delta\chi^2 = 45.49$ (df = 1, $p<.001$) for problematic Internet use and sleep pattern change, $\Delta\chi^2 = 93.66$ (df = 1, $p<.001$) for physical activity change and social activity change, $\Delta\chi^2 = 39.92$ (df = 1, $p<.001$) for physical activity change and dietary pattern change, $\Delta\chi^2 = 31.8$ (df = 1, $p<.001$) for physical activity change and sleep pattern change, $\Delta\chi^2 = 72.51$ (df = 1, $p<.001$) for social activity change and dietary pattern change, $\Delta\chi^2 = 107.33$ (df = 1, $p<.001$) for social activity change and sleep pattern change, and $\Delta\chi^2 = 45.17$ (df = 1, $p<.001$) for dietary pattern change and sleep pattern change. These results indicated that adequate discriminant validities were shown among the five factors. The alpha reliability coefficients for these factors were acceptable ranging from 0.75 to 0.83.



$\chi^2_{(220,\ N=354)}$ =317.16 (p<.01), CFI = 0.97, RMSEA = 0.050, SRMR = 0.061

Figure 1. The five-factor model of the LC-PIU

The association between the LC-PIU and validation measures: Concurrent and cross-year predictive utilities

Pearson correlation was adopted to assess the concurrent validity of LC-PIU. The correlation coefficients between "problematic Internet use", "physical activity change", "social activity change", "dietary pattern change", and "sleep pattern change" at Time 1 and Time-1 depression were 0.33, 0.28, 0.27, 0.30, and 0.26 (ps < .01), respectively; the correlations between LC-PIU subscales at Time 1 and Time-1 loneliness were 0.20, 0.21, 0.29, 0.18, and 0.17 (ps<.01), respectively. As also shown in Table 1, participants' Time-1 weekly Internet use was significantly correlated with problematic Internet use (r = 0.31, p<.01), physical activity change (r = 0.44, p<.01), social activity change (r = 0.22, p<.01), dietary pattern change (r = 0.28, p<.01), and sleep pattern change (r = 0.29, p<.01) at Time 1. The longer the participants spent on the Internet per week, the more severe their problematic Internet use and unhealthier lifestyle changes.

Similarly, problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change at Time 1 were positively correlated with Time-2 depression (0.21, 0.27, 0.19, 0.23, and 0.22, respectively, ps<.01) and Time-2 loneliness (0.13, 0.18, 0.19, 0.13, ps<.01, and 0.10, p<.05) that show cross-year predictive utility of the LC-PIU questionnaire. In addition, the LC-PIU of Time 1 were positively correlated with weekly Internet use (0.21, 0.38, 0.15, 0.21, and 0.23, respectively, ps<.01) of Time 2, cross year. Gender was not significantly correlated with most of the LC-PIU subscales at either Time 1 or Time 2, although there was a negative correlation between gender and social activity change (r = -0.12, p<.01 and r = -0.09, p<.05 at Times 1 and 2, respectively). Men were less active on social activity due to Internet use compared with women.

Table 1. The inter-correlations among the study variables at Time 1 (n = 708) and Time 2 (n = 540)

	PIU, T1	PAC, T1	SAC, T1	DPC, T1	SPC, T1
Mean	9.11	10.88	7.75	10.88	5.76
SD	3.41	3.50	2.67	3.35	2.30
PIU, T1	---				
PAC, T1	.62**	---			
SAC, T1	.55**	.60**	---		
DPC, T1	.56**	.57**	.48**	---	
SPC, T1	.57**	.57**	.48**	.54**	---
Depression, T1	.33**	.28**	.27**	.30**	.26**
Loneliness, T1	.20**	.21**	.29**	.18**	.17**
WIU, T1	.31**	.44**	.22**	.28**	.29**
Gender, T1[a]	.01	.06	-.12**	-.01	-.03
Depression, T2	.21**	.27**	.19**	.23**	.22**
Loneliness, T2	.13**	.18**	.19**	.13**	.10*
WIU, T2	.21**	.38**	.15**	.21**	.23**
Gender, T2[a]	.04	.06	-.09*	.02	.00

* p<.05, ** p<.01

Note. T1 = time 1; T2 = time 2; PIU = problematic Internet use; PAC = physical activity change; SAC = social activity change; DPC = diet pattern change; SPC = sleep pattern change; WIU = weekly Internet use.

[a] 1 = male, 2 = female

DISCUSSION

Using a sample of Taiwanese freshmen, we confirmed that the LC-PIU, a newly developed screening tool for primary prevention, has a meaningful and distinct factor structure. We randomly divided the sample (n=708) at Time 1 into two independent groups for the purpose of validity examinations. In Subsample 1, an EFA of the LC-PIU items resulted in a five factors: problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change. The CFA on Subsample 2 revealed an adequate-fitting measurement model confirming the five latent constructs extracted from EFA on Subsample 1. Two-step factor structural examinations showed a strong support to the construct validity to LC-PIU questionnaire. The reliability (alphas coefficients) for these five factors were acceptable. The results also revealed an adequate convergent and discriminant validity among these five factors.

A concurrent, cross-year predictive utility examination revealed positive correlations between LC-PIU scores and depression as well as between LC-PIU scores and loneliness at Times 1 and 2. Our result is consistent with previous findings that longer Internet use is associated with higher depression and loneliness in university students. For example, Fortson, Scotti, Chen, Malone, and Del Ben (2007) found that abuse of and dependence on the Internet was associated with depression among undergraduates. Lin, Ko, and Wu (2011) found Internet addiction was positively correlated with a greater number of depressive symptoms in Taiwanese college students. Koç (2011) found the addicted Turkey university students were more depressed than the non-addicted. A. Ceyhan and E. Ceyhan (2008) indicated that loneliness and depression significantly predicted problematic Internet use; loneliness was found to be the most important predictor of problematic Internet use, and depression was the second most predictor among university students. Morahan-Martin and Schumaker (2000) found that loneliness was associated with pathological Internet use in undergraduate students.

In addition, our results indicate that gender was not significantly correlated with problematic Internet use, physical activity change, dietary pattern change, or sleep pattern change but was correlated with social activity change. Specifically, male freshmen reported less active social activity due to Internet use compared with females. Previously, Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, and Scherlis (1998) found that heavy Internet use was associated with longitudinal declines in the size of adolescents' social circle, social contact, and family communication. Nie, Hillygus, and Erbring (2002) found that more time spent on the Internet, less time spent with friends, family, and colleagues. Moreover, previous research (Odell et al., 2000; Thayer & Ray, 2006; Boneva et al., 2001; Subrahmanyam, Greenfield, Kraut, & Gross, 2001) regarding gender differences in adolescent technology use has been reported often. Women use the Internet for interpersonal communications such as e-mail, chat rooms, and communicating with family and friends more frequently than men. Conversely, men are more likely to use the Internet to build web pages, pursue sexual relationships, and play games compared with women. Because men dominated computer-related fields traditionally and there is a gender gap in the types of online activity, the Internet might draw men's attention away from friends and family compared with women.

Our results also show that the more time spent on the Internet, the more likely were to have problematic Internet use and unhealthier lifestyles. In other words, excessive Internet use is problematic because an individual lack of the ability to control his or her online schedule. Stopping Internet use led to anxious feelings as well as maladaptive cognitions and behaviors. These individuals neglected exercises, remained sedentary for long periods and reduced social activities with friends and family. When individuals spent excessive time on the Internet, they changed their dietary patterns by postponing or ignoring regular meals, having a bite of whatever was available, or forgetting to drink water for a long time. They were more likely to stay up late because of Internet use, thereby reversing their sleep pattern. In 1996, Young briefly reported that Internet-dependent users had significant impairments in many areas of lives including health and sociability. Subsequent studies indicated that adolescents who develop problematic Internet use changed with regard to several lifestyle-related factors including decreases in physical activity, increases in time spent on the Internet, shorter durations or lack of sleep, and increasingly irregular dietary habits and poor eating patterns (Gunnell et al., 1998; Lam et al., 2009; Kim & Chun, 2005; Choi et al., 2009). Our study reaffirmed these negative effects of excessive Internet use. Because the LC-PIU provides detailed descriptions of inactive/unhealthier life-event associated with maladaptive Internet use, this assessment has potential to reveal longitudinal consequences of problematic Internet use and to compare harmful consequences of various Internet activities across users of various backgrounds.

Due to the easy access to the Internet/a computer, university students are particularly vulnerable to problematic Internet use. The LC-PIU can be used to evaluate the risk and potential of university student Internet-related problems and may help parents, teachers, and students to reflect upon the consequence of excessive Internet use. As investigating the lifestyle-related factors of Internet use might reveal personal choice health-damaging patterns, which could be one of the health and well-being issues of primary prevention. Primary prevention can be conducted in numerous ways. One of the possibilities is that one can build adaptive lifestyle patterns conflicting with Internet use, such as involving in sports, outdoor leisure, friends contact, reading books and so on. .

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THE TYPES, FREQUENCY AND QUALITY OF ELEMENTARY PUPILS' QUESTIONS IN AN ONLINE ENVIRONMENT

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ABSTRACT
This study explored the types, frequencies and quality of student questioning based on three kinds of question-stems (detailed-stem, simple-stem, and no-stem). A questioning-supported thinking and learning system (QSTLS) was developed to scaffold stem-based student questioning. One hundred fifth-grade students participated in this study. Students were assigned to three groups: a detailed-stem group, simple-stem group, and no-stem group. Results show that the detailed-stem groups used more types (11) of questions, asked a greater number of questions (472) and asked questions of higher quality than both the simple-stem group and the no-stem group. The conclusion of the study is that online questioning is a useful learning strategy, and more specifically that detailed question-stems in particular help students to develop their questioning skills. This study also shows that with the assistance of question-stems, the QSTLS system can provide a student-centered and active learning environment for elementary pupils.
Keyword: online questioning, question type, question frequency, question quality, question stem

1. INTRODUCTION

Student questioning, which plays an important role in student's active learning, has several advantages. Firstly, student's attention can be focused (Chin & Osborne, 2008; Rosenshine, Meister, & Chapman, 1996), and cognitive comprehension can be enhanced (Koch & Eckstein, 1991; Pedrosa de Jesus, Almeida, & Watts, 2004). Secondly, students' knowledge can be elaborated (Black, Harrison, Lee, Marshall & Wiliam, 2004; Chin & Osborne, 2008; King, 1992; Rosenshine et al., 1996; Schmidt, 1993). And thirdly, productivity, creativity and high-order thinking can be promoted (Gallas, 1995; Shodell, 1995).

The frequency of student questioning in classroom is relatively low (Dillon, 1988; Graesser & Person, 1994; Van der Meij, 1988). Graesser and Person (1994) pointed out that only 1.3 to 4 questions were asked each hour in classroom (the median is 3). Dillon (1988) indicated that there were approximately 26.7 students in a class the average of question number a student asking was just 0.11 questions. Scholars have indicated that students' questions are mostly factual questions (Chin & Osborne, 2008). The phenomena of low questioning frequencies and of mostly factual questions might be caused by the insufficient ability of students, limited time of classroom instruction, and unfriendly atmosphere in the classroom (Chu, Li, & Hsia, 2007; Pedrosa de Jesus, Teixeira-Dias, & Watts, 2003). To avoid the disadvantages of classroom questioning and to improve the quality of student questioning, network-supported online questioning is a possible alternative.

A specific online environment may have advantages for promoting student questioning. In such an environment, students will have more opportunities to think, ask, and answer questions. Students also can avoid the sometimes uncomfortable classroom atmosphere (Chu et al., 2007). Some online questioning systems have been developed for student questioning, such as P&Q (Point and Query) (Graesser & McNamara, 2005; Langston & Graesser, 1993), NATA (Not afraid to ask) (Chu et al., 2007), QSIA (Question Sharing and Interactive Assignments) (Barak & Rafaeli, 2004), DFAQ (Dynamic Frequently Asked Questions environment) (Ng'ambi & Hardman, 2004), and QBISS (Question-Based Instructional Support System) (Chiou, Liao, & Hu, 2007) . Studies based on these systems indicate that students can have a good learning experience, that is, their learning can benefit from various online questioning activities. Although an online questioning system can stimulate students' questioning, unfortunately those systems were developed for high school, undergraduate, or postgraduate students. An online questioning system for elementary pupils is needed if educators want to understand the online questioning of elementary pupils.

Introducing online questioning activities into elementary classrooms can provide pupils with more questioning opportunities and thinking time; however, elementary pupils' prior knowledge and meta-cognitive skills aren't as good as those of high school and college students. If elementary pupils are placed in an online environment without guidance, they may not get any substantial learning benefit. Scholars have proposed some strategies to assist students in their questioning. For example, researchers used the strategies of "peer-questioning" and "questioning tips" to guide students' questioning (Choi, Land, & Turgeon, 2005). King (1989, 1993) used the strategy of "question-stems" to scaffold students' elaborative questioning. King found that question stems have clearly positive effects on student questioning, that is, they have a positive learning effect. In this study, we want to know whether these supportive strategies are also effective for elementary pupils in an online environment.

This study uses three question-stem conditions (detailed-stem, simple-stem, and no-stem) to understand the types, frequencies and quality of pupils' online questioning. Pupils use a questioning-supported thinking and online learning system (QSTLS) to read a teacher-selected science text, to post/ask questions, and to answer posted questions. The purpose of this study is to explore pupils' questioning under different question-stem conditions. The research questions are: What types of questions do pupils tend to ask? Does the detailed-stem group manifest more questioning frequencies and types than both the simple-stem and the no-stem groups? And does the detailed-stem group demonstrate a better (higher) quality of questioning than both the simple-stem and the no-stem groups? In this study, "question" and "questioning" are alternately used. "Question" refers to the actual question that is asked, either mentally or as a spoken (interrogative) sentence. And questioning refers to the process or act of asking.

2. RELATED STUDIES

2.1. Advantages and difficulties of the student questioning

Student questioning has the advantages of guiding self-learning, monitoring self-understanding, driving knowledge construction, triggering deep-thinking, improving learning comprehension, helping self-evaluation, enhancing discussion, and strengthening the quality of dialogue (Chin & Osborne, 2008). These advantages are important for science learning and have been emphasized by some scholars (Black et al., 2002; Chin & Osborne, 2008; Graesser, 1993; Pedrosa de Jesus et al., 2003; Rosenshine et al., 1996).

The difficulties associated with student questioning are primarily the tendency toward lower questioning frequencies and more factual questions being asked in the classroom (Chin & Osborne, 2008; Dillon, 1988; Graesser & Person, 1994; Van der Meij, 1988). The causes of these difficulties include students' lack of ability to detect contradictory information (Grasser & Person, 1994), to identify their own knowledge deficits (Glenberg, Wilkinson, & Epstein, 1982; Markman, 1979; Pressley, Ghatala, Woloshyn, & Pirie, 1990), and to acquire questioning skills. Students also fear that their questions might induce negative reactions from classmates or teachers (Dillon,1988).

2.2. Strategies for student questioning

To promote students' questioning skills, some studies have proposed strategies that may help students ask questions. King (1989, 1991, 1992, 1993) uses question-stems to help students ask effective questions. In her 1989 study, King used question-stems to guide the questioning of college students in an education course. The question-stems provide some words to help students form complete questions. Examples of question-stems are "How is … related to …?", "What is example of …?" and "What do I (you) still not understand about …?" King's study's results show that the stem-guided questioning group has a significantly improved lecture comprehension ability and more explanatory ability than the unguided group. However, the frequency of questioning wasn't significantly different. In her 1993 study, 34 fifth-grade pupils were randomly assigned to three conditions (highly-elaborated, less-elaborated, and unguided) under which to learn science material presented in classroom lessons. The highly-elaborated group used highly-elaborated question stems such as "Why is…important?" The less-elaborated group used signal words such as "How". Study results showed that the highly-elaborated group had better material comprehension than the other two groups, and also a higher retention score than that of the unguided group.

Choi et al., (2005) designed "questioning tips" to assist the questioning of thirty-nine college students. When students clicked a specific situation on the screen, they could see "Tips" (specific explanations of what to do), "Generic examples" (such as "Would you clearly differentiate between…?"), and "Specific examples" (such as "Does the atmospheric temperature slow down or speed up transpiration rates?"). Study findings revealed that this questioning–tip strategy was useful in increasing the frequency of students' questions. However, this guidance in the form of tips didn't appear to significantly improve students' questioning quality and learning outcomes.

2.3. Online questioning

To alleviate the students' pressure in the classroom, some online questioning systems were developed to facilitate the asking of questions. Forty-eight undergraduate students used the P&Q (Point and Query) system (Graesser &

McNamara, 2005; Langston & Graesser, 1993) to ask questions in a psychology course, and this study pointed out that the frequency of asking questions was 127.2 questions per student per hour in the P&Q system. The NATA system (Not afraid to ask) (Chu et al., 2007) was also developed to overcome the pressure of questioning. 123 college students used this system to ask questions in an introductory computer science course. The results of a questionnaire survey showed that more students preferred to ask questions in this system than in the classroom. And the in-system questioning frequency was far greater than the in-classroom questioning frequency.

In addition to increasing questioning frequency, the online questioning system also provides other advantageous functions. For example, questions and responses can be easily accessed, updated, maintained, and managed (Yu, Liu, & Chan, 2005), and therefore students have more opportunities to reflect, internalize, and increase practical debating skills (Ng'ambi & Hardman, 2004; Kuminek & Pilkington, 2001). In DFAQ (Dynamic Frequently Asked Questions environment), learners asked questions and responded to posted questions. During a two-hour session, twenty-five learners asked 154 questions. And these stored information (questions and responses) became an important resource for a learner community (Ng'ambi & Hardman, 2004). The QSIA (Question Sharing and Interactive Assignments) system (Barak & Rafaeli, 2004) was used in a postgraduate MBA course. This study examined the learning effects of merging question-posing, peer assessment and the attitude toward QSIA . Results indicated that students were highly engaged in online question-posing and peer-assessment activities, and gained higher scores on final examination. A QSIA study also found that online questioning-supported learning could promote active learning, constructive criticism, and knowledge sharing.

The QBISS (Question-Based Instructional Support System) provided an environment for vocational school students to engage in online questioning activities in class. The system has questioning, answering, and evaluating functions. A QBISS study found that students' questions were mostly factual and there was no significant difference between the learning effects of the QBISS and the classroom groups, although students kept a positive attitude toward QBISS (Liao, 2007). QBISS also was applied to a basic computer concept course for vocational school senior students as an after-school learning aid (Wang, 2008). An experimental group of 50 students used QBISS after school, while a control group of 50 students asked questions in the classroom. The results showed that the experimental group had a better achievement than the control group, in particular a higher frequency of questioning and responding.

2.4. Question types

Question type has been extensively studied in questioning research. Graesser, Person, and Huber (1992) developed a taxonomy of questions according to cognitive science. Their taxonomy includes eighteen types: verification, disjunctive, concept completion, feature, feature specification, quantification, definition, example, comparison, interpretation, causal antecedent, causal consequence, goal orientation, instrumental/procedural enablement, judgmental, expectational, assertion, and request/directive. Costa, Caldeira, Gallastegui, and Otero (2000) used this taxonomy to explore the question types, numbers, and quality of 289 students (grades 8, 10, and 12). Results showed that students could ask many questions and generate a large volume of causal-antecedent questions related to science texts. However, no clear effects were found with regard to achievement and task type.

King (1994) mentioned three question-types: factual questions, comprehensive questions and integrative questions. These three types have the functions of knowledge integration, knowledge assimilation and knowledge representation, respectively. Scardamalia and Bereiter (1992) investigated the ability of elementary school students to ask and recognize educationally productive questions. Their study defined three question-types: basic information questions, uneducated guess questions, and wonderment questions. Basic information questions and uneducated guess questions are basic questions which usually have fixed or simple yes-no answers. wonderment questions reflect students' curiosity, puzzlement, and skepticism. Their findings showed that students will adjust the questioning type according to their own knowledge level. Lacking domain knowledge, pupils will ask basic questions; students possessing more domain knowledge will ask higher-level questions.

2.5. Question Quality

Grasser and Person (1994) indicated that there may be three reasons for the low questioning frequency and lack of consideration of question quality. First, students have difficulty in identifying a knowledge deficit. Second, students have difficulty in detecting contradictory information. And third, students lack good questioning skills. In their study, degree of specification, content, and question-generation were used to analyze the quality of college students' questions. Results showed that students' achievement was positively correlated with the quality of their questions.

Some studies analyzed the levels of questions, and characterized the nature of high-level questions. Grasser and

Person (1994) mentioned that inferring, multi-step reasoning, the applying of an idea to a new domain of knowledge, synthesizing, and evaluating are high-level questions. Elder and Paul (1998) indicated that a good quality of questioning demonstrate clarity, accuracy, precision, relevance, depth, breadth, and logic. King (1989) used the strategies of cooperative and independent questioning to examine college students' comprehension, indicating that applying, interpreting, analyzing, and evaluating were important for questioning quality. Pedrosa de Jesus et al. (2003) explored the understanding of chemistry through the generation of questions. They found that a low-quality questioner asks one type of question only, while a high-quality questioner asks a judiciously mixed type.

Based upon the aforementioned research literature, this study adopts King's question-stem approach in order to assist pupils' questioning. By collecting the data on pupils' questioning activity in an online environment developed specifically for elementary pupils (the QSTLS), the study intends to understand the types, frequencies and quality of elementary pupils' questioning.

3. METHODS

3.1. Participants

Participants are 100 fifth graders from three classes in a city elementary school in southern Taiwan. Fifty-five pupils were boys. The three classes have 34, 33, and 33 pupils respectively. Classes were assigned to three question-stem groups. The prior knowledge of science among three classes are homogeneous (ANOVA reveals no significant difference: $F_{2, 96}=0.130$, $p=.878$). Pupils participated in the online questioning-supported science activity at a computer lab, and each class had one science period (40 minutes) per week to engage in online questioning activity. Three classes were guided by the same science teacher. The role of that science teacher was to assist and guide pupils while they were engaging in a designated science activity, and the teacher didn't intervene during the activity. Pupils participated in the online questioning activities for twelve weeks.

3.2. System: Questioning-supported thinking and learning system (QSTLS)

QSTLS, an Internet-based questioning and learning support system, was developed for this study. The functions of QSTLS are to assist pupils' questioning and learning in the science course. Figure 1 and Figure 2 shows the user interface.

QSTLS has the following modules:

- Questioning module: This module is for question-posing. Pupils are requested to type the keyword(s) and title, choose a question mode (text-based or audio-based mode), and type the contents of a question.
- Question stem module: This module provides structured stems. It provides detailed-stem, simple-stem and no-stem for the three groups. Students can select an appropriate example of question stem for assisting their questioning.
- Checking module: This module is for checking similar questions. It helps pupils avoid asking repeated questions.
- Searching module: This module is for searching for posted questions. Pupils input a keyword or an author's name to find questions in which they are interested.
- Answering module: This module is for answer-posing. Pupils can type the answer to a question and post it.
- Evaluating module: This module is for evaluating questions and answers. Pupils can mutually assess questions and answers according to the evaluation criteria.
- Motivating module : This module is for maintaining learning motivation. System will automatically give points when students ask questions, answer questions or evaluate questions and answers. An automatically updated list shows the ranking of students' points.

The functions of QSTLS have been tested by one sixth grade class before experiment. Pupils perceived that the interface of system is clear, consistent and easy to use.

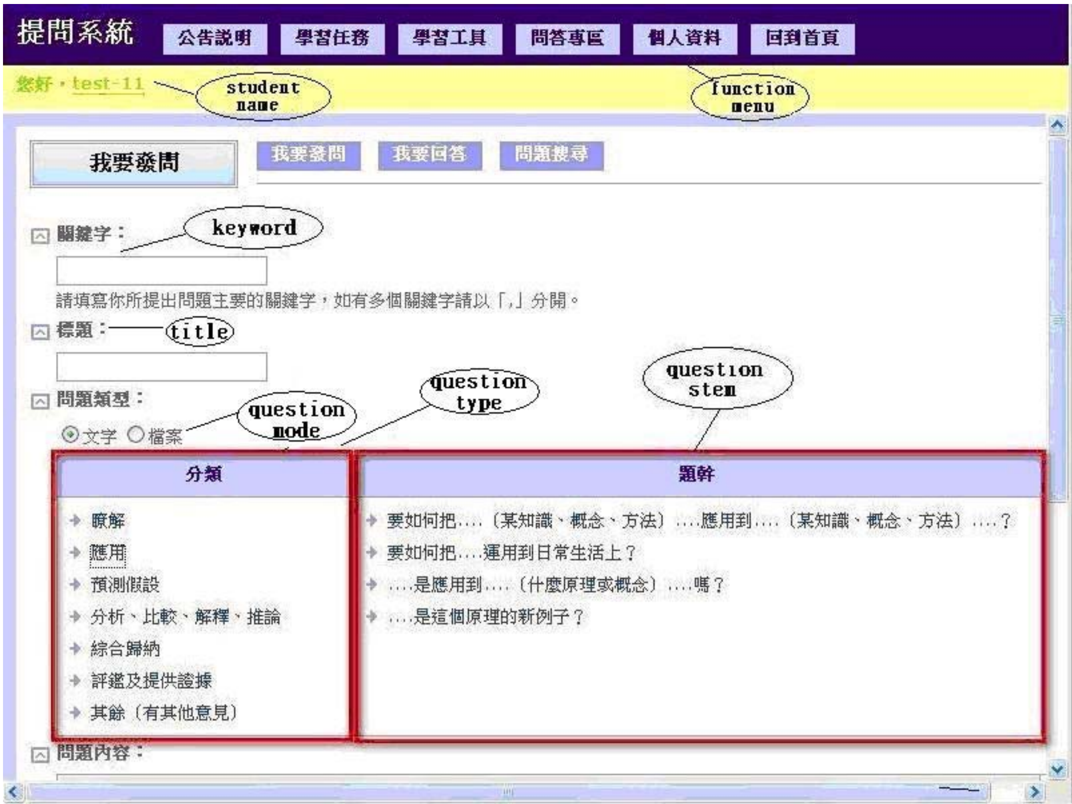

Figure 1 The user interface of QSTLS

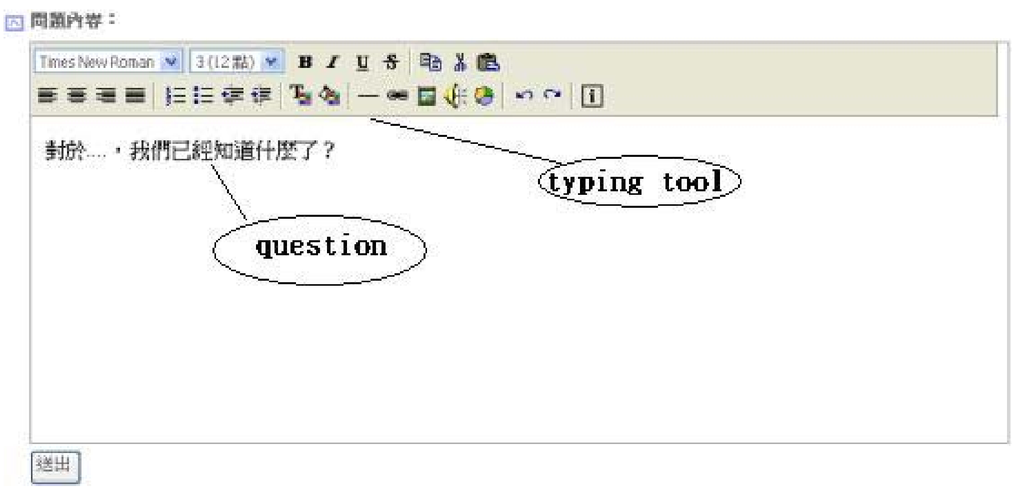

Figure 2 The user interface of typing question

3.3. Procedures, stems and criteria

Three classes were assigned to three question-stem groups. The detailed-stem group was provided with more complete question stems than the other two groups (Table 1). The simple-stem group was only provided with words (Table 1). And the no-stem group didn't have stems.

There are five sessions in the scientific activity and each session is about 2-3 science periods. At the outset, pupils were introduced to the functions of QSTLS, and practiced the operations of the system. There were thirty-four pupils in the detailed-stem group, thirty-three in the simple-stem group, and thirty-three in the no-stem group. During the science learning and questioning activity, each pupil first read an online science text about "weather and rainfall." The science text is an introductory article about the rainfall-factors, including the monsoon, topography, air mass, typhoon, and so on. The pupils read the text and everyone was required to pose at least three questions about the article content. They can carefully think and ask question through the guidance of question stem, and then evaluate posted questions according to five criteria (Table 2). After that, pupils were required to respond to at least three questions and evaluate posted answers according to specified criteria (Table 2).

Table 1 Samples of detailed-stems and simple-stems

Detailed-stems	Simple-stems
What is the example of …? What is the …?	What sample…? What…?
How do you apply … to …? How do you apply…on daily life? What concept (principle) is applied to …	How to apply…?
What would happen if…? How do you solve (handle)…if…? What outcome would happen if…?	If…?
Compare…and …with regard to …How are…and…similar? How are…and…different? Is …(concept) similar to …what we have learned before? What…(concept or principle) is related to what we have learned before?	The relation…? Compare…? …different…? …similar…? …as before…?
Explain why…? Explain how…? Why… is important? Why …is important to…?	Explain…? Why important…?
How does…affect…? What do you think cause …?	How to affect…? What result…?
What are the strengths and weaknesses of…? What are possible solutions for…? Would you draw a conclusion…?	Strengths and weaknesses...? Solution…? Conclusion…?
Which one is the best….and why? Do you agree or disagree with this …and why?	Evaluate...and why…?
For …, what we have known…? What idea do you have…?	What know…? Who know…?

Table 2 Evaluation criteria for questions and answers

Question evaluation criteria	Answer evaluation criteria
● the statement of question is clear. ● the question is important. ● the question is challenging. ● the question is worth answering. ● the question is helpful to my leaning. ● other opinion	● the statement of answer is understandable. ● the answer is correct. ● the answer motivates me to continue the discussion thread . ● the answer is helpful to my learning. ● other opinion.

3.4. Data sources and analysis

All participants were required to ask questions, answer questions, evaluate questions, and evaluate answers. The research data for this study includes pupil-generated questions, pupil-generated answers, and pupils' evaluation of questions and answers. These data were collected in QSTLS. By constantly reviewing and comparing the data, several questioning types emerged. The frequency of each questioning type was calculated and analyzed by Kruskal-Wallis test. The QSTLS was open for pupils during class time and the non-class periods; therefore some of the data collected from the non-class time was also analyzed in order to understand more about pupils' questioning behavior. Besides, when the scientific activity came to the end, the "Critical Thinking Test-Level I "(CTT- I) (Yeh, 2003) was used to measure the critical thinking skill of students. Owing to the data of critical thinking is still under analyzing, therefore, the relation between question-stem and thinking will not be discussed in this paper.

4. FINDINGS

4.1. Types of question

After an analysis of all pupil-generated questions, nine content-focused question-types emerged. Table 3 presents the definitions, examples and "thinking dispositions" of those nine types. Besides, two types of non-content related questioning were also found. They are "Beyond" questions (The content of question exceeds the scope of the designated science text) and "Invalid" questions (title only, question hasn't been completed, question's meaning isn't clear, or it just copies other pupils' question).

Table 3 Definitions, examples and dispositions of content-related question types

Types	Definitions	Examples	Thinking dispositions
What	Asking for the definition or meaning of a science concept or a science term.	What is a wall cloud?	Understanding definition or meaning.
Example	Asking for some instances for some science concepts or phenomena.	Could you give examples of a disaster that will be brought by a stationary front?	Understanding concrete examples.
Why	Seeking a causative reason for a scientific or natural phenomenon.	Why typhoon has the eye?	Exploring cause and reason
How	Seeking a formation process or scientific cause for a natural phenomenon.	How does the typhoon's eye form?	Exploring a formation process
Comparison	Comparing two scientific concepts or scientific phenomena.	Could you tell the difference between a sea breeze and a land breeze?	Analyzing differences
Influence	Affecting what will happen from nature phenomenon	What influence will be brought by an orographic rain?	Understanding effects
Relation	Connecting two scientific concepts	What is the relationship between a fontal surface and a frontal cloud?	Analyzing relatedness
Hypothesis	Mentioning a possible situation that may result in certain events.	If a cold air mass comes to Taiwan, what disasters may be caused?	Assuming and inferring results
Perspective	Asking for an alternative viewpoint on an event, a situation, an idea or a concept.	What are your ideas about a cold air mass?	Evaluating and inducing

4.2. Frequency of question

The total number of questions and the frequency of each type were counted. The results show that the simple-stem group had the largest number of questions (172), and the no-stem group had the smallest number (81). If the number of "Invalid" questions is deducted from the total (172-47=125), the detailed-stem group and the simple-stem group had almost the same number of questions (128 and 125 respectively).

Pupils' questioning can be classified into two categories: content-related and non-content-related. In the content-related category, Table 4 shows that the detailed-stem group has 9 question types during class time, the simple-stem group 7 question types and the no-stem group 5 question types. "Example", "Comparison", "Hypothesis" and "Perspective" types were not found in the no-stem group. The simple-stem group had no "Hypothesis" and "Perspective" types. "What", "Why" and "How" proved to be common questioning types (28.47%, 21.6%, and 8.4% respectively).

Table 4 Numbers and percentages of content-related questioning types in the three groups

types / group	What	Example	Why	How	comparison	influence	relation	Hypothesis	Perspective
	class time / non-class period								
Detailed-stem group	40 (25.6%) 90 (28.5%)	7 (4.5%) 1 (0.3%)	38 (24.4%) 79 (25.0%)	14 (9.0%) 19 (6.0%)	3 (1.9%) 7 (2.2%)	3 (1.9%) 5 (1.6%)	4 (2.6%) 12 (3.8%)	5 (3.2%) 5 (1.6%)	2 (1.3%) 0 (0%)
Simple-stem group	54 (31.4%) 4 (8.3%)	10 (5.8%) 0 (0%)	29 (16.9%) 4 (8.3%)	13 (7.6%) 1 (2.1%)	2 (1.2%) 1 (2.1%)	3 (1.7%) 1 (2.1%)	3 (1.7%) 0 (0%)	0 (0%) 0 (0%)	0 (0%) 0 (0%)
No-stem group	23 (28.4%) 2 (16.7%)	0 (0%) 2 (16.7%)	19 (23.5%) 4 (33.3%)	7 (8.6%) 1 (8.3%)	0 (0%) 0 (0%)	2 (2.5%) 0 (0%)	5 (6.2%) 0 (0%)	0 (0%) 0 (0%)	0 (0%) 0 (0%)

During the non-class time, the total number of questions for the detailed-stem group far exceeded that for the other two groups (316, 48, and 12). The detailed-stem group had 8 types of question and the no-stem group had 4 types. Both "What" and "Why" types had larger percentages in class time than in non-class time, however, these two types reduce substantially in the simple-stem group (31.4% to 8.3% and 16.9% to 8.3%).

In the non-content-related category, Table 5 shows that the no-stem group has the maximum frequency for the "Beyond" type (16.1%) during class time. And the simple-stem group has the maximum frequency for the "Invalid" type (27.3% and 35.4%) during both class and non-class time. The average frequency for the "Beyond" type within the detailed-stem group is lower than that for the simple-stem and no-stem groups (7.05%, 24.05%, and 20.55%).

Table 5 Numbers and percentages of non-content related question types

types / group	Beyond	Invalid
	class time / non-class period	
Detailed-stem group	11 (7.1%) / 22 (7.0%)	29 (18.6%) / 76 (24.1%)
Simple-stem group	11 (6.4%) / 20 (41.7%)	47 (27.3%) / 17 (35.4%)
No-stem group	13 (16.1%) / 3 (25%)	12 (14.8%) / 0 (0%)

As shown in Table 4 and Table 5, the detailed-stem group has the most question types and question frequencies. On the other hand, the no-stem group has the least question types and question frequencies. The ratio of the total numbers of question types and frequencies for the three groups is approximately 4:2:1 (472:220:93). The average question frequency of each pupil is 13.88, 6.67 and 2.82. In the Kruskal-Wallis analysis of question frequency, the result reveals a significant difference:χ^2=14.244, p=.001(Table 6). The post-hoc test indicates that the question frequency for the detailed-stem group and simple-stem are significantly greater than that for the no-stem group (25.86 > 16.97 and 18.17 > 17.10). Moreover, there is no significant difference between the detailed-stem group and the simple-stem group (7.69 < 16.97). "What" and "Why" are the most common question types. Besides, the detailed-stem group has the minimum frequency for the "Beyond" type. Finally, the simple-stem group posted the maximum number of invalid questions.

Table 6 The Kruskal-Wallis test for average question frequency per student

Group	N	Mean Rank	Chi-Square	Post-hoc test
Detailed-stem	34	61.57	14.244**	Detailed-stem > No-stem
Simple-stem	33	53.88		Simple-stem > No-stem
No-stem	33	35.71		
Asymp. Sig=.001 ** P<.01				

4.3. Quality of questioning

In this study, basic-quality questioning is defined as a form of questioning used for recalling factual information or explaining a phenomenon. It includes the types of what, example, why, and how. Advanced-quality questioning is defined as a form of questioning that requires higher-level cognitive skills. It includes the types of comparison, influence, relation, hypothesis, and perspective–taking. Table 7 shows that according to the findings of this study, basic-quality questioning had the highest frequency (89.13%). In comparison, advanced-quality questioning only had a frequency of 10.87%. Although the frequency of basic-quality questioning is almost the same for the three groups (86.2%, 92%, and 89.2% respectively), the detailed-stem group has the lowest frequency (86.2%), and the simple-stem group has the highest frequency (92%). For advanced-quality questioning, the detailed-stem group had the highest frequencies (13.8%) and the simple-stem group the lowest (8%). It therefore seems that the detailed-question stem could help students to develop advanced-quality questioning. If the design of the question-stem involves only one word or a few words (as in simple-stem questions), the questioning quality seems less than for the other question-stems.

Table 7 Frequency of basic and advanced quality in question types

Quality	Basic-quality				Advanced-quality				
type / group	What	Example	Why	How	comparison	influence	relation	Hypothesis	Perspective
Detailed-stem group	38.9%	2.4%	35.0%	9.9%	3.0%	2.4%	4.8%	3.0%	0.6%
	86.2%				**13.8%**				
Simple-stem group	46.4%	8%	26.4%	11.2%	2.4%	3.2%	2.4%	0%	0%
	92%				**8%**				
No-stem group	38.5%	3.1%	35.4%	12.3%	0%	3.1%	7.7%	0%	0%
	89.2%				**10.8%**				
Total	**89.13%**				**10.87%**				

Pupils evaluated questions posted by peers using five criteria (Table 2). The rates of evaluated questions were calculated. 71.2% of all evaluated questions were rated higher than 3 or equal to 3 on a five-point scale. The detailed-stem group had the highest frequency for level-5, level-4 and level-3 questions, as compared with the simple-stem and no-stem groups; the no-stem group had the lowest frequency for level-5, level-4 and level-3 questions, as compared with detailed-stem and simple-stem groups (Table 8). This seems to show, once again, that the questions of the detailed-stem group were of higher "quality."

Table 8 Frequency of question-rating (on a 5-point scale, from 5 to 1)

	5	4	3	Average
Detailed-stem group	50%	57.98%	61.20%	56.39%
Simple-stem group	45.83%	33.61%	26.76%	35.4%
No-stem group	4.17%	8.40%	12.04%	8.20%

In summary, detailed-stem has the effects on numbers of questions, types of question, and quality of questioning.

5. DISCUSSION AND CONCLUSION

This study set out to explore the use of question-stems to support students' online questioning. The hypothesis was that the question-stem provides a questioning structure to help pupils mentally construct a question, and it was found that indeed question-stems can help pupils to ask questions. Moreover, it was found that detailed-stem questions can increase the frequency, type and quality of pupils' questioning during online learning. The most plausible interpretation of this increase in questioning frequency is that, if we look at question-posing *via* the concept of questioning structure, it is obvious that the detailed-stem has a more detailed questioning structure than the simple-stem. Does questioning structure then affect the frequency of posted questions? Our study's finding is "Yes." The no-stem group had the lowest number of questions posed because, it is also concluded, they had no prompts to assist their question-posing. This finding is similar to that of the study of Choi et al. (2005), which found that the scaffolds were useful in increasing the frequency of college student questioning during online discussion.

Our study thus found that the detailed-stem can help pupils create more question types in the process of online learning. A likely reason for this, it is concluded, is that since the question-stem provides a "thinking point" for pupils, the detailed-stem gives them more thinking points to guide their questioning mindset, and therefore helps them to ask more question types. The no-stem group has no prompt to assist pupils' questioning, and pupils in this group therefore asked the smallest number of question types. Furthermore, some question types at a higher thinking level, such as the hypothesis type, perspective type and comparison type, aren't found in the no-stem and simple-stem groups. These findings support the hypothesis that the level of the question-stem can affect pupils' "thinking disposition" and questioning capacity.

Though this study shows that the majority of posted questions (87.98%) in the online environment are of the basic-quality type, detailed stems can apparently reduce the frequency of basic-quality questioning and increase the frequency of advanced-quality questioning. One unexpected phenomenon found by the study was that the simple-stem group had more basic-quality and fewer advanced-quality questions than the no-stem group, even though the no-stem group had no stems as a prompt or clue to ask questions. A possible explanation is that the simple question-stems are not clear enough or are too simple to stimulate pupils to deeply organize their thinking and construct advanced-quality questions. Another plausible interpretation is that the incomplete stem structures might interfere with pupils' cognitive processes and limit their thinking, whereas the no-stem structures, interestingly enough, had less of a negative effect in this regard. This explanation can be partly verified by the finding that the simple-stem group had more 'Invalid' questions than the other two groups.

This study shows that detailed question-stem can moderately push or pull pupils to think and ask more numbers of questions, more types of questions and better quality of questioning in a specific online questioning environment. With the assistance of question-stems, the QSTLS system can provide a student-centred and active learning environment for elementary pupils. The QSTLS can be a helpful information system and resource for elementary pupils in learning science.

The findings have implications for the use of online questioning activities with elementary pupils. There are three points to be emphasized here. First, elementary pupils lack sufficient domain knowledge and questioning skills compared to graduate student, college student or high school student, and therefore an online questioning environment should provide appropriate scaffolds for assisting pupils in their questioning. Secondly, detailed question-stems can help pupils to formulate quality questions, and thus an online questioning environment for elementary pupils should provide detailed-question stems. Simple-question stems are not recommended. And finally, online questioning is a very useful instructional strategy.

This study showed that a stem-supported online questioning systems helpful to elementary pupils, however, because the participants are just fifth graders, and the subject is only on science, the results of this study may not be generalized too far. Further studies may explore the online questioning behavior in different subject areas, and the relationship between advanced online questioning and thinking skills.

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USING BLENDED LEARNING IN DEVELOPING STUDENT TEACHERS TEACHING SKILLS

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ABSTRACT
The research aims to determine the effectiveness of using blended learning Approach in developing student teachers teaching skills, and defining teaching skills that confront students of teachers college at King Saud University need it. The research uses the Quasi- Experimental approach, with four experimental groups (Mathematics (21) – Science (15) – computer (20) – Quran (15)). The research is limited to the students of practical course in the second term of (2010/2011) academic year. Additionally, it investigates teaching skills that are not excelled by student teachers. The research uses observation skill card for teaching skills with pre-post applied, while preparing and implementing a suggested proposal for developing skills of teaching implementation of student teachers, Results of statistical treatment indicated that there were significant differences between means of pre-post treatment in Experimental groups in favor of post treatment. As Students thought, these results indicated that Blended Learning helped them to improve their Teaching skills. More details of the results are discussed in the study.
Keywords: Blended E- Learning, Teaching Skills, Student Teachers, Teacher Preparation.

INTRODUCTION
Skills of teaching implementation are one of the most important skills which should be excelled by the teacher. These skills should be acquired by students in educational colleges before they enter the educational field. Different mentors, who were inspecting student teachers in field education, have noticed that student teachers suffers from a weakness in teaching implementation skills, as well as they need to practice these skills effectively, which is definitely a barrier in front of achieving teaching goals effectively and quickly.

After exploring past literatures in educational studies, it becomes clear that the problem of unskillful student teachers was discussed by many researchers, and they make use of different strategies and entries in order to help student teachers transcend this problem and develop their skills.

Some researchers have achieved success and others have failed in their experiments, and the problem is standing still. There were trials to investigate the efficacy of using blended E- learning model, in order to develop student teachers skills in teaching implementation, because they have studied teaching methods curriculums earlier which pave the way to use E-learning in the reassessment of theoretical part of delivery skills, using normal summer education in training students on skills of teaching implementation. Moreover, they asked students to do home works and assignments that will be delivered electronically across electronic management system.

E-learning is considered as an excellent substitute for delivering educational services for learners everywhere and anywhere, as it does not have the normal obstacles of traditional education inside classrooms and labs, therefore, it complements the existent teaching styles. Also E-learning has specific characteristics: effectiveness, originality, centered around the learner, individual management, usability, direct electronic support, cost efficacy, and provides numerous experiences, electronic evaluation, maintaining curriculum safety, and easy international access. Furthermore; it interacts with different cultures and diminishes racial discrimination. (Khan, B , p.26, 2005). Also 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 , HB, 2011, p 43). Online learning, utilizing Web features, is increasingly important for education (Min jou et al , 2010 , pp 49 - 57).

In general, Computer-Based Training, Web-Based Training, online learning, distance learning, tele tutoring, distributed learning all of that are used as examples of E-Learning which used as a name for all such forms of learning. Now Different researchers have identified E-learning characteristics, Allison Littlejohn and Chris Pegler refers to E-learning merits, and they are: Uses Virtual Learning Environment (VLE) to access Curriculum's educational sources and direct questions inside and outside the university. And You can download your notes during the lecture or use manual electoral instruments to provide instant feedback to the lecturer. Also You can collect and publish electronic achievement record for your work through the curriculum in different educational institutions. The E-learning supports the establishment of a successful and motivating relationship between the student and the teacher through the internet without the need to face to face meeting. (Littlejohn, A and Pegler, C. 2007, p9)

E-learning has become an important element in the universities and the corner stone for further learning, however; it is still challenging for most of the educators in different educational stages because of four basic reasons, and they are:

- Learners' increased expectations of effective implementation of technology, which may terrify learners and staff members from using this technology.
- Teachers should understand how to design a suitable mixture in order to interact through the internet effectively, taking in mind those who have limited time.
- Curriculum should be designed continuously, in order to establish, restore, and save learning materials easily.
- Teachers and staff misunderstanding and doubt about how they could invest their time and effort in an ever changing field.

Despite this outstanding spread in using E-learning and its applications, educational members have many reservations concerning complete dependence on the internet and computers because it has different side effects which affects learners values and desires, as well as they doubt the correctness of the information they receive from internet courses. Accordingly, different studies have supported these fears, which encouraged researchers to try to explore the effect of the complete dependence on computers and the internet by adopting blended E-learning model which employs blended E- Learning with traditional summer classrooms in teaching and learning.

Blended E- learning has been used widely around the world especially in universities, because it depends on blending and complementing learning across the internet through Web Based Learning with Face to face learning and complimentary learning environments. (Yilmaz, M.B & Orhan, F, 2010, p157). Also Blended learning is not just adding materials and educational documents across the internet, but also it should be correlated and keep peace with the characteristics of learners and scholarly subjects. (Reay, 2006, p6). But in order to achieve blended learning successfully, educational multimedia, and students' learning styles should be understood, furthermore; we should know how to use the information, and how they will deal with face to face teaching methods across the internet. (Mortera- Gutierrez, 2006, p313-337). zaytoon (2005) refers to blended learning model as it is a sort of learning and teaching in which E-learning complements traditional learning, because it employs E-learning tools, which includes computers, internet lessons, lectures, and training sessions which take place in real classrooms, such as; computer laboratories, and intelligent classes. In these classes, the teacher meets his students face to face in the same time every time. In this type of learning, the instructor leads the process of teaching and learning, but it does not mean that the instructor is responsible for students learning but it means that he is directing students' learning process, while students learn collaboratively with their peers all the time. Thus, mixed learning is usually, a student centered learning. (Zaytoon, H, 2005, p168-178)

The term ' blended e- learning' means that the opportunities of using e-learning individually in educational situations is much lesser if compared to using it in connection with other means or types in order to produce blended e- learning. Lately, recent social software innovations have changed people's interactions with each other, and provide new opportunities for publishing personal data, and exploring new interesting issues. Moreover, students' expectations have been affected by these changes and accelerated the educational field. E-learning and blended learning have witnessed some changes which affects its future approaches, as it refers to the availability of new authenticity in using new technology in blending current teaching methods. The Blended learning enables to choose between an immense group of substitute resources on your personal computer which are available on international and regional digital stores which are accessed by creating personal accounts in order to provide a kind of personalization on blended learning on the internet. E-learning also, facilitates instructors' supervision which encourages mutual innovation. Additionally, it allows individuals to download educational content on laptops, e-books, and taking notes in the class. You can use text messages to access new innovations, and subscribe in e-games or multimedia and studying real methods of solving problems. (Littlejohn, A and Pegler, c, 2007).

One of the key advantages of blended learning is the flexibility it offers to learners. Particularly with regards to Hamdan Bin Mohammed e-University (HBMeU) model, the implemented blended learning approach addresses the 21st century learners' need for flexibility while minimizing the feeling of isolation experienced by learners' in full distance education. This feature is of high importance and relevance in a region where e-learning is still in its infancy and awareness to its viability and strengths is catching up. (Tamim, R .M. & Parahoo, S . K ,2011)

Blended E- learning gives us the ability to change the time and place of the practice, but it changes the nature of sources and tools which support learning and its means. Blended E-learning adds new dimensions which insure the relation between different places, giving the student the opportunity to learn in the school or the university, at work or at home environments. It provides flexible timetables for the learner and helps the learner keep the balance between his commitments in work and at home. It also, expands multimedia sources which could be used in the learning process. (Littlejohn, A & Pegler, C. 2007). In Addition, Blended E-learning adds new dimensions for the process of learning by Blending between place, time, and multimedia provides new capabilities ranging from different types of activities that could be accomplished by students, and the means that enable the student to cooperate using available e-tools.

Consolidating material and electronic space means that different communities could interact in different ways, which were hard to be imagined in the past, because it provides opportunities for synchronized (in the same time) unsynchronized interactions (in different time). Thus, new learning types and different types of dialogues take place. Besides, informational tools and sources enable students to constitute personal learning sources, in which they blend their innovations with scientific materials which were collected from different libraries around the world. This may arouse different questions about some traditional educational values, such as; who owns or controls knowledge? Because the modern learning activities challenge the customary means of learning and formulates new roles and literatures for teaching and learning process, moreover, it enables the learner to take control of the learning process instead of the instructor.

Despite of the flexibility of e-learning and blended learning, still there are various obstacles, they are:

- Defining the motivating power of change and making use of it.
- The necessity of finding continuous methods for learning because of the high cost of the educational process despite of its availability.
- Complex methods of the new teaching methods which affects the efforts being exerted on preparing for blended e- learning.
- The new interactive means and the free exchange of information need a strong concern about ethical issues.

All these issues have different effects on the users of this educational institution, because the principles of senior management and policy makers should provide new opportunities and logical justifications which support their adoption of blended e-learning, furthermore; the managers of e-learning should think of the needed levels of promotion and its economical effects. Sustenance team should provide advices for staff and students in universities, colleges, work environments or the individuals working in these fields. Staff members should think of new contexts for learning beside the other factors which affect blending and the interaction of all these elements. Everybody should take care of the ethical side of the new forms of interaction and the freedom of information exchange. (Littlejohn, A and Pegler, C. 2002). Therefore, different researchers have dealt with the efficacy of using blended e-learning in various researches such as; (Yilmaz, M.B and Orhan, 2010), (Siew-Eng,I et al. 2010), (Korkmaz,o and Karakus, u. 2009), (Hyde, R. and Jefferies, A. 2010), (Collopy, R. & Arnold, J. 2009); which assures the efficacy of blended e-learning in developing students' positive response toward curriculums as it contributes in developing students' thinking methods. also (Korkmaz,o & Karakus, u. 2009) suppose the blended learning model contributes more to student critical thinking dispositions and levels, particularly at the sub-dimensions of open-mindedness and truth seeking (Korkmaz,o and Karakus, u. 2009, p 59).

THE STUDY

The aim of the research is to shed light on students weakness in the skills of teaching implementation in field education period in teachers college at King Saud University, referring to student teachers' complain of the difficulty of dealing with various behaviors inside the classroom. It, also, considers staff supervisors notes on students teachers and their weak skills in teaching implementation because they need to develop their skills, which encourages the researchers to use Blended Learning to develop teaching implementation skills of student teachers. Furthermore, students have studied teaching methods in the last term, which enables them to use e-learning in representing information and the theoretical part of performance skills. Moreover, they could use the normal classrooms in training students on skills of teaching implementation, and they could ask students to prepare assignments to be delivered electronically across the system of e-learning management. Thus, consolidating between different learning environments could achieve the main goal of blended learning besides suggesting a solution for the problem of the research. also The research tries to answer the following questions: What is the effect of using blended e-learning in developing teaching skills for student teachers? Which has sub ***questions:***

1- What are the necessary teaching skills which should be taught to student teachers in Teachers college at King Saud University?
2- What are the main difficulties which confront students of field education in Teachers college in King Saud University?
3- What is the effect of using Blended Learning in developing teaching skills for student teachers?

The research use the Quasi- Experimental approach into one group; the sample was divided to four experimental groups (Mathematics (21) – Science (15) – computer (20) – Quran (15)). And The research limits to Students of field education in the teachers college at King Saud University, in the second term of the academic year (2010/2011) G 1432/1431 HJ, and It deals with teaching Skills which not excelled by student teachers in domains (The planning skills, learning strategies and classroom management skills , and evaluation skills.

In this research, the experimental groups use the blended E- learning in Field Education course, which employs E-learning tools (includes computers, internet lessons, lectures, and training sessions which take place in computer laboratory and intelligent class). The Learning management system of King Saud University (Blackboard) was used in E-learning classes. And we meet the students face to face in the same time every weak along the study period.

FINDINGS

To answer the first question "What are the most necessary teaching skills which should be taught to student teachers in Teachers college at King Saud University?" the researchers use an open questioner to introduced this question to sample consists of (100) faculty members, teachers, supervisors, and stallholders. We take the skills which ranked more than (90%) of the sample. They decided the most necessary teaching skills are:

1. The planning skills
2. learning strategies and classroom management skills
3. knowledge of subject matter skills
4. evaluation skills

To answer the second question "What are the main difficulties which confront students of field education in Teachers college in King Saud University?" the researchers use an open questioner to introduced this question to (20) faculty members in Teachers college home supervise the student teachers in schools during the period of practical study. We take the difficulties which ranked more than (85 %) of the sample. They decided the main difficulties in teaching skills are:

1. The planning skills
    - ❖ determining the educational needs of the student
    - ❖ planning for greater targets not for detailed information
    - ❖ designing suitable educational activities
2. learning strategies and classroom management skills
    - ❖ utilizing educational strategies that meet student needs
    - ❖ facilitating effective learning experience
    - ❖ involving students in problem-solving, critical thinking and creativity

- ❖ providing a climate that promotes justice
- ❖ effective utilization of motivation methods
- ❖ Effective time management and limiting time wasted. (time on task)

3. knowledge of subject matter skills
   - ❖ Fully understanding the basis and nature of the subject.
   - ❖ Having comprehensive knowledge of research methods.
   - ❖ Being able to integrate his subject with other subjects.
   - ❖ Ability to produce knowledge.
4. evaluation skills
   - ❖ Self-evaluation.
   - ❖ Student evaluation.
   - ❖ Feedback.

To answer the third question "What is the effect of using Blended Learning in developing teaching skills for student teachers?" the researchers made the treatment of statistical analysis by T-test (**Paired Samples Test**), between the post and pre applied of Teaching skills scale card (TSSC) by observed the students teachers in classrooms, he differences between domains as revealed in table (1)

Table (1) the differences between domains

Domain	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Domain 1 planning	1.39112	.28509	.03383	41.116	70	.000
Domain 2 learning Strategies and classrooms management	1.46932	.29073	.03450	42.585	70	.000
Domain 3 Evaluation	1.60463	.35874	.04257	37.690	70	.000

The result in table (1) shows that there is a significant deference between the pretest and posttest in favor of the posttest, this finding indicates that the blended learning model contributes to developing the teaching skills especially over the four domains.

In Details, to check the development in teaching skills over Standards, table (2) shows the differences between standards over domains:

Table (1) The differences between standards over domains

Domain	Standards	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Domain 1 planning	determining the students educational needs	1.37089	.48403	.05744	23.865	70	.000
	planning for greater targets not for detailed information	1.49765	.61689	.07321	20.457	70	.000
	Designing suitable educational activities	1.34155	.50751	.06023	22.273	70	.000
Domain 2 learning Strategies and classrooms management	utilizing educational strategies that meet student needs	1.54930	.67504	.08011	19.339	70	.000
	facilitating effective learning experience	1.40141	.54360	.06451	21.723	70	.000
	involving students in problem-solving, critical thinking and creativity	1.38028	.45813	.05437	25.387	70	.000
	providing a climate that promotes justice	1.48944	.55330	.06566	22.683	70	.000
	effective utilization of motivation methods	1.52113	.62165	.07378	20.618	70	.000
	Effective time management and limiting time wasted. (time on task)	1.52113	.46288	.05493	27.690	70	.000
Domain 3 Evaluation	self-evaluation	1.51761	.51465	.06108	24.847	70	.000
	student evaluation	1.60161	.51729	.06139	26.089	70	.000

Domain	Standards	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
	feedback	1.72770	.65782	.07807	22.130	70	.000

The result in table (2) assess the result in table (1), its shows that there is a significant deference between the pretest and posttest in favor of the posttest, also this finding indicates that the blended learning model contributes to developing the teaching skills in standards over domain.

Generally, the Results of statistical treatment indicated that there were significant differences between means of pre-post treatment in Experimental group in favor of posttest. As Students thought, these results indicated that Blended E- Learning helped them to improve their Teaching skills.

CONCLUSION AND DISCUSSIONS:

This finding is compatible with the literature In: a study investigated the experiences of pre-service English teachers in blended learning environment (BLE) in respect to their learning approaches. Yilmaz and Orhan (2010) revealed that pre-service English Language teachers were in general highly satisfied with the blended learning environment (BLE). In addition, it stated that the courses that designed for the blended learning environment (BLE) contribute to the achievement of the students with surface learning approach. Based on these conclusions, BLE advised for training of pre-service English Language teachers with different learning approaches.

Yaman & Ggraf (2010) study Evaluated an international Blended learning cooperation project in biology teacher education, the result showed that: In-class sessions, individual learning, exercises and application ranked higher than online phases, group work, discussions and information exchange. Items evaluating the overall concept received relatively high ratings. Despite the cautious ratings some items received, the positive overall results support efforts to further develop such international teaching concepts.

Korkmaz. Özgen & karakuş. Ufuk (2009) examined the impact of blended learning model on student attitudes towards geography course and their critical thinking dispositions and levels, the study aims to determine the impact of blended learning model on student attitudes towards Geography course and their critical thinking dispositions and skills. They used the experimental pattern with pretest-posttest control group. The participants of the study consisted of (57) High School students (28 in the experiment group and 29 in the control group). The experiment group was subject to hybrid learning through the Geography web page, while the traditional learning model used for the control group. The study demonstrated that Blended learning model contributed more to student attitudes toward geography course and blended learning model contributed more to student critical dispositions and levels when both of them were compared to the traditional learning model; and there was a positive correlation between student attitudes toward geography course and their critical thinking dispositions and levels.

Brooks, Lori. (2008) analysis the factors that affect faculty attitudes toward a blended learning environment, he examined faculty attitudes toward a blended learning environment which includes traditional face-to-face interaction as well as an Internet component. 107 university faculty members in various degree programs completed the Faculty Attitudes Towards Technology-based Distance Education survey on blended learning. Of these, 57 (53.3%) were female while 50 (46.7%) were male. The most common age group was 31 to 40 years old. The qualitative results confirmed the quantitative results in that faculty with more positive attitudes toward a blended learning environment also tended to have a positive perception of educational technology, and pay/monetary rewards and work recognition were important incentives while time requirement was an obstacle.

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Appendix (1)
Teaching Skills Scale card
(TSSC)

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2011

Teaching Skills Scale card
(Isman, A et al , 2011)

Domain	**Standards**	**Indicators**	**score**
planning	determining the educational needs of the student	The teacher designs activities to explore the students' need and talents.	
		Uses different methods to determine the students' level of understanding.	
		Encourages students to reflect about their life and personal experience.	
		Uses dialogue as a means of knowing the needs and experience of students.	
		Involves students in setting targets for the educational plan and its components.	
		Determines the stages of lesson planning according to student needs and implements them during the time available.	
	planning for greater targets not for detailed information	teacher makes an integrated and comprehensive study of his subject to set his plan.	
		Adds to his plan motivating activities to encourage research.	
		Sets educational objectives to develop critical thinking and methods of problem solving.	
	Designing suitable educational activities	Teacher designs activities that increase effective learning time.	
		Designs educational units and lessons in the light of long-term objectives.	
		Plans lessons on the bases of his knowledge of the subject and the students.	
		Designs educational activities that allow the use of diverse strategies such as peer and cooperative education.	
		Total Domain score (13)	
		Ratio	
learning strategies and classroom management	utilizing educational strategies that meet student needs	Teacher involves all students in diverse educational experiences suitable to their skills and talents.	
		Uses different strategies to present concepts, introduce skills and explain the subject.	
		Gives students open-ended questioned and facilitates discussion to clarify and motivate the student's thinking.	
		Diversifies educational strategies to promote active student participation.	
		Utilizes technology to improve student learning.	
	facilitating effective learning experience	Teacher provides independent and cooperative learning opportunities.	
		Divides students into groups to promote interaction and learning.	
		Encourages positive interaction and cooperation among students.	
		Assists students in decision-making, time management and the sound	

Domain	Standards	Indicators	score
		utilization of subjects through learning activities.	
	involving students in problem-solving, critical thinking and creativity	Encourages students to apply what they have learnt in educational and life situations.	
		Encourages students to be inquisitive, have initiative and show creativity.	
		Assists students to make a thorough and critical study of the subject and its questions.	
		Involves students in problem-solving activities and encourages various ways to reach solutions.	
		Encourages students to put forth critical questions.	
		Helps students to analyze content and reach correct inferences.	
		Helps students to reflect on how they are being taught.	
	providing a climate that promotes justice	Helps students to respect each other regardless of their differences.	
		Assures equality and respect in the classroom.	
		Encourages students' achievements and participation without discrimination.	
		Handles inappropriate behavioral patterns in a fair way.	
	effective utilization of motivation methods	Creates a favorable educational and learning climate to encourage classroom interaction.	
		Utilizes effectively tools and equipment available in the classroom.	
		Designs audio-visual aids suitable to the environment, lesson and learners.	
	effective time management and limiting time wasted. (time on task)	Teacher achieves lesson objectives during the time limit of the lesson by using time effectively.	
		Utilizes verbal and non-verbal means to attract and maintain attention.	
		Adopts flexibility in teaching the lesson within the time scheduled for it.	
		Utilizes time in a manner that would ensure smooth transfer and progress from one stage to another.	
		Regulates classroom behavior.	
Total Domain score (28)			
Ratio			
knowledge of subject matter	fully understanding the basis and nature of the subject.	uses his subject in educational activities.	
		Analyses the subject and defines its main elements.	
		Utilizes the correct terminology.	
		Clarifies the main concepts of the subject.	
		Utilizes diverse strategies to explain the concepts and the skills in a simplified manner.	
	having comprehensive knowledge of research methods	Follows up the latest development in his subject.	
		Utilizes learning sources and the various technological methods to obtain information and knowledge and encourages students to use them.	
		Utilizes systematic observation in understanding the aspects related to the educational situation and the surrounding environment.	
		Guides students to solve problems in a scientific manner.	
		Puts forth key questions related to a particular phenomenon.	
	being able to integrate his subject with other subjects.	Relates between the concepts of his subject and those of other subjects.	
		Clarifies the relationship between the context of his subject and that of other subjects.	
		Utilizes the fundamental concepts of his subject to resolve problems related to other subjects.	
	ability to produce knowledge	Classifies data and information into harmonious groups and trains students to do the same.	
		Analyzes available information and trains students to do the same.	
		Combines between unrelated parts and makes them meaningful.	
		Deduces new knowledge from available information.	
		Thinks in a flexible way and accepts new things.	
		Encourages student to criticize what is customary and not give in to	

Domain	Standards	Indicators	score
		tradition.	
		Helps students to discover contradictions.	
		Total Domain score (20)	
		Ratio	
evaluation	self-evaluation	Studies and reflects about the results of his action and decisions concerning students and colleagues.	
		Uses different tools and methods to evaluate his performance.	
		Encourages students to evaluate themselves and each other.	
		Designs tools for self-evaluation with the help of students and colleagues.	
	student evaluation	designs new and creative tools for evaluation	
		Utilizes authentic evaluation methods such as student portfolios to know the student's level.	
		Determines the weaknesses and strengths in students.	
		Designs preventive as well as curative activities to overcome the student's weak points.	
		Designs rich activities to reinforce the strengths and speed up the educational process.	
		Involving students with special needs as well as the gifted in classroom activities.	
		Involves the family in evaluating the student with the aim to promote learning and performance.	
	feedback	Utilizes evaluation results to promote his performance.	
		Utilizes the opinion and evaluation of students to improve his performance.	
		Encourages students to express their views and feelings towards certain situations and educational activities.	
		Total Domain score (14)	
		Ratio	
		Total score (75)	
		Ratio	

VIDEOS AND ANIMATIONS FOR VOCABULARY LEARNING: A STUDY ON DIFFICULT WORDS

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ABSTRACT
Studies on using still images and dynamic videos in multimedia annotations produced inconclusive results. A further examination, however, showed that the principle of using videos to explain complex concepts was not observed in the previous studies. This study was intended to investigate whether videos, compared with pictures, better assist English learners to learn difficult words. It adopted a three-group immediate posttest and delayed posttest quasi-experimental design. Ten target words were selected and embedded in a reading text, each of which was annotated by three annotation types: text-only, text and picture, and text and video. Three intact classes, a total of 88 students, were recruited in a junior high school in northern Taiwan, each of which was randomly assigned to one of the three groups. All participants took the pretest two weeks before the experiment, the immediate posttest after reading the text, and the delayed posttest two weeks after the experiment. The result revealed significant differences between the three groups, in which the video group outperformed the other two groups. Pedagogical implications and suggestions for future research are also given.
Keywords: multimedia annotations, videos, vocabulary learning

1. INTRODUCTION

Annotations, as an instructional design to facilitate reading comprehension, have been employed in multimedia learning for more than a decade. Since their pioneer studies in 1996, Chun and Plass have successfully brought attention to investigate how multimedia annotations could assist language learners in acquiring unknown vocabulary words. A major concern of studies on multimedia annotations was the competitions among media, including texts, pictures, videos and audios, for vocabulary learning. That is, how each annotation type, for example, textual definitions, pictures, animations, films and sound clips, or how combinations of the aforementioned annotation types, could help language learners learn unknown vocabulary words. The combination of textual definitions and pictures has thus far been believed to be more effective for vocabulary learning than single annotations as textual definitions or pictures; it is also more effective than combinations of textual definitions and other types of media (Shahrokni, 2009; Yeh & Wang, 2003; Yoshii, 2006; Yoshii & Flaitz, 2002). One of the inconclusive results is the comparisons between results of textual definitions and still images and those of textual definitions and dynamic videos (Akbulut, 2007; Al-Seghayer, 2001; Chun & Plass, 1996a, 1996b). The reason making animations and films inferior to pictures, based on a further examination done in this study, is that the concepts conveyed by the target words in the previous comparative studies may not have needed such dynamic videos as animations and films. Simple pictures together with textual definitions could have served the purpose of defining the target words. Thus, the purpose of this study is to investigate whether or not dynamic videos, such as animations and films, assist language learners in their learning vocabulary words that entail video presentations, in particular, those that convey meanings difficult for learners to comprehend. The sole research question of the study is: Is there any difference among effectiveness of Taiwanese high school students viewing pictures and animations/films on learning difficult English words?

2. LITERATURE REVIEW

2.1 Vocabulary learning and annotations

Annotations embedded in or appended to reading texts were considered beneficial for reading comprehension and vocabulary acquisition. Marginal annotations using short definitions served as bridges connecting learners' previous knowledge to new information; during their processing of texts, annotated vocabulary words were learned and acquired. Advantages of using annotations in reading tasks were that annotations attracted learners' attention to reading and learning; their proximity to the reading texts provided minimal interruption of reading flow; their appearances also avoided wrong guessing or improper inferences; and, most importantly, annotations made it easier for learners to comprehend difficult texts, which eventually made them more independent and autonomous learners. (Nation, 2001). Researchers of annotations focused their efforts on three major areas, and they were marginal text annotations, multiple-choice text annotations and annotations in target languages, to which we now turn.

Marginal text annotations were the focus of study when annotations started to play a role in foreign language classrooms in 1980s. Text annotations appended to reading texts were implemented for such affective reasons as drawing attention, lowering anxiety, promoting motivation, and securing understanding (Davis, 1989; Johnson, 1982). Later, their effectiveness became a research interest in reading comprehension (Jacobs, 1994), in incidental vocabulary acquisition (Hulstijn, Hollander, & Greidanus, 1996) and in both reading comprehension and vocabulary learning (Jacobs, Dufon & Hong, 1994). It is generally agreed that annotations help enhance learners' later performance on reading comprehension and vocabulary learning.

Multiple-choice text annotations, as opposed to single text annotations, referred to learners' choosing a proper definition for an unknown word from a given list of options. It is argued that the invitation to choosing the correct definition from a list induces deep processing of the target vocabulary words, which further helps learners retain the target vocabulary words (Hulstijn, 1992; Nagata, 1999; Rott, 2005; Watanabe, 1997). However, wrong choices or improper inferences from a given list of annotations debilitated vocabulary learning (Hulstijn, 1992; Watanabe, 1997). Immediate feedback after learners' making choices rendered multiple-choice annotations effective (Nagata, 1999).

Annotations in target languages instead of in learners' mother tongue were also believed to enhance vocabulary acquisition (Jacobs, Dufon & Hong, 1994; Miyasako, 2002; Myong, 2005). While annotations in learners' mother tongue provided direct access in their lexicon, those in target languages required learners to make sense of texts by forming meanings of target vocabulary words. This instructional design for vocabulary learning and reading comprehension was either competitive to their counterparts in learners' mother tongue (Jacobs, Dufon & Hong, 1994; Miyasako, 2002) or superior (Myong, 2005).

Based on the previous findings, this study concerns the use of marginal single text annotations in learners' native language for the following reasons. Supported by the noticing hypothesis (Schmidt, 1990), the bold-faced design, with its highlighting effect, was employed to attract learners' attention while reading. Accurate meanings were provided to avoid wrong guessing. And, because of our participants' proficiency level, their native language was chosen.

2.2 Multimedia annotations for vocabulary learning

The learning theory that studies on multimedia-enhanced vocabulary learning are based upon is a generative theory of multimedia learning, whose major concern is learners' cognitive load during learning (Mayer, 2005; Plass & Jones, 2005). The theory first categorizes all input information into two types, verbal and non-verbal; then, it maintains that new information prompt our brain to perceive, comprehend, subsume, and merge it into old, existing system. When the content of learning is well controlled (intrinsic cognitive load) and the presentation is properly designed (extraneous cognitive load), effective learning is likely to take place (germane cognitive load). Ineffective learning occurs usually when the presentation of the learning content is carelessly designed, which causes learners' attention to split (Sweller, 2005). Take multimedia annotations for example. Learning vocabulary words from textual definitions alone creates insufficient links for retrieval of meanings whereas learning vocabulary words with textual definitions and some visual aids constructs stronger meaning representations for future retrieval. Proponents of multimedia-based vocabulary learning, taking advantages of this instructional principle, concentrate their efforts on providing most helpful non-verbal aids so as to enhance vocabulary learning and retention. With the innovative elements multimedia offers, the process of language learning can be more entertaining and supportive by activating students' visual and auditory senses (Kayaoglu, Akbas & Ozturk, 2011) and enhance learners' autonomy and motivation by providing them with a greater variety of effective learning strategies (Kilickaya & Karjka, 2010).

Although texts, pictures, animations, films and sounds could all be candidates for multimedia annotations, practitioners and researchers used pictures most frequently as the non-verbal aid for vocabulary learning. Starting from Kost, Foss, and Lenzini (1999), pictures were used together with textual definitions in studies on annotations and found effective. They were later implemented on computers (Yoshii & Flaitz, 2002) and on the Internet (Shahrokni, 2009) for reconfirmation of their superiority. In many following studies, pictures were regarded as a reference so that other factors were investigated, such as languages of definitions (Yoshii, 2006), learners' age (Acha, 2009), parts of speech (Shahrokni, 2009), and principles of vocabulary learning (Yanguas, 2009). The implementations of pictorial annotations were supported by their efficiency in vocabulary learning, more efficient than other non-verbal media as videos (Chun & Plass, 1996a, 1996b) and audios (Yeh & Wang, 2003). From the past 15 years of research on multimedia annotations, language learners seemed to have a preference for textual definitions accompanied by pictorial annotations when asked to comprehend reading texts with unknown vocabulary words.

Textual definitions along with pictorial annotations may have better learning results than other kinds. However, the results of learning vocabulary words with textual definitions and pictures and those of learning vocabulary words with textual definitions and animations or films have not yet reached a consensus. In Chun and Plass' studies (1996a, 1996b), college learners of German favored learning vocabulary words with pictorial annotations, whereas English learners in Al-Seghayer's study (2001) preferred learning vocabulary with video clips. Others (Akbulut, 2007) found the two modalities equal. A further examination of the word list given in the video related studies, Chun and Plass' being the only one, found that a crucial feature of using animations, films, or video clips is not observed, that is, its capacity of simplifying complex concepts as defined in Weiss, Knoelton & Morrison (2002).

In their studies (1996a, 1996b), Chun and Plass investigated whether multimedia annotations facilitated reading comprehension and vocabulary learning. They selected 36 target words and evenly divided them into each of the three annotation types, that is, text only, text and picture, and text and video. Their German learners were asked to read a reading text in which the target words were embedded. The results showed that text and picture were more effective than text only and text and video in vocabulary learning. The English equivalents of the target words annotated by video were: to sit up, shaking of one's head, sign language, to stretch, lighter, white caps, helicopter, mouths, irritated, sad, missed, hostile. And, those annotated by picture were: to explode, to doze, to thaw, to threaten, catch, schools of fish, cutter, fisherman's cap, poor, measurable, anxious, pensive. According to the video principle, the necessity for video presentations for the video list is not clear. In other words, the concepts conveyed by the target words were familiar to their college participants. The ease with the concepts conveyed by the target words may have rendered dynamic visual aids distracting, which in turn made the learning results of video presentations inferior to those of pictures. This paper argued that dynamic visual aids as opposed to static ones are considered facilitative when used to explain difficult words to learners. Difficult words in this study are defined as those that may cause problems for learners to learn because of their unfamiliar spellings and/or concepts.

3. METHODS

The study recruited 88 seventh graders from three intact classes in a junior high school in northern Taiwan. They were beginners of English when the study took place; and they had four hours of English classes per week and each class lasted for 50 minutes. All participants had never had experiences learning vocabulary with multimedia annotations online.

The reading text, 417 words (See Appendix A), was first adapted from several passages on world festivals by the English teacher of the three classes and later revised by an experienced English teacher and writer. The Flesch Reading Ease of the text was 71.1 and its Flesch-Kincaid Grade Level was 6.0, both showing that the readability level of the text was moderate and equal to a reading text for 6^{th} graders. Ten nouns in the text were selected and they were: boa, bazaar, derby, falconry, gasp, jester, raffle, revelry, ringtoss, and smoothie. The nouns were deemed to be challenging because their forms were unfamiliar or their meanings conveyed ideas difficult to comprehend to our young learners of English. None of the ten target nouns was included in the basic vocabulary for a junior high graduate in Taiwan; thus, they were all beyond the level of the participants.

The digital version of the reading text was duplicated onto a Moodle site. When reading the text, participants could click on the words that were highlighted. After the target words were clicked on, its annotation appeared in the display area on the right-hand side of the screen. The text group read Chinese definitions only, the picture group had Chinese definitions and pictures, and the video group had Chinese definitions and animations or films. The snapshot of target word derby prepared for the picture group is shown in Figure 1.

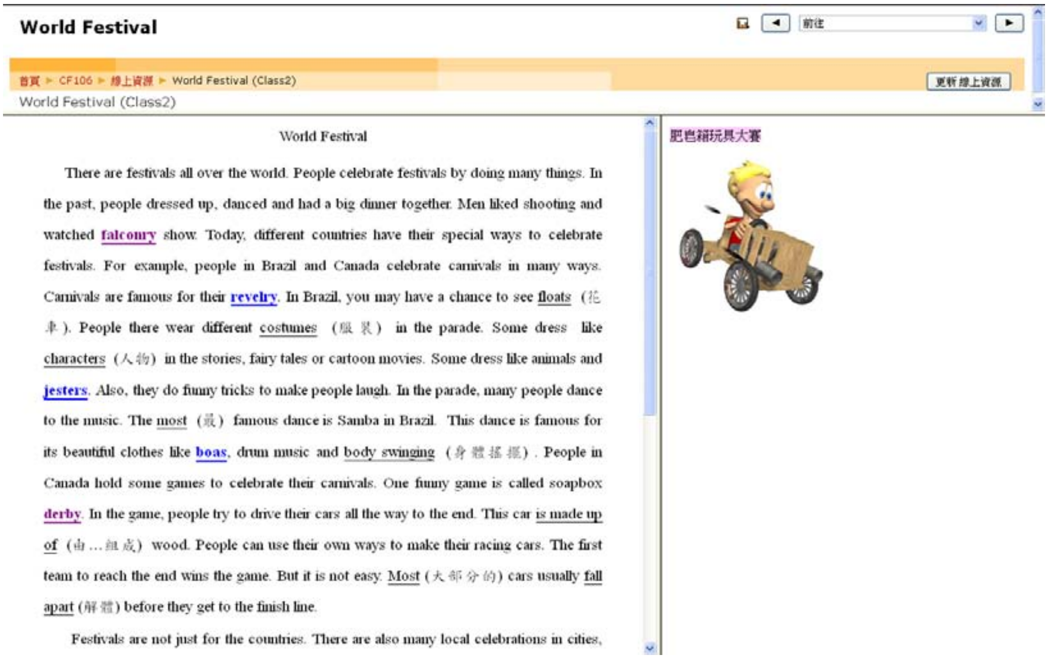

Figure 1. Screen design of the reading text and multimedia annotations

The study had two instruments, a pretest and a posttest, to collect data. The pretest administered two weeks before the treatment consisted of 10 target nouns and 10 distracters, in which the participants were asked to write down the Chinese meanings of the English words. For those that they didn't know, they could put down a check under the "I don't know" column. The posttest consisted of 10 questions of production and 10 questions of recognition (See Appendix B). Participants needed to write down the English words according to the Chinese meanings in the production test and to choose the correct Chinese meaning of the English word from three alternatives in the recognition questions. A question weighed a point, and 20 was the maximum and 0 the minimum in the posttest. The posttest was given to the participants twice, one immediately after they finished reading the passage and the other two weeks after the treatment.

The scores of the pretest were analyzed by one-way ANOVA to inform whether or not the three groups had an equal start and whether or not the participants had previous encounters of the target nouns. A three-way mixed ANOVA, three types of annotations (text, text and picture, and text and video), two times of measurement (immediate and delayed posttests), and two types of tests (production and recognition tests), with times of measurement and types of tests as the repeated measures, were used to analyze the scores of the two posttests.

4. RESULTS AND DISCUSSIONS

The results of the one-way ANOVA of the pretest showed no significant differences ($F(2,85) = 0.084$, *n.s.*), suggesting an equivalence among the three annotation groups. Their mean scores, 0.20 for the text group, 0.19 for the picture group, and 0.26 for the video group, showed that they hardly knew the target words before the treatment.

In both posttests, the video group scored the highest among the three annotation groups. Across the groups, the participants scored higher in the recognition tests than in the production tests; also, they performed better in the immediate posttest than in the delayed posttest. The descriptive statistics of the two posttests in general and of the production and recognition tests in particular are shown in Table 1.

Table 1. Descriptive Statistics of the Two Posttests

Groups	N	Immediate Posttest M (SD)	Production M (SD)	Recognition M (SD)	Delayed Posttest M (SD)	Production M (SD)	Recognition M (SD)
Text	30	11.03 (3.634)	2.13 (2.193)	8.90 (2.023)	10.90 (3.407)	2.10 (2.339)	8.80 (1.627)

Picture	27	11.19 (3.981)	2.37 (3.027)	8.81 (1.520)	10.33 (4.252)	1.96 (2.624)	8.37 (2.372)
Video	31	13.35 (3.527)	3.65 (3.241)	9.71 (0.739)	12.71 (3.368)	2.94 (3.065)	9.77 (0.956)
Total	88	11.90 (3.821)	2.74 (2.903)	9.16 (1.553)	11.36 (3.773)	2.35 (2.704)	9.01 (1.797)

A three-way repeated measures ANOVA was conducted to examine whether the vocabulary learning varied by group (of annotation), time (of measurement), and type (of test). The results of which are shown in Table 2.

Table 2. Repeated Measures ANOVA Summary for Group, Time, and Type

Source	SS	df	MS	F
Between-subjects effects				
Group	94.628	2	47.314	3.824*
Error	1051.620	85	12.372	
Within-subjects effects				
Time	6.475	1	6.475	5.192*
Time × Group	1.982	2	0.991	0.795
Error	105.993	85	1.247	
Type	3747.366	1	3747.366	628.386*
Type × Group	1.715	2	0.857	0.144
Error	506.896	85	5.963	
Time × Type	1.095	1	1.095	0.995
Time × Type × Group	3.435	2	1.717	1.560
Error	93.562	85	1.101	

The three-way ANOVA revealed no significant interaction effect, including time-by-group interaction effect ($F(2,85) = 1.247$, *n.s.*), time-by-type interaction effect ($F(2,85) = 0.857$, *n.s.*), and the interaction effect among all three factors ($F(2,85) = 1.717$, *n.s.*); however, the main effect of each of the three factors was found significant. The analyses revealed significant differences among the annotation groups ($F(2,85) = 3.824$, $p < .05$), between immediate and delayed posttests ($F(1,85) = 5.192$, $p < .05$), and between production and recognition tests ($F(1,85) = 628.386$, $p < .05$). Of the differences among the three different types of annotation, post hoc comparisons showed that the video group (M = 13.032) significantly outperformed the text group (M = 10.967) and the picture group (M = 10.759). Concerning the significant differences between the two posttests, marginal means showed higher scores of the immediate posttest (M = 11.858) than those of the delayed posttest (M = 11.314), suggesting a memory loss of the target words over two weeks of time. Finally, in terms of the significant differences between the two types of tests, marginal means showed that the scores of the recognition tests (M = 9.062) are higher than those of the production ones (M= 2.065), indicating that for our participants, recognizing target words was an easier task than producing them.

The differences between the two posttests and those between the two test types are expected. The significant memory loss of target words in the delayed posttest is considered normal and in agreement with previous studies. After a span of two weeks the teenagers in the study demonstrated a degree of forgetting the difficult words that they had learned. One point that deserves attention among the three groups, though, is the forgetting rate, the differences between the two posttests over the immediate posttest. The one-way ANOVA revealed no significant differences among the three annotation groups ($F(2,85) = 1.437$, n.s.) with the text group showed the lowest forgetting rate (M = 0.01, SD = 0.246) followed by the video group (M = 0.03, SD = 0.198) and by the picture group (M = 0.08, SD = 0.246). This phenomenon shown in the text group concurred with the average belief of learning vocabulary words with textual definitions: once a word is learned by textual definition, it is part of the lexicon. The effectiveness of learning difficult words with textual definitions alone requires further investigation. Similarly, the drastic differences found between the performances in recognition tests and those in production tests are common, too. The word-supply tests present more problems to our teenagers than the multiple-choice tests which correct answers can be found among other two alternatives. The appearances of possible correct answers helped our adolescents retrieve the meanings of the target words. All tests, including immediate and delayed posttests and recognition and production tests, showed a decrease in scores except for the recognition test of the video group in their delayed posttest. Although the increase from 9.71 in the immediate posttest to 9.77 in the delayed posttest was found, it was not statistically significant. An explanation was wild guessing encouraged by the multiple-choice test type in the recognition test.

Correct responses of each target words in the production and recognition tests of the two posttests were tabulated in Table 3. From the frequency counts and percentage of correct responses in the table, it showed that the shortest noun boa was the easiest to learn of all.

Table 3. Frequency Counts and Percentage of Correct Responses of Target Words

Words	IMp	%	IMr	%	IM	%	DEp	%	DEr	%	DE	%	Both	%
boa	59	67.05	85	96.59	144	81.82	65	73.86	84	95.45	149	84.66	293	83.24
bazaar	14	15.91	79	89.77	93	52.84	14	15.91	76	86.36	90	51.14	183	51.99
derby	18	20.45	77	87.50	95	53.98	10	11.36	83	94.32	93	52.84	188	53.41
falconry	18	20.45	79	89.77	97	55.11	14	15.91	83	94.32	97	55.11	194	55.11
gasp	35	39.77	86	97.73	121	68.75	26	29.55	79	89.77	105	59.66	226	64.20
jester	36	40.91	83	94.32	119	67.61	23	26.14	83	94.32	106	60.23	225	63.92
raffle	12	13.64	75	85.23	87	49.43	9	10.23	78	88.64	87	49.43	174	49.43
revelry	9	10.23	81	92.05	90	51.14	6	6.82	70	79.55	76	43.18	166	47.16
ringtoss	20	22.73	78	88.64	98	55.68	22	25.00	78	88.64	100	56.82	198	56.25
smoothie	21	23.86	83	94.32	104	59.09	17	19.32	79	89.77	96	54.55	200	56.82

Note. IM stands for immediate posttest, DE delayed posttest, p production test, and r recognition test. The total number of each production test is 88 and so is that of each recognition test. That total number of the immediate posttest (IM) is 176 and so is that of the delayed posttest. Finally, the number of the both posttests is 352.

Except for gasp in the recognition test of the immediate posttest (86, 97.73%), boa received the highest scores of all words in all other tests; in particular, the scores in the two production tests, 59 (67.05%) of the immediate posttest and 65 (73.86%) of the delayed posttest, left those of other target words far behind. The three-letter word boa with its meaning easy to comprehend became the most popular word of all (293, 83.24%). The percentage of correct responses of other target words fell between 64 for gasp and jester and 47 for revelry. The most difficult words for our teenage participants to learn were revelry and raffle, receiving 166 (47.16%) and 174 (49.43%) correct responses in both posttests, respectively. Following the patterns in scoring, both revelry and raffle scored the least in two production tests, with revelry's 9 (10.23%) and 6 (6.82) and raffle's 12 (13.64%) and 9 (10.23%), respectively. As expected, our teenagers' unfamiliarity to the spellings as well as their form-meaning associations both contributed to their low scores. The scoring patterns of each annotation group agree to those discussed earlier, the details of which are included in Appendix C.

The findings in the present study lent support to Weiss et al's definition of videos (2002). That is, videos in this study provide a concrete reference and a visual context for complex and difficult target words. The dynamic presentations in the form of animations and films, rather than the static ones, facilitated our participants' schema construction of the difficult vocabulary words, which can be ascribed to the following reasons. First and foremost, because videos have the capabilities of representing form-meaning connections and of providing a gestalt, dynamic stimuli are easily remembered, making effective building mental images of the target words. Furthermore, because videos also provide rich contexts and cultural authenticity embedded in the target words, the learning of them is made meaningful. And, because videos are made of a series of images, our participants pay attention to and stay focused on changes of images illustrating the meanings of the target words. All these reasons of form-meaning connections, contextual richness and attention getting help our teenage learners learn the target words effectively with videos (Al-Seghayer, 2001, p. 225).

The potential difficulties of learning unknown words in the present study lie in the insufficient information given by textual definitions and still images. Based on the scores in two posttests, some target words, for example, falconry, derby, revelry, raffle, and bazaar selected in the study, are difficult for our participants to comprehend from reading textual definitions alone. The existence of still images helps little, too. When verbal and visual information are both available, according to Chun and Plass (1997), the learner's attention may be directed to the type of information deemed more important or more interesting and taken away from the other mode which may in fact contain more important information. Accordingly, the participants may have focused more on the pictures instead of inferring meanings expressed through textual definitions. In other words, pictures can neither illustrate the complicated meanings embedded in the target words nor serve as a retrieval channel. Instead, they caused a split in the participants' attention to the processing of the target words. The process of integrating the two different sources of information, textual definitions and still images, to some extent, resulted in additional cognitive load for participants learning with pictures (Sweller, 2005). This can also account for the absence of significant differences between the picture group and the text group in both posttests.

5. CONCLUSIONS

This paper has presented a study on multimedia annotations based on the argument that videos are designed to present complex concepts (Weiss et al., 2002), complex concepts being those difficult to learners. The finding of this study is that learning difficult words with textual definitions and videos is more effective than learning them with textual definitions and pictures and with textual definitions alone. Not only do our teenage learners enjoy the contents of the target words presented in animations and films, they also focus their efforts on learning them. The rich contexts in the dynamic video clips later help our adolescent learners recall the meanings of the difficult words. It is, therefore, our pedagogical suggestions that language practitioners and classroom teachers take advantage of videos when learners find textual definitions and pictorial aids in vain for comprehending the meanings of vocabulary items. As free online video sources have gained their popularity, making a link to play animations and films to explain vocabulary should be regarded essential in modern classrooms.

The limitations of the present study are two-fold: the target words of nouns and the teenage participants. Animations and films must not be employed to explain nouns only. Verbs and adjectives should be incorporated in multimedia-based vocabulary learning and teaching as well. For example, to sauté in cuisines and to fumble in sports may be a couple examples for video annotations, in particular, in English classrooms for teenagers. The primary reason is that to some learners video presentations of some verbs better depict the meanings than other media. Participant-wise, adult or advanced language learners should be recruited in learning difficult words with videos. For adult language learners, who have already had enough worldly knowledge and have few unfamiliar concepts, their requests for multimedia annotations may vary. Similarly, advanced language learners, who have acquired most basic vocabulary and have developed their own habits of learning vocabulary, may demand different combinations of multimedia annotations. Both groups are worth further investigations.

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Appendix A
Reading Text and Vocabulary Tests

World Festival

There are festivals all over the world. People celebrate festivals by doing many things. In the past, people dressed up, danced and had a big dinner together. Men liked shooting and watched falconry show. Today, different countries have their special ways to celebrate festivals. For example, people in Brazil and Canada celebrate carnivals in many ways. Carnivals are famous for their revelry. In Brazil, you may have a chance to see floats. People there wear different costumes in the parade. Some dress like characters in the stories, fairy tales or cartoon movies. Some dress like animals and jesters. Also, they do funny tricks to make people laugh. In the parade, many people dance to the music. The most famous dance is Samba in Brazil. This dance is famous for its beautiful clothes like boas, drum music and body swinging. People in Canada hold some games to celebrate their carnivals. One funny game is called soapbox derby. In the game, people try to drive their cars all the way to the end. This car is made up of wood. People can use their own ways to make their racing cars. The first team to reach the end wins the game. But it is not easy. Most cars usually fall apart before they get to the finish line.

Festivals are not just for the countries. There are also many local celebrations in cities, towns, schools or neighborhood. In these places, it is common to see bazaars. People set up different stands and sell many things here. Some stands sell toys, clothes, or arts; while some stands sell food like snacks, candy or juice. If you feel thirsty, you can have a try to drink the smoothie. It is good to have an icy drink with much fruit when you feel hot. For outdoor activities, you can watch shows like dancing or singing, or play games like ring toss. If you are good at this game, you have a good chance to take away the biggest prize or whatever you like. If you are not good at this game, you can still try your luck in the raffle to win other prizes. In some places, the festivals also have some stunt shows like juggling with balls or riding on the monowheel. It is very exciting to watch these shows. People usually give a gasp of surprise and admire the performance. No matter what activity the festivals have, its purpose is to make people feel relaxed and have fun in it.

Appendix B
Vocabulary Posttest

Part A: Production Test

1. f _ _ _ _ _ _ y ：放鷹打獵，獵鷹訓練
2. r_ _ _ _ _ y ：狂歡，尋歡作樂
3. j _ _ _ _ r ：弄臣，小丑
4. d _ _ _ y ：肥皂箱玩具大賽
5. b _ a ：圍巾
6. b _ _ _ _ r ：市集
7. s _ _ _ _ _ _ e ：冰沙
8. r _ _ _ _ _ _ s ：套圈圈遊戲
9. r _ _ _ _ e ： 抽獎活動
10. g _ _ p ：(因驚訝或驚喜) 倒抽一口氣

Part B: Recognition Test

11. ( ) falconry： （1）放鷹打獵訓練 （2）馬術競賽會 （3）騎士長槍比武活動
12. ( ) jester： （1）魔術師 （2）小丑 （3）街頭藝人
13. ( ) derby： （1）肥皂箱玩具大賽 （2）抽獎比賽 （3）套圈圈遊戲
14. ( ) boa： （1）手套 （2）圍巾 （3）緊身褲
15. ( ) revelry： （1）打架 （2）祈福 （3）狂歡
16. ( ) bazaar： （1）教會 （2）市集 （3）遊行
17. ( ) smoothie： （1）氣泡水 （2）冰沙 （3）彈珠飲料

18. (　　) ringtoss：　（１）抽獎比賽　（２）肥皂箱玩具大賽　（３）套圈圈遊戲

19. (　　) raffle：　（１）肥皂箱玩具大賽　（２）抽獎活動　（３）套圈圈遊戲

20. (　　) gasp：　（１）喘氣　（２）點頭　（３）倒抽一口氣

Appendix C
Scores of Each Target Words by Three Annotation Groups

Table 4: Frequency Counts and Percentage of Correct Responses in Immediate Posttest

Words	Production Test						Recognition Test					
	Text		Picture		Video		Text		Picture		Video	
	N	%	N	%	N	%	N	%	N	%	N	%
boa	17	56.67	18	66.67	24	77.42	29	96.67	25	92.59	31	100.00
bazaar	2	6.67	4	14.81	8	25.81	29	96.67	21	77.78	29	93.55
derby	4	13.33	4	14.81	10	32.26	23	76.67	24	88.89	30	96.77
falconry	2	6.67	4	14.81	12	38.71	27	90.00	23	85.19	29	93.55
gasp	13	43.33	9	33.33	13	41.94	28	93.33	27	100.00	31	100.00
jester	11	36.67	8	29.63	17	54.84	25	83.33	27	100.00	31	100.00
raffle	2	6.67	4	14.81	6	19.35	26	86.67	22	81.48	27	87.10
revelry	1	3.33	2	7.41	6	19.35	27	90.00	23	85.19	31	100.00
ringtoss	5	16.67	6	22.22	9	29.03	26	86.67	21	77.78	31	100.00
smoothie	7	23.33	5	18.52	9	29.03	27	90.00	25	92.59	31	100.00

Note. The maximum for the text group is 30, that for the picture group is 27, and that for the video group is 31.

Table 5: Frequency Counts and Percentage of Correct Responses in Delayed Posttest

Words	Production Test						Recognition Test					
	Text		Picture		Video		Text		Picture		Video	
	N	%	N	%	N	%	N	%	N	%	N	%
boa	21	70.00	18	66.67	26	83.87	28	93.33	26	96.30	30	96.77
bazaar	3	10.00	6	22.22	5	16.13	25	83.33	21	77.78	30	96.77
derby	1	3.33	2	7.41	7	22.58	28	93.33	25	92.59	30	96.77
falconry	5	16.67	2	7.41	7	22.58	29	96.67	24	88.89	30	96.77
gasp	10	33.33	5	18.52	11	35.48	27	90.00	22	81.48	30	96.77
jester	6	20.00	4	14.81	13	41.94	28	93.33	24	88.89	31	100.00
raffle	3	10.00	3	11.11	3	9.68	25	83.33	22	81.48	31	100.00
revelry	0	0.00	3	11.11	3	9.68	22	73.33	18	66.67	30	96.77
ringtoss	9	30.00	5	18.52	8	25.81	24	80.00	23	85.19	31	100.00
smoothie	5	16.67	4	14.81	8	25.81	28	93.33	21	77.78	30	96.77

Note. The maximum for the text group is 30, that for the picture group is 27, and that for the video group is 31.

VIEWS OF STUDENTS IN THE DEPARTMENT OF RECREATION AND SPORT MANAGEMENT ON DISTANCE EDUCATION

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ABSTRACT
This study aims to investigate viewpoints of students in recreation and sport management department on distance education, and the effects of sex, having computers and internet access at home, family's monthly income, district of the family, and students' level of class on these viewpoints. Survey method was used to carry out the study. The sample of the study consisted of the students who attend Recreation and Sports Management Departments of Physical Education and Sports High School in Sakarya University. In order to gather information, a questionnaire was developed by the researcher, and it was applied to 292 students. Several statistical techniques such as frequency, percentage, t-test and ANOVA were used to analyze the data. The result of the study showed that the variables like sex, having a computer and an internet access at home, monthly income of the families of students, the place where students' families live and class levels of the students have an influence on their opinions.
Keywords: Physical education, Distance Education, Recreation, Sport Management.

INTRODUCTION
Distance education is a kind of instruction that occurs when the instructor and student are separated by distance, time, or both (WCET 2004). It is, in the most general sense of the term, the instruction delivered over a distance to one or more individuals located in one or more places (Phipps, Wellman & Merisotis 1998). In a report prepared for NCES (1999), distance education is also defined as education or training courses delivered to remote (off-campus) location(s) via audio, video (live or prerecorded), or computer technologies, including both synchronous and asynchronous instruction. It encompasses the programs that allow the learner and instructor to be physically apart during the learning process and maintain communication in a variety of ways (Keegan, 1986). Many researchers believe that distance education is a key factor in expanding educational opportunities to remote areas (Gamble & Fischer, 1993; Hodder & Carter, 1997; Ludlow, 1995). Thus, it enables larger numbers of people to have access to education and training (Grill, 1999). Learners, no matter which country they live in, study in four types of locations when taking a course offered by distance education: home, workplace, study centers, and classrooms (Roberts, 1996).

There has been many ways for distance education throughout the history. Main different characteristics of the generations of technologies used in distance education include (NCES, 1999):

- the number of individuals that can be simultaneously supported in communication (i.e., one-way, two-way, or multiple-way communication);
- the amount and types of information (voice, video, data) that can be delivered (i.e., whether the communication channels are "broadband" or "narrowband"); and
- the speed level at which that information is delivered (i.e., whether the return rate is fast or slow).

Distance education has expanded enormously for the last two past decades throughout the world, and teachers, especially primary school teachers, reach a significant number of learners. The history behind the use of teacher education by distance differentiates between the north and the south. Until recently, in industrialized countries where distance education is just one option within a highly developed educational system, its use in teacher education was fairly limited, and the main aim of using it was to reach remote learners. But the growing legitimization in distance education, market forces in higher education and use of new educational technologies have provided an expansion in this field within the decade. Particularly, new information and communication technologies (ICTs) have opened up a range of new opportunities for course-and resource-based learning in teacher education. Examples include email tutoring, computer-based learning, online conferencing, virtual classroom observation and web-based teacher resources (Creed, 2001).

Because the distance factor minimizes dialogue between teacher and learner and also imposes a relatively high level of structure in order to meet learning goals, it is claimed by critics of independent study that distance education brings about dependence rather than improving critical thinking and self-directed learning as claimed by its proponents. Some argue that the main skill that a distance education student gains is the ability to provide perfunctory answers based on readily available information contained in the course material. One view suggests

that distance education is rigidly prescriptive and creates dependency; another argues that it promotes autonomy and encourages self-directed approaches to learning (Beaudoin, 1990).
Although online education has increased, there are some challenges. Teaching in distance education is not the same as teaching in a face-to-face environment; administration of distance education programs requires different experiences; and for students, learning online is not like the ones in face-to face environments. Due to growing demands in distance education and the unique experience it provides, it is important for educational authorities to be aware of the benefits, difficulties, and challenges of distance education (Mupinga, 2005). The task of the distance instructor or mentor is much more than just to grade submitted materials of students. Normally, the process of instruction involves (MacKenzie, Christensen & Rigby, 1968):

- Deciding whether the students are ready to learn or not,
- Monitoring student progress toward desired objectives,
- Recognizing the difficulties that students experience in learning process,
- Encouraging students for further efforts,
- Evaluating the quality of learning, and
- Assigning a grade to estimate learning outcomes.

Distance Education in Physical Education
Improvements in the computer technology have made class activities easier for students and increased the motivation of students. Additionally, technologies in distance education can be seen as a way to facilitate learning and to improve interaction with the students in Physical Education (Yaman, 2009). The students in Physical Education Departments can cooperate with the students from other departments or schools and can make projects via internet (Mohnsen, 2001; Sheingold & Hadley 1990). Owing to the effects of constructivist view, distance education has changed the role of the students and teachers in traditional learning process. (İşman, 2004). For instance, forums on the internet can increase group interaction, and web-pages can enable students to reach lots of information easily. In today's world, with modern education, we mean environments which have no place limitation and contribute to the development of individuals regardless of place and time. (Yaman, 2008). In order to be sure of its efficiency, this contribution must be very fast using all the technological innovations and it must be joyful and meet the requirements of the contemporary world (Yaman, 2008). Using e-mail is a beneficial way for informal communication among teachers as well (Knapper, 2001). The use of internet in physical education enables the information to spread fast, improves communicative and writing skills, and facilitates motivation for learning (Yaman, 2009).

The aim of this study is to investigate the viewpoints of students in Recreation and Sport Management Departments in distance education, and the effects of sex, having a computer and an internet access at home, family's monthly income, district of the family, and students' level of class on these viewpoints.

METHOD
Research Scale
For this study, 28 items were used in a fivefold Likert-type scale to mesure the competency areas on computer. The students who participated in the research graded items 1-5 points in which they are required to choose one of the alternatives between Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree according to their views. In the analysis, grading was made as Strongly Disagree=1, Disagree=2, Neutral =3, Agree=4 and Strongly Agree=5.

Reliability of the Scale
It is enough to find a Cronbach Alpha value higher than 60 in order for the scale to be reliable. In the distance education scale that was designed for this research, Cronbach Alpha value was found 0,895 for the Recreation Department, and 0,887 for the Sport Management Department. This scale was seen as highly reliable.

Research Data
Datas used in this research are obtained from the distance education scale that was applied to 292 students studying at Sakarya University Physical Education Sport College, Recreation and Sport Management Departments in the academic years of 2009-2010. After the scale was applied, an evaluation was made on the variables like sex, level of class, district of the family, monthly income of the family, having a computer and an internet access at home.

The Statistical Method of the Research
Qualitative and quantitative research methods were used in this research. SPSS available statistical program was used for the section analysis of the scale. Each skill area was evaluated by frequency, percentage and average

values within itself and according to sex, level of class, district of the family, monthly income of the family, having a computer and an internet access at home variables. In the last section, each individual’s total points in the scale was analyzed and evaluated according to sex, level of class, district of the family, monthly income of the family, having a computer and an internet access at home. For each variable, the frequency and percentage ranks were given, and furthermore Independent Samples T-Test and ANOVA were used in order to find the correlation between two variables.

FINDINGS

Demographic Situations of the Participants

Table 1. Demographic Situations of the Participants

Variables	RECREATION		MANAGEMENT	
	N	%	N	%
Sex				
Female	57	41,3	71	46,1
Male	81	58,7	83	53,9
Total	138	100	154	100
Level of Class				
1	40	29,0	41	26,6
2	35	25,4	36	23,4
3	31	22,5	34	22,1
4	32	23,2	43	27,9
Total	138	100	154	100
District of the Family				
Province	81	58,7	99	64,3
County	47	34,1	40	26,0
Village	10	7,2	15	9,7
Total	138	100	154	100
Monthly Income of the Family				
400 TL and down	23	16,7	23	14,9
401-800 TL	51	37,0	52	33,8
801-1001 TL	32	23,2	36	23,4
1001-1500 TL	13	9,4	20	13,0
1501 TL and up	19	13,8	23	14,9
Total	138	100	154	100
Is there a computer?				
Yes	77	55,8	91	59,1
No	61	44,2	63	40,9
Total	138	100	154	100
Is there any Internet Access?				
Yes	68	49,3	75	48,7
No	70	50,7	79	51,2
Total	138	100	167	100

Statement Analysis

	RECREATION					SPORT MANAGEMENT				
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I think distance education is a useful educational system.	1 22,5	6 26,1	2 23,2	1 22,5	5,8	0 13,0	3 34,4	6 23,4	4 22,1	1 7,1
I can get enough feedback about my strength in education thanks to distance education.	5,8	5 25,4	0 29,0	1 37,0	2,9	4,5	1 26,6	7 30,5	2 33,8	4,5
My opinion on using internet in distance education is positive.	3 9,4	5 10,9	2 15,9	8 49,3	0 14,5	3,9	0 19,5	2 14,3	8 50,6	8 11,7
I want these kind of implementation methods in all our classes (including the applied ones).	5 18,1	1 29,7	2 15,9	5 25,4	5 10,9	6 16,9	2 27,3	9 18,8	0 26,0	7 11,0
Distance education provides opportunity for using various internet technologies.	5,1	4 17,4	5 18,1	5 47,1	7 12,3	5,8	0 19,5	9 18,8	0 45,5	6 10,4
Distance education gives more learning responsibility to me.	8 13,0	0 36,2	9 21,0	5 18,1	6 11,6	1 13,6	7 37,0	7 24,0	9 18,8	0 6,5
Distance education makes me feel like I am good at an important field.	0 14,5	9 35,5	3 16,7	5 25,4	1 8,0	8 11,7	4 35,1	2 27,3	3 21,4	4,5
I can get enough feedback about my weaknesses in education thanks to distance education.	4 10,1	1 29,7	0 21,7	3 31,2	0 7,2	0 6,5	9 31,8	0 26,0	7 30,5	5,2
I think distance education is better than traditional class teaching.	1 22,5	9 35,5	9 21,0	0 14,5	6,5	5 22,7	9 38,3	9 12,3	4 22,1	4,5
Having education independent from time and place increases my performance.	2 15,9	0 36,2	6 18,8	4 17,4	6 11,6	6 16,9	2 33,8	0 19,5	5 22,7	1 7,1
I can ask questions that I avoid to ask in class atmosphere thanks to distance education.	3 9,4	0 21,7	2 8,7	5 47,1	8 13,0	1 7,1	7 24,0	4 15,6	5 42,2	7 11,0
I can improve my learning by asking debative questions.	2	4	8	7	7		3	6	1	6

	8,7	17,4	13,0	8,6	12,3	5,2	21,4	23,4	39,6	10,4
E-mail, talking and debative activities made on electronic bulletin board provide me more perspectives.	6,5	3 16,7	0 14,5	8 49,3	8 13,0	2 7,8	6 16,9	3 21,4	1 39,6	2 14,3
At distance education, there is no discomfort that I encounter in traditional class atmosphere	4 10,1	4 31,9	4 17,4	4 24,6	2 15,9	8 11,7	5 29,2	0 19,5	8 31,2	3 8,4
Applied lessons take more time than the ones in traditional class atmosphere	3 9,4	3 31,2	8 20,3	4 31,9	0 7,2	8 11,7	0 26,0	3 21,4	1 33,1	2 7,8
I think that I have to know the computer softwares very well to have distance education	5,8	5 10,9	5 10,9	2 52,2	8 20,3	3 8,4	5 22,7	4 9,1	6 42,9	6 16,9
I think that I have to know the computer hardwares very well to have distance education	5,8	4 17,4	3 9,4	6 47,8	7 19,6	5 9,7	7 24,0	7 11,0	6 42,9	9 12,3
I think that I have to know the internet very well to have distance education	0 7,2	4 10,1	9 13,8	6 47,8	9 21,0	5 9,7	3 21,4	7 11,0	5 42,2	4 15,6
Distance education decreases my communication and travelling costs	6,5	3 16,7	1 15,2	4 39,1	1 22,5	5 9,7	2 20,8	0 19,5	1 33,1	6 16,9
Studying at home in distance education process causes motivational problems, parental conflicts and lack of attention	7 12,3	7 19,6	8 20,3	8 27,5	8 20,3	6 10,4	5 16,2	5 29,2	0 32,5	8 11,7
I think that in distance education, it will be difficult to communicate with academics	5,8	2 15,9	8 20,3	1 37,0	9 21,0	6 10,4	9 18,8	6 10,4	9 44,8	4 15,6
I think that in distance education, in-class interaction and debative activities will be lesser.	0 7,2	3 16,7	3 9,4	5 39,9	7 26,8	5 9,7	0 13,0	4 15,6	3 47,4	2 14,3
I think that campus is more useful for job sources and benefits of having the job facilities	6,5	8 20,3	2 15,9	6 40,6	3 16,7	2 7,8	6 16,9	9 25,3	8 37,7	9 12,3
I think contemporary teaching methods are used in distance education	1 8,0	4 24,6	6 26,1	1 29,7	6 11,6	4,5	1 20,1	0 39,0	9 31,8	4,5
I think the lessons with distance education will be permanent	9 13,8	5 32,6	0 29,0	6 18,8	5,8	2 14,3	9 31,8	7 30,5	9 18,8	4,5
I think that lack of school and lesson materials will be provided by distance education	2 15,9	7 26,8	5 25,4	3 23,9	1 8,0	9 12,3	2 27,3	6 29,9	5 22,7	2 7,8

Students having distance education benefit from library more.	5,8	5 18,1	4 17,4	3 38,4	8 20,3	0 6,5	3 21,4	9 18,8	0 39,0	2 14,3
Thanks to distance education, global education come true and equal opportunity in education is achieved	4 10,1	0 14,5	5 18,1	2 37,7	7 19,6	4 10,1	0 14,5	5 18,1	2 37,7	7 19,6

T-Test Results on Sex Variable
As a result of the analysis, it was found that there is a meaningful difference level of P<0,05 among the students studying at Recreation Department according to the sex variable. Female students agreed more with the statement "Distance education gives more learning responsibility to me" at the meaningful level of P=0,034 than the male students.

It was also found that there is a meaningful difference level of P<0,05 according to sex variable among the students studying at Recreation Department. Male students agreed more with the statement "I can ask questions that I avoid to ask in class atmosphere thanks to distance education" at the level of P=0,009 than the female students.

T-Test Results on Having a Computer at Home
As a result of the analysis, it was found that there is a meaningful difference level of P<0,05 according to having a computer at home variable among the students studying at Recreation Department. The students that have a computer at home agreed more with the statement "My opinions on using internet in distance education is positive" at the meaningful level of P=0,043 than the students who do not have.

It was also found that there is a meaningful difference level of P<0,05 among the students studying at Management Department. The students that have a computer at home agreed more with the statement "I can get enough feedback about my weaknesses in education thanks to distance education" at a meaningful level of P=0,048 than the students who do not have.

T-Test Results on Having Internet Access at Home
As a result of the analysis on the students studying at Recreation Department, it was found that there is meaningful difference level of P<0,05 according to having internet access at home variable. The students that have internet access at home agreed more with the statement "My opinions on using internet in distance education is positive" at a meaningful level of P=0,005 than the students who do not have.

It was also found that there is a meaningful difference level of P<0,05 according to having the internet at home variable among the students studying at Management Department. The students that have internet access at home agreed more with the statement "I can get enough feedback about my weaknesses in education thanks to distance education" at a meaningful level of P=0, 46 than the students who do not have.

ANOVA Results on Family's Monthly Income
As a result of the ANOVA, it was found that there is a meaningful difference level of P<0,05 on the statements "I think that I have to know how to use internet thoroughly to have distance education" and "Studying at home in distance education process, causes motivational problems, parental conflicts and lack of attention" according to family's monthly income variable among the students studying at Recreation Department.

According to LSD test results that was carried out to find which group created this difference, it was found that the students whose family income is 400TL and less (P=0.005) and between 801TL-1000 TL (P=0,024) gave more positive answers to the statement "I think that I have to know how to use internet thoroughly to have distance education" than the students whose family income is between 401TL-800TL. According to LSD test result about the statement "Studying at home in distance education process, causes motivational problems, parental conflicts and lack the attention", the students whose family income is 400TL and less (P=0.003) and between 801TL-1000TL (P=0,017) meaningfully agreed more with the statement than the ones 401TL-800TL.

However, as a result of the ANOVA, it was found that there is no meaningful difference according to family income variable of the students studying at the Management Department.

ANOVA Results on the District of the Family

It was found that there is a meaningful difference level of P<0,05 according to district of the family variable among the students studying at the Recreation Department regarding the statements "I want these kind of implementation methods in all our classes (including the applied ones)" and "I think that campus is more useful for job sources and benefits of having the job facilities".

According to LSD test results was carried out to find out which group created the difference, it was found that the students whose family district were county gave more positive answers to the statement "I want these kind of implementation methods in all our classes (including the applied ones)" than the students whose family district were province and village at meaningful levels respectively P=0,008 and P=0,001.

According to LSD test results regarding the statement "I think that campus is more useful for job sources and benefits of having the job facilities", the students whose family districts are province meaningfully (P=0,009) agreed more with the above statement than the students whose family districts are county.

However, according to ANOVA results, it was found that there is no meaningful difference according to family's district variable among the students studying at the Management Department.

ANOVA Results on Class Variable

As a result of the ANOVA for the Recreation Department, it was found that there is a meaningful difference level of P<0,005 in the statements " I think distance education is a useful educational system.", "I can get enough feedback about my strength in education thanks to distance education", "I can get enough feedback about my weaknesses in education thanks to distance education", "Distance education decreases my communication and travelling costs", "I think that in distance education, in-class interaction and debative activities will be less" and "I think that contemporary teaching methods are used in distance education".

According to the LSD test result regarding the statement "I think that distance education is a useful educational system", it was identified that 2nd class students agreed with the statement more than the 1st and 3rd class students at meaningful levels respectively P=0,001 and P=0,019. Besides, 4th class students agreed more with the above statement at a meaningful level of P=0,005 than the 1st class students.
According to the LSD test result regarding the statement "I can get enough feedback about my strength in education thanks to distance education" it was identified that 2nd class students agreed more with the above statement than the 1st, 3rd and 4th class students at meaningful levels respectively P=0,005, P=0,015 and P=0,019.

According to the LSD test result regarding the statement "I can get enough feedback about my weaknesses in education thanks to distance education" it was identified that 2nd class students agreed more with the above statement than the 1st and 3rd class students at meaningful levels respectively P=0,014 and P=0,004.

According to the LSD test that was carried out for the item "Distance education decreases my communication and travelling costs" , it was identified that 2nd class, 3rd class and 4th class students agreed more with the above statement than the 1st class students at meaningful levels respectively P=0,008, P=0,003 and P=0,008.

According to the LSD test that was carried out for the statement "I think that at distance education, in-class interaction and debative activities will be less", it was identified that 2nd class, 3rd class and 4th class students agreed more with the above statement than the 1st class students at meaningful levels respectively P=0,023, P=0,002 and P=0,000.

According to the LSD test that was carried out for the statement "I think that contemporary teaching methods are used in distance education" it was identified that 2nd class students agreed more with the above statement than the 1st and 3rd class students at meaningful levels respectively P=0,021 and P=0,015.

As a result of the ANOVA made for the Management Department, it was found that there is a meaningful difference at the level of P<0,005 regarding the statements "I think that distance education is a useful educational system", "I want these kind of implementation methods in all our classes (including the applied ones)", "Distance education gives more learning responsibility to me", "I can get enough feedback about my weaknesses in education thanks to distance education", "I think that it is better than traditional class teaching", "I can improve my learning by asking debative questions" and "Applied lessons take more time than the ones in traditional class atmosphere".

According to the LSD test that was carried out for the statement “I think that distance education is a useful educational system” it was identified that 3rd class students agreed more than the 1st, 2nd and 4th class students at meaningful levels respectively P=0,036, P=0,000 and P=0,000. Also, 1st class students agreed more with the above item than the 2nd and 4th class students at meaningful levels respectively P=0,032 and P=0,042.

According to the LSD test that was carried out for the statement “I want these kind of implementation methods in all our classes (including the applied ones)” it was identified that 1st class students agreed more than the 3rd and 4th class students at meaningful levels respectively P=0,025 and P=0,000. Also, 2nd class students agreed more with the above statement at a meaningful level of P=0,013 than the 4th class students.

According to the LSD test that was carried out for the statement “Distance education gives more learning responsibility to me” and it was seen that 1st class students agreed more than the 2nd and 4th class students at meaningful levels respectively P=0,005 and P=0,009.

According to the LSD test that was carried out for the statement “I can get enough feedback about my weaknesses in education thanks to distance education” it was identified that 1st , 2nd and 3rd class students agreed more than the 4th class students at meaningful levels respectively P=0,002, P=0,023 and P=0,006.

According to the LSD test that was carried out for the statement “I think that it is better than the traditional class teaching” it was identified that 1st class students agreed more than the 2nd and 4th class students at meaningful levels respectively P=0,005 and P=0,015.

According to the LSD test that was carried out for the statement “I can improve my learning by asking debative questions” , it was identified that 1st and 3rd class students agreed more than the 4th class students at meaningful levels respectively P=0,001 and P=0,035.

According to the LSD test that was carried out for the statement “Applied lessons take more time than the ones in traditional class atmosphere”, it was identified that 3rd class students agreed more than the 2nd and 4th class students at meaningful levels respectively P=0,006 and P=0,019.

CONCLUSION

The result of this study has shown that the variables like sex, having a computer and an internet access at home, monthly income of the families of students, the place where students’ families live and class levels of the students have an influence on their opinions. For example, the female students agreed more with the statement “Distance education gives more learning responsibility to me; the male students agreed more with the statement “I can ask questions I avoid to ask in class atmosphere thanks to distance education”. Moreover, the variables like having a computer and an internet access at home, and families who live in small towns affected students’ views in positive ways. Furthermore, it was seen that class levels of the students resulted in meaningful differences between the students’ views. Students almost from every class level had more positive views on some of the statements and the views differed from each other concerning certain statements.

Based on these results some recommendations can be made as follows: While designing distance education, classes that take student qualities into consideration might help them to increase their concentration. Besides, improving distance education facilities and the number of the courses accessible via distance education might help the students who have difficulties in attending the courses due to personal issues. Moreover, designing asynchronous learning facilities and improving the flexibility of the attendance may help students to attend courses without being worried to skip the classes.

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

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

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

This paper reports an optimal solution making use of the information technology without sacrificing the quality of the negotiation practicum due to the students' low level of reading comprehension skills.
Keywords*:* course development, PBL, communication, empathy, negotiation, ICT, reading comprehension, role playing

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

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

It is natural that a new course design will encounter some difficulties. This new practicum-based course is heavily dependent on students' reading comprehension skills to deeply understand the description of the detailed situation in which various levels of negotiation processes are involved. Thus, the low level of students' reading comprehension skills will reduce the understanding of the description. This paper attempts to tackle with such issue in terms of the information technology available to us.

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

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

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

2.1 Definition: Basic Academic Skills

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

2.2 Traditionally Speaking: Debate for Ultimate Logical and Critical Thinking

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

2.3 Kansai University's Challenge to Design a New Course

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

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

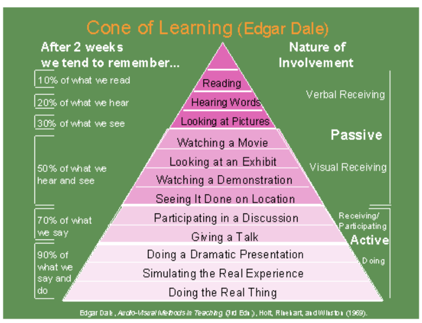

Fig. 1. Edger Dale's Cone of Learning (source: www.cals ncsu.edu/agexed/sae/ppt1/sld012.htm)

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

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

2.4 The Methodology Proposed by Dr. Roger Fisher at Harvard University

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

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

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

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

2.5 A New Course Design

Having the basic concepts of negotiation by Dr. R. Fisher, the negotiation methodology has been developed incorporating a case study and a role-playing simulation. In the course, students are first divided into two groups for the later negotiation session. For ease of exposition, let us call these groups Group A and Group B. Further, in each group, four to five students are sub-grouped for the discussion for building strategies for the negotiation session. See Fig. 3. The each colored box represents a sub-group consisting of four to five students.

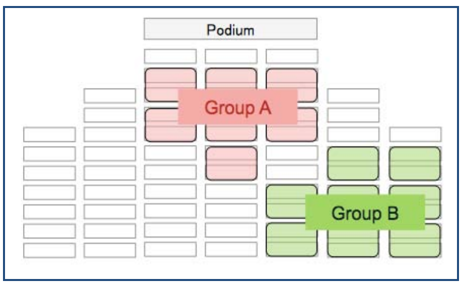

Fig. 3. Seating Layout for Groups (Group A is shown in red Group B, in green. Each block represents 4 to 5 students.);

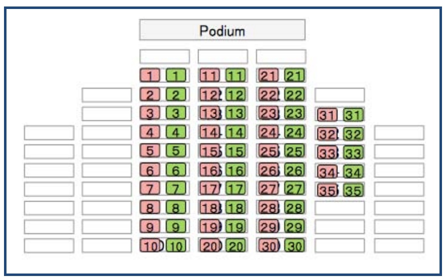

Fig. 4. Layout for One to One Negotiation Session:

While the students are seated in the formation shown in Fig. 3, the following learning activities are conducted. First, a mini lecture is given to share the goal for the practicum with the students. Second, the house keeping rules for the practicum such as the basic concepts of negotiation, the procedures for the practicum are explained to the students. With such background information, reading materials for the negotiation situation are distributed. Both groups have a common situation sheet. See Fig. 5. And then each group is given their group-specific additional information. See Fig. 7 for the group-specific information sheet for Group A and Fig. 8 for the group-specific information sheet for Group B. With such preparation, the students proceed to Exercise 1. Exercise 1 is conducted on the individual student basis.


Fig. 5. Common Situation Sheet


Fig. 6. Negotiation Worksheet

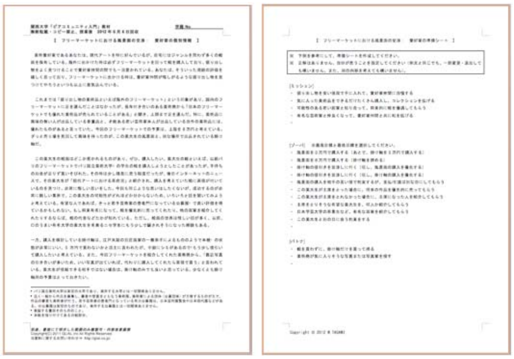
Fig. 7. Group-Specific Information Sheet for Group A

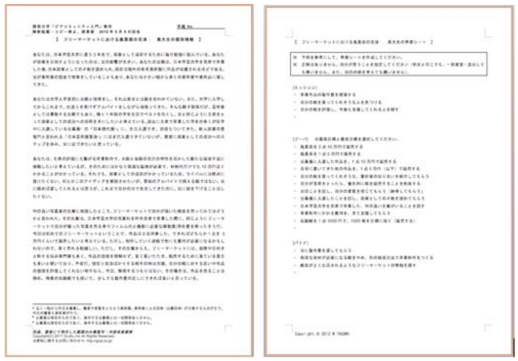
Fig. 8. Group-Specific Information Sheet for Group B

(Fig. 5 through Fig. 6 are by courtesy of GLIAL, Inc.)

Each student reads the given situation sheets individually to understand the situation in which the character to be role modeled is. And then, he/she prepares for strategies for the negotiation with the worksheet. See Fig. 6. It is important that each student must complete the worksheet individually prior to the group discussion.

When Exercise 1 is completed, students move forward to Exercise 2: Sub-Group Discussion, in which four to five students in each sub-group discuss and share their strategic plans to finely tune up their minute details while making reference to their worksheets. After Exercise 2, the main session of communication with empathy and negotiation is conducted. In the following Exercise 3, based on the worksheet and the result of the discussion in Exercise 2, paired students conduct the role-playing negotiation session. See Fig. 4 above for seating arrangement.

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

2.6 A Problem Revealed

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

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

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

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

3. AN OPTIMAL SOLUTION WITH THE USE OF ICT

3.1 Rationale behind Optimizing Time for Students to Grasp the Situation

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

- Time-wise limitation: The classroom contact hours for a course are limited. A course usually consists of fifteen 90-minute lessons. In order to conduct one negotiation session, it requires two lessons in sequence. In one negotiation session ranging over two lessons, the allocated time for the students to grasp the negotiation situation is only thirty minutes. Within such a short time slot, the amount of information to be processed through the reading activity by the students is limited..
- Limitation of the competence of students' reading comprehension: The students are of the age ranging from eighteen to twenty years old. Thus, these young adults do not have the full-fledged reading comprehension skill. They are the generation that read only from the smart phone screen and do not have the habit of reading newspapers daily. They tend to read slowly and the concentration for reading does not last long.
- Adopted learning methodology, PBL: For the teaching methodology, we adopted a Problem-Based Learning approach. In the PBL classroom, all instructions and learning occur in the classroom, where "the feeling of being there" as well as the face-to-face group activities exist. In such classroom, the communication with eye contacts as well as facial expressions is omnipresent. With such conditions, we must devise a method to boost the amount of the information to be processed within the limited conditions mentioned above. Further, the contents-wise, more complicated negotiation situations should be developed reflecting the real-life situation in which more than two characters or opponents are involved.

3.2 Adoption of ICT

In order for the negotiation contents to be the reflection of the real-life situation, a non-fiction novel was adopted. Further, we employed the novel's dramatized video or movie. From the novel, excerpts relevant to the negotiation are prepared. Refer to the slide number 8 in Fig. 8 below. And further, the video clips corresponding to the excerpts are prepared. Refer to the slide numbers 4 and 5 in Fig. 8. In addition, to provide the students with background information for the video clips, synopses for the video clips are also prepared. Refer to the slide numbers 2 and 10 in Fig. 8.

(Sources of Video clips: www.wowow.co.jp/ dramaw/rocket/)

Fig. 8. Negotiation Practicum Enhanced with Video and Synopses.

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

4. CONCLUSION

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

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

Table I: Distribution of Active Engagement by the Students.

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

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

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

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COMPUTER-BASED VS PAPER-BASED EXAMINATIONS: PERCEPTIONS OF UNIVERSITY TEACHERS

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ABSTRACT
This research reported teachers' perceptions about computer-based (CB) vs. paper-based (PB) examinations. Teachers were divided into 7 major categories i.e., gender, departments, designations, qualifications, teaching experiences, computer training certifications and CB examination experiences, which were the key factors to be observed and analyzed to perceive teachers' attitude regarding CB or PB examinations. It was concluded from the results that overall sampled teachers' attitudes were positive towards CB examination systems but in some situations they preferred PB as well. Comparatively female, highly ranked, highly qualified, less experienced, teachers who have computer training certificate or degree, and teachers who have CB examination experiences were more positive towards CB examinations.

INTRODUCTION
It is generally recognized that examinations determine the extent to which educational objectives have been achieved as well as the extent to which educational institutions have served the needs of community and society (Shah, 2002). Examinations are not limited to measure educational or societal objectives and needs but incorporate in a way of coping with the educational system (Havens, 2002). Rehmani (2003) briefly described that 'examinations play a significant role in determining what goes on in the classroom in terms of what, and how teachers teach and students learn and can have impact on both teaching and learning'. Wikipedia used test or examinations as alternative terms of assessment and defined it as: 'test or an examination (or exam) is an assessment indeed to measure a test-takers knowledge, skill, aptitude, physical, fitness or classification in many other topics'.

Various examination methods used in higher education institutions to assess academic progress, for example, paper-pencil-based examinations, assignments, presentations, and etc.,. Sim, Holifield, & Brown (2004) identified more than fifty varied techniques used within higher education for assessment purposes; the most commonly used are examinations. The rapid advancement of Information and Communication Technologies (ICT) in teaching and learning has shifted the paradigm (Uysal & Kuzu, 2009) from paper-pencil-based to computer-based system of examinations which are usually termed as Computer Assisted Testing, Computerized Assessment, Computer Based Testing (CBT), Computer Aided Assessment (CAA), Computer Based Assessment (CBA), Online Assessment, E-Assessment and Web-Based assessment (Bull (1999), Haslington, Jupp (2000), Mckenna (2001), Elliot (2003), Maddison (1983), Winship (2003), JISC (2008) and many others). Computer – based examinations are the form of assessment in which the computer is an integral part of question papers' delivery, response storage, marking of response or reporting of results from a test or exercise (Whittington, Bull & Danson, 2000). Conole and Warburton (2005) defined CAA as 'the use of computers for assessing students' learning'.

Due to the inclusion of ICTs in education, it is required to re-consider and rethink, modify or change the traditional examination methods. Electronic assessment tools had reduced the burden of teachers and facilitate to conduct examinations purposefully. Computer-based examinations can be used to promote more effective learning by testing a range of skills, knowledge and understanding. Accessing and managing of information and managing and developing communication skills are possible to assess online which cannot be assessed in regular essay based examinations (Brown, Race, & Bull, 1999). JISC (2008) quoted Weaver (2003) that '… diversity decreases the dependency on the traditional formal examination, a method that does not suit the learning styles of many students. The key factor in determining whether an assessment program is good depends on whether the assessment tasks are relevant to the aims and intended learning outcomes for the course, not forgetting the attitudes and skills that are to be tested'.

Computer and related technologies provide powerful tools to meet the new challenges of designing and implementing assessments methods that go beyond the conventional practices and facilitate to record a broader repertoire of cognitive skills and knowledge. According to Bodmann and Robinson (2004) computer-based tests offers several advantages over traditional paper-and-pencil or paper-based tests. Technology based assessment provide opportunities to measure complex form of knowledge and reasoning that is not possible to engage and assess through traditional methods. The link between observation and interpretation through computer based technologies makes it possible to score and interpret multiple aspects of student performance on a wide range of tasks chosen for cognitive features and compare the results against profiles that have interpretive value (Pellegrino, Chudowsky, and Glaser, 2001). Computer based assessment technique is becoming more and more common in HEIs because of its relevance and direct approach towards CAI. According to Conole and Warburton (2005): "CAT items are written to test particular levels of ability they have the potential to deliver more accurate and reliable results than traditional tests". Traditional methods of assessment are being replaced by automated assessment in all over the world gradually but it is not clear yet to up to what extent these changes will be fruitful to the academicians and administrators of HEIs (McAlpine, 2004).

Therefore, it was significantly important to perceive university teachers' approaches towards Computer-Based (CB) and/or Paper-Based (PB) examinations. It was observed through literature that little attention was paid to understand teachers' thoughts about how they differentiate between CB and PB examinations in terms of their effects on teaching and learning. Authors of this research, therefore, analyzed teachers' attitude in new and different dimensions or categories i.e., not only limited to gender-based attitudinal differences but also discipline-wise, designations-wise, qualifications-wise, teaching experiences-wise, Computer Skilled (trained) and non-skilled (untrained) teachers and the teachers who EXPERIENCED to conduct CB examinations versus to those who NEVER experienced. Following is a brief literature review that summarizes the studies of those authors who experimented or surveyed CB examinations versus PB examinations at higher educational institutions.

LITERATURE REVIEW

According to Fluck, Pullen & Harper (2009) '… educators must consider which assessment techniques permit students to utilize the affordances of new technology'. The authors conducted an eExamination for the students of 4-year Bachelor of Education Program at the University of Tasmania. Students' (N=270) achievement was assessed through two equally weighted activities: first was a home assignment in which students explored learning content through the use of ICT and the second activity was a 2 hour test comprised of 14 questions based on all the material in the unit. At the end of the test, a single page survey with five questions was offered to students. Survey indicated that 38% of the survey respondents had previously taken a CB exam, 78% had used the practice CD before eExamination and 71% had found it very or moderately useful. The valid responses (N=230) indicated that 94.5% preferred CBT. The prior exposure to CBT was a highly significant factor for preferring the computer medium.

Karadeniz (2009) studied the impact of paper based, web based and mobile based assessment on students' achievement. A group of 38 students were experimented for 3 weeks. Significant differences were found between the scores achieved by the students in second week, but not in first week. It was perceived by the authors that students had positive attitude towards web based and mobile based assessment due to ease of use, comprehensive and instant feedback. Moreover, most favoured tests were web based and the least favoured were paper based.
7
The National University of Singapore introduced computer-based testing (CBT) in 2004. Lim, et al (2006) examined medical students' attitude about CB VS PB testing. Through an online survey 213 (53.5%) final-year MBBS students were tested out of which 91 (79.8%) preferred CBT, 11 (9.6%) preferred paper-and-pencil (PNP) format and 12 (10.5%) were un-sure. Authors further explained that 42 indicated that 42 liked CBT because of good quality of images and independent of assigned seating positions; 22 liked because they could proceed at their own pace; one stated that CBT examinations was fun; 4 enjoyed the convenience of CBT and 6 cited "equality" as the reason they preferred CBT over PNP testing.

Bodmann and Robinson (2004) conducted an experimental study to compare speed and performances differences among computer-based (CBTs) and paper-pencil tests (PPTs). In experiment fifty-five undergraduate students enrolled in the subject of educational psychology, participated in the studies which were already familiar with computer-based tests. Both CBTs and PPTs contained 30 MCQs items with 35 minute of time limit. Approximately half class (28 students) took the first test on the computer and rest preferred first test on paper. Procedures shifted for the second tests, with the first group receive PPTs and second group CBTs with a gape of two weeks. It was concluded that undergraduates completed the CBT faster than PBT with no difference in scores.

Koppel and Hollister conducted a study to examine the impact on student performance of a computer-based assessment (CBA) as compared to a traditional testing method. Three different research tool were used in the study to collect and interpret results i.e., questionnaires completed by students to express their CBA experiences; faculty interviews who had administered computer-based test to determine students' perceptions of using this medium of testing and analysis of students test scores in both conventional paper-based tests (PBT) and CBA.

Total 133 students out of which 91 have no prior experience of CBA and remaining 42 had experienced the same in their previous courses. The Excel CBA was comprised of 25 items was constructed. Students' scores on CBA were automatically recorded which included overall scores achieved. Grades on CBA were based on students' ability to complete a specific skill-based operation in the application of MS Excel. CBA was administered in one class period, at the end of the exam students reviewed their results. PBT was administered in the next class period. The PBT were examined manually by viewing the printout and actual Excel file containing the completed examinations. Results of PBT were recorded physically by noting the required information in an Excel sheet. Grades on the PBT were based on the final product submitted by each student as opposed to how each task was performed. On the question of ease of use, majority of the students (59%) found the software to be easy, 29% found it to be moderate and 12% the software to be somewhat difficult to use. Interpreting the range of skills, 76% responded that CBA was more effective test. Evaluating the difficult of question paper 65% responded that question paper were moderated, 34% of the students felt the automatic grading system was fair while 39% didn't find the grading fair. Only 19% felt that CBA negatively impacted their performance. Only 14% students found CBA easier while 49% found it difficult or more difficult. Total 58% preferred CBA and 42% preferred PBT. Faculty perceived to be more positive towards CBA in terms of less time writing exams, reduce grading time, simple method of record keeping of grades and improved validity of test validity through post-test statistical analysis.

Calarina and Wallace (2002) investigated to confirm several key factors in computer-based versus paper-based assessment. Factors of the study were content familiarity, computer familiarity, competitiveness, and gender. The study used a post-test only designed with one factor, test mode (Computer-based and paper-based). Students' score on 100-item multiple choice items and students' self-report on a distance learning survey were treated as dependent variables. Four sections of Computer Fundamental Course consisting of 105 students were selected as sample of the investigations. Results showed that computer-based test delivery impacted positively on students' scores as compared to paper-based test. From the abstract of the study, it was found that ANOVA of test data showed that the computer-based test group outperformed the paper-based test group. Gender, competiveness, and computer familiarity were not related to this performance difference, though content familiarity was.

THE STUDY

Instrumentation: A survey was designed for which all items of the instrument were couched and included after the literature review. The instrument was comprised of three parts. Part – 1 was related to teachers' demographic information i.e., department name, gender, designation (i.e., job tile) and professional qualifications. Two variables regarding the information for computer training certificate or diploma and experience of conducting CB examination were also included in the same part. 5 – Point attitude scale comprised of 21 items was included in the questionnaire as Part – 2 to explore teachers' attitude towards CB examinations on the basis of their personal experiences. And Part –3 contained 19 statements, which were designed to depict teachers' perceptions by comparing PB versus CB examinations, same on the bases of their personal experiences. This part helped the researchers to understand teachers' belief on PB or CB examinations.

Instrument Validity: To assess the validity, the instrument was piloted among 5 randomly selected teachers of 3 different departments i.e., Education, Physics and Business & Administration. Responses, views, and difficulties to complete the questionnaire from 30 teachers including 18 male and 12 females, were collected and recorded instantly by the researchers themselves and then thoroughly discussed with the experts. Changes were made accordingly and the final draft of the questionnaire was sent to the six different experts in the field of Education and Assessment for validating the instructions and necessary amendments.

Sampling: In 2008 there were 111 (i.e., 60 Public Sector and 53 Private Sector) universities in Pakistan (Higher Education Commission, Pakistan, 2008) out of which 36 (i.e., 20 Public Sector and 16 Private Sector) universities from Punjab Province were delimited for the study. Out of 20 Public Sector Universities, 8 (40%) were included in the sample randomly. Private Sector Universities were dropped because of the limited number of students, and the variety of different and technical disciplines offered by different universities. All male and female teachers from all teaching departments of different disciplines of sampled universities during session 2008 – 2010 constitute the population of this study. After the selection of the universities, different teaching departments of Pure Sciences, Social Sciences and Professionals were included in the study on the basis of random sampling technique. However, teachers of each department were selected on the basis of 'availability' in their offices. Permission was sought from the head of departments in each university in advance for said purpose. In all, 410 teachers were asked to complete the questionnaire. Out of which 314 (77%) questionnaires were recollected successfully after completion. Therefore, the resultant sample consisted of 314 teachers.

Response Rate & Data Analysis: Table – 1 showed detail of 314 teachers' response rate in terms of frequencies and percentages. To analyze data purposefully, demographic data of university teachers were categorized as (gender, discipline, designation, qualifications, teaching experience, computer literate/trained and experience of conducting CB examinations). Disciplines included following sub-groups: Pure Sciences (i.e., Bio, Chemistry, Physics, and Mathematics), Social Sciences (i.e., Economics, Education, and Psychology) and IT Professionals (i.e., MBA IT, Computer & Information Technology, and E-Commerce). Designations-wise distributed teachers were: Low Ranked (i.e., Lecturers and Assistant Professors) and High Ranked (i.e., Associate Professors and Professors). Qualifications-wise categories were: Less Qualified (i.e., M. A./M. Sc./M. Ed., and M. Phil) and Highly Qualified (i.e., Ph. Ds and Post Docs.). First category of teaching experience was from 1-9 years (Less Experienced) and second from 10 or more than 10 years (High Experienced). And the responses of last two groups were in the form of YES or NO. Moreover, simple percentages and Chi Square tests techniques were used to analyze data statistically. The data were interpreted on the bases of overwhelming majority (85% and above), good majority (70% to 84%) and simple majority (55% to 69%) with respect to all categories given in questionnaire.

FINDINGS & CONCLUSIONS

Part – II of the Questionnaire

Table 3 displayed attitudinal differences of each sampled group of teachers in terms of overwhelming, good majority, and simple majority responses.

From the given table it was depicted that overwhelming majority of sampled teachers; male & female teachers; teachers from natural and social sciences; low ranked teachers; less qualified teachers; less experienced & more experienced teachers; teachers who have & haven't CB examination experiences were strongly agreed that HEC Pakistan should plan to train university teachers for conducting CB examinations to enable them to assess large group of students in less time.

It was portrayed from Table 3 that good majority of sampled teachers (i.e., overall sampled teachers, male teachers, low & high ranked teachers, less & highly qualified teachers, less & more experienced teachers, teachers who have no computer training certificate, and teachers who have & have no experience of CB examinations) were agreed with the authors of the research that CB examinations are demanded due to the semester system which facilitate all stakeholders i.e., teachers, students and administrators.

It was illustrated from the same table that simple majority of sampled teachers (i.e., overall sampled teachers, female teachers, low ranked teachers, less & highly qualified teachers, less & more experienced teachers, teachers who have & have no computer training certificate, and teachers who have no experience of CB examinations) were agreed that CB examinations saves time and also facilitate the students to improve their understanding which ultimately improve their GPA therefore a country-wide policy should be prepared at university level regarding CB examinations.

Results in the column of Overwhelming Majority Responses facilitate the researchers to compare responses within the groups with respect to the percentages. It was found that female teachers, teachers from social sciences departments, highly ranked teachers, highly qualified teachers, less experienced teachers, teachers who have computer training certificate or degree, and teachers who have CB examination experiences were comparatively more positive towards CB examinations.

Percentages in the column of Good Majority Responses demonstrated that male teachers, teachers from natural sciences departments, highly ranked teachers, highly qualified teachers, less experienced teachers, teachers who have computer training certificate or degree, and teachers who have no CB examination experiences were comparatively more positive towards CB examinations.

Percentages in the column of Simple Majority Responses pointed out those teachers from IT, low ranked teachers, highly qualified teachers, more experienced teachers, teachers who have not computer training certificate or degree, and teachers who have no experience of CB examinations were more interested in CB system of examinations. While no major differences were found in the percentages of male and female teachers.

Table 6 indicated the significant and insignificant results between the attitudes of sampled teachers group-wise for each statement. Significant differences (χ^2 = 11.698>5.966, α=0.05, Sig.=0.003) were found between the attitudes of male and female teachers in 15th statement of the questionnaire. Percentages of the statement showed that 33% female and 42% male were agreed while 43% female and 49% male were disagreed. Due to the minor differences in percentages, it was not possible to declare whether male or female were more inclined towards CB examinations.

Significant differences were found between the attitudes of teachers from different departments in statements 6th (χ^2 = 10.502>9.49, α=0.05, Sig.=0.033), 8th (χ^2 = 13.729>9.49, α=0.05, Sig.=0.008), and 13th (χ^2 = 11.287>9.49, α=0.05, Sig.=0.024). In statement 6, it was clear from percentages that good majority (70%) of social science teachers, simple majority of IT professionals (65%) while 51% from natural sciences disciplines disagreed with the statement that CB testing is a worst tool of assessment. Same in statements 8 and 13, drastic difference were found between the calculated percentages.

Significant differences were found between the attitudes of low ranked and high ranked teachers in statement 20 (χ^2 = 8.132>5.99, α=0.05, Sig.=0.017). From calculated values it was clear that both groups recommended preparing a master plan to introduce CB examinations at national level. But overwhelming majority (88%) of low ranked teachers and good majority (73%) of high ranked teachers showed major attitudinal difference among the same groups.

Significant differences were found between the attitudes of teachers from different level of qualifications in statements 3rd (χ^2 = 7.867>5.99, α=0.05, Sig.=0.020), 6th (χ^2 = 8.651>5.99, α=0.05, Sig.=0.013), and 9th (χ^2 = 6.883>5.99, α=0.05, Sig.=0.032). From calculated values of statement 3, it was clear that both groups were agreed that computer facilitated in minimizing clerical mistakes. But percentages (i.e., 88% highly qualified and 78% less qualified) showed major attitudinal difference among the same groups. Same in statements 6 and 9, sweeping difference were found between the calculated percentages.

Significant differences were found between the attitudes of teachers from different level of teaching experiences in statements 3rd (χ^2 = 7.282>5.99, α=0.05, Sig.=0.026) and 11th (χ^2 = 8.651>5.99, α=0.05, Sig.=0.016). From calculated percentages of statement 11, it was clear that an overwhelming majority of both groups were agreed that CB examinations facilitate to assess more students in less time. But percentages (i.e., 86% highly experienced and 99% less experienced) showed less experienced teachers were more in CB examinations with respect to the given statement.

Part – III of the Questionnaire

Table 5 displayed results of each sampled group of teachers in terms of overwhelming, good majority, and simple majority responses.

An overwhelming majority of overall sampled teachers, female teachers, teachers from the group of social sciences & IT professionals, high ranked, less qualified teachers less experienced teachers and those teachers who have any type of computer training certificate or degree were strongly agreed with the statement that CB examinations seems to be very interesting technique of assessment but even then it’s difficult for teachers to construct objective type question papers for the same system of examinations. While same majority of all other groups of sampled teachers were highly anxious about the difficulty of constructing items for CB examinations.

Good majority of overall sampled teachers, female & male teachers, teachers from IT profession, low ranked teachers, less experienced, teachers who have computer training certificate or degree and teachers who haven’t CB examinations experiences expressed that CB examination system is risky because of system failure or light failure problems during examinations even then it’s an interesting technique of examinations for students. Not only this, they also believe that CB examinations can affect the entire educational system positively in terms of innovation and modern changes in teaching and learning methods.

Simple majority of overall sampled teachers, female & male teachers, low ranked teachers, less qualified teachers who have & have not computer certificate or degree teachers who have & have not CB examinations experiences articulated that CB examination systems could have flaws in terms of constructing different form of test items i.e., fill in the blanks, MCQs, matching items, or short answers but even then they agreed that they could frequently assess their students during session through this technique of assessment.

Not a single responded item of the questionnaire was found in the column of overwhelming majority of PB examinations. This concluded that they were highly inclined towards CB examinations. This was verified by good majority of sampled teachers from all groups except female teachers, teachers from the group of IT profession, more experienced and teachers who have no computer training certificate or degree expressed that administrators of their institutions are trying hard to bring change in PB examinations systems.

Simple majority of overall sampled teachers, female & male teachers, teachers from social, natural sciences, low ranked teachers, teachers who have and have not certificate or degree and teachers who have no experience of CB examinations expressed that PB examinations systems is beneficial and easy to manage because results are more accurate in same system of examinations.

Column-wise interpretations of Table 5 helped to compare and conclude that overall sampled teachers were in favor of CB examinations, female teachers, teachers from social science group, highly ranked teachers, highly qualified teachers, more experienced teachers, and teachers who have CB examination experiences were found to be more interested in CB system of examinations as compared to other peered groups.

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Appendices

Table – 1: Group-wise Percentages of Overall Sampled Teachers

Categories	Groups	(n) Percentage
Gender		
	Female	(140) 45%
	Male	(174) 55%
Departments		
	Natural Sciences	(123) 39%
	Social Sciences	(093) 30%
	IT* Professionals	(098) 31%
Designation (i.e., Job Tile)		
	Low Ranked: Lecturers + Assistant Professors	(277) 88%
	Highly Ranked: Associate Professors + Professors	(037) 12%
Qualifications		
	Less Qualified: M. A/M. Sc + M. Phil/MS	(247) 79%
	Highly Qualified: Ph. Ds + Post Docs	(067) 21%
Teaching Experiences		
	Less Experienced: 1 – 9 Years	(241) 77%
	More Experienced: 10 and above	(073) 23%
Computer Training Certificate		
	No	(177) 56%
	Yes	(137) 44%
Experience of CB Examination		
	No	(293) 93%
	Yes	(021) 07%

***IT = Information Technology**

Table – 2: List of Statements/Items included in Part – II of the Questionnaire

S. No. *	Statements
1.	CB examinations save time.
2.	Online self-assessments help students to improve their understanding and GPA.
3.	Using computer in preparing and declaring results minimizes clerical mistakes.
4.	CB examinations are insecure technique of assessment.
5.	Results of CB examinations are always invalid.
6.	Computer-based testing is a worst tool of assessment.
7.	CB examinations are demanded due to semester system.
8.	Using computers in examinations does not have any effect on students.
9.	Teachers should be trained for using computer in examination.
10.	New technological-based assessment methods should be used to analyze students' progress.
11.	CB examinations facilitate to assess more students in short time.
12.	Online examination technique should be limited to classroom tests.
13.	CB examinations facilitates all e.g., administrators, teachers and students.
14.	Computer-based papers reduce cheating by a difficult shuffle of questions available for each student.
15.	Paper free environment slashes cost.
16.	Computer negatively effect on thinking potential of students' during paper.
17.	A country-wide policy should be prepared for CB exams at university level.
18.	Both systems of examinations should be kept parallel.
19.	It is not possible in Pakistan to apply CB system of exams in its real form i.e., construction, administration, delivery and marking via computer, in all universities.
20.	HEC Pakistan should make a master plan to introduce CB examination at national level.
21.	In order to implement CB examinations, all institutions are required to improve their teaching techniques.

Table 3: Group-wise Responses of Teachers for all Statements of Part – II of the Questionnaire

Group No	Overwhelming Responses in Statements (%):	Good Majority Responses in Statements (%):	Simple majority Responses in Statements (%):
Overall Sample	9 (89%), 11 (89%), 20 (87)	3 (80%), 7 (74%), 10 (83%), 13 (74%), 18 (70%), 21 (82)	1 (66%), 2 (62%), 4 (64%), 6 (61%), 14 (63%), 16 (66%), 17 (59%), 19 (69%)
Female	9 (90%), 10 (85%), 11 (87%), 20 (90%), 21 (87%).	3 (75%), 7 (75%), 18 (71%).	1 (60%), 2 (63%), 4 (58%), 5 (56%), 6 (63%), 14 (57%), 16 (68%), 17 (61%), 19 (68%)
Male	9 (88%), 11 (91%), 20 (84%).	1 (70%), 3 (84%), 7 (73%), 10 (82%), 13 (75%), 19 (71%), 21 (79%)	2 (61%), 4 (68%), 6 (60%), 12 (56%), 14 (68%), 16 (64%), 17 (57%), 18 (68%),
Natural Sciences	9 (86%), 11 (86%), 20 (89%)	3 (77%), 10 (73%), 18 (72%), 19 (71%), 21 (83%)	1 (65%), 2 (64%), 4 (58%), 7 (81%), 16 (61%), 17 (62%)
Social Sciences	9 (90%), 10 (89%), 11 (90%), 20 (88%), 21 (86%)	3 (76%), 6 (70%), 13 (76%), 16 (73%), 18 (70%)	1 (67%), 4 (63%), 5 (55%), 7 (71%), 17 (63%), 19 (68%)
IT Prof.	3 (85%), 9 (91%), 10 (91%), 11 (93%)	4 (72%), 13 (82%), 20 (82%), 21 (78%)	1 (65%), 2 (67%), 6 (65%), 7 (67%), 8 (55%), 12 (57%), 16 (65%), 18 (66%), 19 (69%),
Low Ranked	9 (87%), 11 (88%), 20 (88%)	3 (78%), 7 (73%), 10 (84%), 13 (74%), 21 (83%)	1 (66%), 2 (61%), 4 (64%), 6 (60%), 14 (63%), 16 (64%), 17 (57%), 18 (69%), 19 (69%)
Highly Ranked	3 (91%), 9 (100%), 11 (100%)	7 (79%), 10 (77%), 13 (79%), 16 (77%), 17 (73%), 18 (78%), 19 (73%), 20 (73%), 21 (77%)	1 (59%), 2 (65%), 4 (65%), 6 (68%), 12 (68%), 14 (67%)
Less Qualified	9 (87%), 11 (87%), 20 (88%)	3 (78%), 7 (71%), 10 (83%), 13 (75%), 19 (70%), 21 (83%)	1 (68%), 2 (62%), 4 (65%), 6 (63%), 14 (63%), 16 (63%), 17 (57%), 18 (69%)
Highly Qualified	3 (88%), 9 (94%), 11 (95%)	7 (83%), 10 (83%), 13 (72%), 16 (74%), 18 (73%), 20 (81%), 21 (82%)	1 (55%), 2 (60%), 4 (59%), 12 (65%), 14 (64%), 15 (55%), 17 (66%), 19 (69%)
Less Experienced	3 (90%), 9 (93%), 11 (99%), 20 (88%), 21 (88%)	7 (76%), 10 (79%), 13 (80%), 14 (72%), 18 (75%), 19 (79%)	1 (61%), 2 (59%), 4 (61%), 5 (56%), 6 (69%), 12 (57%), 16 (66%), 17 (68%)
More Experienced	9 (87%), 11 (86%), 20 (86%), 21 (86%)	3 (77%), 7 (73%), 10 (84%), 13 (73%),	1 (67%), 2 (63%), 4 (65%), 6 (59%), 14 (60%), 16 (66%), 17 (57%), 18 (68%), 19 (69%)
No Certificate	9 (87%), 20 (90%)	3 (77%), 7 (78%), 10 (81%), 11 (84%), 13 (71%), 21 (82%)	1 (65%), 2 (59%), 4 (57%), 5 (56%), 6 (59%), 14 (60%), 15 (63%), 17 (56%), 19 (67%)
Yes, Certificate	9 (91%), 10 (85%), 11 (96%)	3 (83%), 4 (73%), 13 (79%), 18 (72%), 19 (73%), 20 (83%), 21 (83%)	1 (66%), 2 (66%), 6 (64%), 7 (69%), 8 (55%), 14 (67%), 15 (69%), 17 (63%),
No, CB Exams	9 (88%), 11 (89%), 20 (87%)	3 (78%), 7 (73%), 10 (82%), 13 (74%), 19 (71%), 21 (82%)	1 (66%), 2 (60%), 4 (65%), 6 (61%), 14 (61%), 14 (65%), 17 (57%), 18 (69%)
Yes, CB Exams	2 (86%), 3 (100%), 9 (100%), 10 (100%), 11 (95%), 14 (86%), 17 (86%), 20 (86%), 21 (95%)	7 (84%), 13 (81%), 15 (76%), 18 (81%)	1 (57%), 6 (62%), 12 (62%)

Table – 4: List of Statements/Items included in Part – III of the Questionnaire

S. No.*	Statements	CB	PB
1.	Students could be assessed more frequently in		
2.	Students could loose confidence in:		
3.	Which system could be more effective to create competition among students?		
4.	Which system seems to be more interesting technique?		
5.	Which system of examination could be more interesting for students?		
6.	Which system of examination could have more flaws?		
7.	Which system of examination is easy to manage?		
8.	Which system of examination is more expensive?		
9.	Which system of examination could produce more accurate results?		
10.	Which system of examination is more beneficial in all respects?		
11.	Educational institutions may work more smoothly under which system of examination?		
12.	Which system of examination is more risky?		
13.	Which system of examination could reduce teachers' work load?		
14.	Which system of examination supports to construct test items in different forms?		
15.	Which system of examination could be more relaxing for students?		
16.	Which system of examination affects the entire educational system more positively?		
17.	Administrators of my institution are trying hard to change for:		
18.	It could be difficult for teachers to construct test items for:		
19.	Which system of examination could be more supportive to achieve educational objectives positively?		

Table 5: Group-wise Responses of Teachers for all Statement of Part – III of the Questionnaire

	CB Examinations			PB Examinations		
Group No	**Overwhelming Responses in Statements (%):**	**Good Majority Responses in Statements (%):**	**Simple majority Responses in Statements (%):**	**Overwhelming Responses in Statements (%):**	**Good Majority Responses in Statements (%):**	**Simple majority Responses in Statements (%):**
Overall Sample	4 (85%), 18 (88%)	5 (72%), 12 (78%), 15 (77%), 16 (73%), 19 (81%)	1 (64%), 6 (65%), 8 (63%), 13 (68%), 14 (68%)	-	17 (71%)	7 (62%), 9 (65%) 10 (64%)
Female	4 (87%), 18 (87%)	5 (75%), 8 (73%), 12 (79%), 13 (73%), 15 (75%), 16 (72%), 19 (79%)	1 (63%), 6 (64%), 14 (68%)	-	-	7 (60%), 9 (66%), 10 (64%), 17 (69%)
Male	18 (88%)	5 (71%), 12 (77%), 15 (79%), 16 (73%), 19 (83%)	1 (64%), 3 (56%), 6 (66%), 8 (55%), 13 (64%), 14 (68%),	-	17 (73%)	7 (64%), 9 (64%), 10 (64%)
Natural Sciences	18 (85%)	4 (82%), 6 (74%), 12 (81%), 13 (79%), 14 (73%), 15 (75%), 16 (78%), 19 (81%)	1 (57%), 2 (57%), 3 (57%), 5 (69%), 8 (63%)	-	17 (74%)	7 (59%), 9 (67%), 10 (62%), 11 (65%)
Social Sciences	4 (88%), 18 (89%)	1 (74%), 5 (76%), 12 (70%), 15 (80%), 19 (80%)	8 (65%), 13 (57%), 16 (64%)	-	17 (71%)	2(55%), 9(57%), 10 (63%), 11 (64%),
IT Prof.	4 (86%), 18 (89%)	5 (73%), 12 (82%), 14 (75%), 15 (77%), 16 (74%), 19 (83%)	1 (63%), 6 (66%), 8 (61%), 13 (65%)	-	-	2 (57%), 9 (69%), 10 (66%), 11 (63%), 17 (67%)
Low Ranked	18 (87%)	4 (84%), 5 (71%), 12 (77%), 15 (77%), 16 (71%), 19 (81%)	1 (63%), 6 (65%), 13 (66%), 14 (66%)	-	17 (73%)	7 (63%), 9 (64%), 10 (64%), 11 (63%)
Highly Ranked	4 (94%), 5 (85%), 12 (85%), 16 (88%), 18 (94%)	8 (72%), 13 (82%), 14 (77%), 15 (84%), 19 (80%)	1 (69%), 6 (65%)	-	9 (74%), 11 (72%)	7 (57%), 10 (59%)
Less Qualified	4 (86%), 18 (85%)	5 (72%), 12 (76%), 15 (78%), 19 (81%)	1 (63%), 6 (65%), 8 (61%), 13 (66%), 14 (65%), 16 (69%)	-	17 (70%)	7 (66%), 9 (64%), 10 (67%), 11 (66%)
Highly Qualified	12 (86%), 16 (86%), 18 (96%)	4 (82%), 5 (75%), 8 (71%), 13 (77%), 14 (77%), 15 (74%), 19 (82%)	1 (67%), 2 (60%), 6 (65%)	-	17 (77%)	9 (67%), 11(58%)
Less Experienced	4 (86%), 18 (85%)	5 (71%), 12 (78%), 15 (75%), 16 (73%), 19 (78%)	1 (61%), 6 (65%), 8 (63%)	-	17 (76%)	1 (61%), 6 (65%), 8 (63%)
More Experienced	15 (85%), 18 (96%), 19 (90%)	1 (72%), 4 (82%), 5 (77%), 12 (78%), 13 (74%), 14 (70%), 16 (70%)	3 (56%), 6 (64%), 6 (64%)	-	-	9 (67%), 10 (61%), 17 (55%)
No Certificate	18 (86%), 19 (85%)	4 (81%), 8 (72%), 12 (82%), 13 (70%),15 (77%), 16 (72%)	1 (62%), 5 (69%), 6 (67%), 14 (69%)	-	-	9 (67%), 10 (64%), 11 (63%), 17 (68%)
Yes, Certificate	4 (90%), 18 (89%)	5 (76%), 12 (73%), 15 (78%), 16 (73%), 19 (76%)	1 (65%), 3 (60%), 6 (62%), 13 (65%), 14 (66%)	-	17 (75%)	9 (62%), 10 (63%), 11 (66%)
No, CB Exams	18 (88%)	4 (84%), 5 (70%), 12 (77%), 15 (77%), 16 (73%), 19 (81%)	1 (64%), 6 (65%), 8 (63%), 13 (68%), 14 (68%)	-	17 (71%)	7 (63%), 9 (66%), 10 (65%), 11 (66%)
Yes, CB Exams	4 (100%), 5 (100%), 12 (86%), 15 (86%)	13 (71%), 18 (76%), 19 (81%)	1 (62%), 2 (67%), 3 (57%), 6 (57%), 8 (67%), 9 (57%), 14 (62%), 16 (59%)	-	17 (75%)	-

Table – 6: Calculated Values of χ^2

Sr. No		Gender	Dept.	Desig.	Qualif.	Teach Exp.	Comp Certi.	CB Exp.
Level of Significance 95%		df = 2, χ^2= 5.99	df = 4, χ^2 = 9.49	df = 2, χ^2=5.99	df = 2, χ^2=5.99	df = 2, χ^2=5.99	df = 2, χ^2=5.99	df = 2, χ^2= 5.99
1.	χ^2	4.923	4.222	3.639	4.474	0.843	1.512	2.542
	Sig.	0.085	0.377	0.162	0.107	0.656	0.469	0.281
2.	χ^2	0.909	4.440	0.348	0.686	2.615	2.997	5.528
	Sig.	0.635	0.350	0.840	0.710	0.271	0.223	0.063
3.	χ^2	3.766	3.289	4.046	**7.867**	**7.282**	1.769	5.754
	Sig.	0.152	0.511	0.132	0.020	0.026	0.413	0.056
4.	χ^2	3.335	5.869	1.045	0.928	1.167	**8.401**	4.589
	Sig.	0.189	0.209	0.593	0.629	0.558	0.015	0.101
5.	χ^2	2.121	3.341	2.172	1.714	0.691	3.196	2.233
	Sig.	0.346	0.502	0.338	0.424	0.708	0.202	0.327
6.	χ^2	0.659	**10.502**	0.708	**8.651**	4.819	1.531	0.045
	Sig.	0.719	0.033	0.702	0.013	0.090	0.465	0.978
7.	χ^2	3.416	7.999	0.654	4.418	0.477	4.621	1.208
	Sig.	0.181	0.092	0.721	0.110	0.788	0.099	0.547
8.	χ^2	3.737	**13.729**	3.724	1.320	4.619	5.780	5.454
	Sig.	0.154	0.008	0.155	0.517	0.099	0.056	0.065
9.	χ^2	0.613	3.112	4.920	**6.883**	2.138	1.855	2.901
	Sig.	0.736	0.539	0.085	0.032	0.343	0.396	0.234
10.	χ^2	3.046	16.525	1.299	0.202	1.353	1.644	4.597
	Sig.	0.218	0.002	0.522	0.904	0.508	0.440	0.100
11.	χ^2	2.280	5.557	4.526	3.243	**8.319**	**10.391**	1.596
	Sig.	0.320	0.235	0.104	0.198	0.016	0.006	0.450
12.	χ^2	1.942	2.982	3.243	4.432	0.801	0.878	0.728
	Sig.	0.379	0.561	0.198	0.109	0.670	0.645	0.695
13.	χ^2	0.951	**11.287**	3.525	4.491	3.868	4.232	3.550
	Sig.	0.621	0.024	0.172	0.106	0.145	0.121	0.169
14.	χ^2	4.506	3.987	0.676	0.391	3.431	1.652	5.233
	Sig.	0.105	0.408	0.713	0.822	0.180	0.438	0.073
15.	χ^2	**11.698**	7.599	0.755	4.324	0.198	1.827	2.350
	Sig.	0.003	0.107	0.685	0.115	0.906	0.401	0.309
16.	χ^2	1.482	7.478	2.009	2.590	0.129	4.628	2.545
	Sig.	0.477	0.113	0.366	0.274	0.937	0.096	0.280
17.	χ^2	1.258	3.900	3.102	2.533	4.045	4.066	**6.684**
	Sig.	0.533	0.420	0.212	0.282	0.132	0.131	0.035
18.	χ^2	0.349	5.490	2.162	1.857	1.415	0.370	1.489
	Sig.	0.840	0.241	0.339	0.395	0.493	0.831	0.475
19.	χ^2	3.047	1.921	1.813	0.266	0.197	1.490	3.619
	Sig.	0.218	0.750	0.404	0.875	0.906	0.475	0.164
20.	χ^2	3.429	7.414	**8.132**	3.124	1.051	**6.388**	0.188
	Sig.	0.180	0.116	0.017	0.210	0.591	0.041	0.910
21.	χ^2	4.704	5.689	3.302	1.003	2.386	1.604	2.570
	Sig.	0.095	0.224	0.192	0.605	0.242	0.448	0.277

CONSTRUCTING KNOWLEDGE: AN EXPERIENCE OF ACTIVE AND COLLABORATIVE LEARNING IN ICT CLASSROOMS

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ABSTRACT
This paper reports on the impact of the implementation of active and collaborative practices in ICT (information and communication technologies) classrooms. Both of these approaches convey a lot of responsibility from the teacher to the students and the hoping, as backed up by the literature, is to promote deeper learning and reasoning skills at a higher level. The question is: how do you do all that? This research describes a specific environment that makes use of collaborative tools, like wikis and forums within an e-learning platform and of specific CRM (customer relationship management) software. In order to analyze how this learning environment gets learners actively involved in learning and working together in productive ways, students were surveyed by responding to questionnaires. Several cause-effect relations underlying the teaching-learning methodology and the students' performance are discussed.

1. INTRODUCTION

Active and collaborative learning are well known as alternative strategies to conventional teaching models (e.g. Kaufman, Sutow & Dunn, 1997; Prince, 2004). In particular, active and collaborative practices in ICT (information and communication technologies) classrooms are an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers. The pedagogical and socio-economic forces that have driven the higher learning institutions to adopt and incorporate ICT in teaching and learning are already changing the organization and delivery of higher education (Sife, Lwoga & Sanga, 2007). However, like Silva *et al*. (2002) say, there is still much to be done within the culture of the universities, to overcome the individualistic matrix to a culture of collaborative learning.

In the present study we highlight a specific environment that makes use of collaborative technological tools, like wikis and forums within an e-learning platform. Against the background of this problematic, the general goal of this paper is to contribute for the theoretical discussion on how active and collaborative experiences in ICT classrooms play a role on the construction of knowledge in higher education institutions (HEIs). We did, however, limit our field of study to the context of the curricular unit of CRM (Customer Relationship Management) Systems, included in the last semester of the last year of the study plan of the first cycle of studies of the Marketing course available at the ISCA-UA (Higher Institute of Accounting and Administration of the University of Aveiro), Portugal. Based on the pointed outlines and within the curricular case presented, we intend to: (1) understand how collaborative learning environments get students actively involved in the learning process; (2) perspective the role of collaborative tools at the level of group work and (3) find out how students assess their performance within a working group.

This article is organized into five key points. After the introduction we try to contextualize the use of ICT at the level of active and collaborative methodologies in the teaching and learning processes in higher education. The next section focuses on the methodological aspects of the study, including the context of the case study used in the research and techniques for collecting and processing data. The fourth section is devoted to present and discuss the results obtained. The paper ends with the main conclusions of the study.

2. CHALLENGES IN LEARNING AND TEACHING IN HIGHER EDUCATION

Trying to ensure that every student who enters the work market bears a set of personal attributions acknowledged as essential, challenges HEIs with the need to activate new ways to produce and disseminate knowledge. Bearing this context in mind, it is possible to realize a society which generates challenges over a set of not only professional competences, but also of personal and social ones.

2.1. The changing paradigm

In the report made for UNESCO by the (International Commission on Education for the Twenty-first Century, 1996) a complementary mission for education is immediately referred: that of fructifying the creative talents and potentialities of all individuals. In that very same report, the need for a lifelong learning process is strengthened, as one of the keys to access education. More, the adequacy of the higher education system to the teaching-learning model sustained by the Bologna Process, did also jeopardize a profound change of paradigm: in order to achieve the European student profile, HEIs should emphasize horizontal competences which render students responsible for their learning processes, thus leaving the teachers with the task to facilitate and orient those processes. The implementation of these guidelines does inevitably create the need to re-evaluate the pedagogical activities at the level of goal definition and assessment, as well as, particularly, at the level of execution and follow-up of the methodological processes. Also, the new demands regarding students' skills have generated profound implications in the change of the pedagogical paradigm to student-centered methodologies, which make the student an active element in learning, properly guided by tutorial support. These set of problems induce some authors (e.g. Silén & Juhlin, 2008) to declare that conventional methods of instruction are inadequate for what needs to be known and so, there seems to be more and more agreement that higher education methodologies have to be rethought. The arguments involved in such methodologies are multidimensional and diversified.

2.2. Active and collaborative learning in higher education

Active learning has received considerable attention over the past several years. Often presented as a radical change from traditional instruction, active learning has appealed strong advocates among those looking for alternatives to traditional teaching methods, while disbelieving ones regard active learning as another fashion trend (Prince, 2004). It is not possible to provide unanimously accepted definitions for all of the vocabulary of active learning since different authors have different interpretations. Still, it is possible to provide some generally accepted definitions and to highlight distinctions in how common terms are used (Prince, 2004).

Generally defined as any instructional method that engages students in the learning process, the core elements of active learning are student activity and engagement in the learning process. While, on the one hand, Kaufman *et al*. (1997) define collaborative learning as a spectrum of instruction that involves small groups of students who have assigned an academic goal, on the other hand, Prince (2004) defines cooperative learning as a structured form of group work where students pursue common goals while being assessed individually. Although some authors (e.g. Kaufman *et al*., 1997) distinguish between collaborative and cooperative learning as having distinct historical developments, this study will assume the perspective of Panitz (1996) and Prince (2004) that collaborative learning encompasses cooperative learning as, in either interpretation, the core element is the emphasis on student interactions rather than on learning as a solitary activity.

Despite the empirical support for active learning is extensive, not all is compelling. In fact, while several authors (e.g. Bonwell & Eison, 1991) conclude that it leads to better student attitudes and improvements in students' thinking and writing, motivating students for further study and developing thinking skills, others (e.g. McKeachie, 1972) admit that the improvement of active learning over lectures seem to be small. But, as Prince (2004) suggests, the variety of instructional methods labeled as active learning muddles the issue. In the analysis that the very same author does of the two core elements of active learning (introducing activities into the traditional lecture and promoting students' engagement) some conclusions arise. First, that simple periodically pauses procedures during classes, provide a baseline that can improve the effectiveness of lectures, as it has to do with student attention span. But, simply introducing activity into the classroom may fail to capture the students' attention if the activities are not designed around important learning outcomes. So, second, it is central to promote thoughtful engagement on the part of the student which is one of the most important predictors of success in college.

2.3. Using ICT to promote active and collaborative practices

A possibility to promote active and collaborative practices is that of fostering the change of a traditional teaching system to adopt and incorporate ICT in teaching and learning. The importance of computer supported learning is an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers. But, as Stahl, Koschmann and Suthers (2006) claim, the interplay of learning with technology has problematized the very notion of learning and called into question prevailing assumptions about how to study it. Namely, about understanding the actions and activities mediated by ICT or about knowing in which fields and to what extent there are obstacles or facilitators, and the risks in using ICT in teaching and learning at university level (Ludvigsen & Morch, 2007; Vajargah, Jahani & Azadmanesh, 2010).

It is not possible to ignore the potential of ICT and, specially, the internet and its expansion through the development of computer networks. The thrilling potential of the internet to connect people in innovative ways provided a stimulus for computer supported collaborative learning research. As ICT developed, unpredicted barriers to design, disseminate and effectively take advantage of innovative educational software became more and more apparent (Stahl *et al*., 2006). As mentioned in the report made by the International Commission on Education for the Twenty-first Century (1996), this technological revolution obviously constitutes an essential element in the understanding of our modernity, as it creates new forms of socialization and, even, new definitions of individual and collective identity. For example, when presenting the theoretical rationale for a pedagogical and technological scaffolding of a computer supported collaborative learning environment, Ludvigsen and Morch (2007) argued that it emerged in response to skills that were previously associated with deep learning, which are important in a knowledge-based society. In the perspective of Lehtinen (2003), the arguments for the use of ICT in education are characteristically based on various self-evident benefits of information and communication technology: the possibility for a beneficial relationship between the system and the learner; the possibility to facilitate the understanding of the phenomena under study; the possibility of advantages in simulating real-life situations; or the possibility of a useful tool for synchronous and asynchronous communication between the teacher and students and among students. But the opinions are not consensual. The very same author, (Lehtinen, 2003), as well as others (e.g. Ludvigsen & Morch, 2007) warns to several paradigms in the use of ICT: the assumption that learning is seen as the process of change in social relations in which the learner is imperatively situated; the problem of mutual understanding in ICT applications; or the insight concerning which conditions one can expect students to develop deep knowledge using ICT. These can give an idea of how ICT have been played a significant role in the development of new theoretical approaches on teaching and learning and how important it is to understand technology-based environments that can provide learners with new opportunities for activities which are beneficial for knowledge construction.

Previous research has been done on student collaboration using wikis (Judd, Kennedy & Cropper, 2010). Widely promoted as collaborative writing tools, wikis are gaining in popularity in educational settings. However, while wikis include features that are designed to facilitate collaboration, the few empirical studies that have considered this issue report that their use do not necessarily ensure or even encourage collaborative learning behavior (Judd *et al*., 2010). Two important aspects denoted by Judd *et al*. (2010) show evidence that the majority of students' contributions were made late in the activity, which made the possibility of extensive collaboration unlikely; and that students made little use of the wiki's commenting feature - a critical tool for contextualizing and coordinating their contributions for and with others - which also made the possibility of extensive collaboration unlikely.

Online discussion forums are an increasingly common use of new information and communication technologies in education. As proposed by Judd *et al*. (2010), the common conception of the online discussion forum is that it is a virtual learning environment in which students are likely to learn as much from one another as from course materials or lectures. This point of view emphasizes that what students learn can be seen as a creative cognitive process of offering up ideas, having them criticized or expanded on, and being able to reshape ideas in the light of peer discussions. In other words, the rationale on forums shows evidence that, by reflecting on peers' contributions in online discussions and articulating emergent understanding, students engage in higher-order processing of information and are led towards the construction of personal meaning which is not individualistic, but rather a product of the students' interaction and collaboration. Judd *et al*. (2010) refer to some studies that point in the same direction: forums increase participation and collaborative thinking through the provision of asynchronous, nonhierarchical and reciprocal communication environments, as well as the academic discourse promotes increased student engagement, critical analysis and reflection, and the social construction of knowledge. Also, the findings of Yukselturk (2010) emphasized that students' workload and responsibilities as well as the planning of instructional activities in discussion forum, should be taken into account in designing online discussions.

3. METHODOLOGY

The curricular unit of CRM Systems was planned not only to allow the maxim participation of the students, but also to be centered on promotion of deep learning and reasoning skills by the students. To allow this, the curricular plan was designed to involve different methodologies to each specific learning outcome. To accomplish this, students were organized into groups according to some specific guidelines. The groups were mainly constituted of four students with homogeneous characteristics: similar grade average on a specific set of units of curricular plan, compatibility of time to work in group, and same registration system in the course. This information was previously identified through a simple questionnaire available on the university's e-learning platform. In a rotative mode (by activity), each group chose a student to be coordinator. Beyond the accomplishment as a group member, the coordinator has the added responsibility of ensuring the observation of a set of working rules, of reading and correcting all documents produced to ensure consistency among the work done, and of promoting cooperation and mutual aid between members. At the end of each activity, each student assesses not only his own performance but also the one of each of his colleagues.

Framed by the goals presented, four main learning outcomes can be defined. First, a successful learner from this curricular unit has to be able to identify the major phases that support customer relationship. In order to demonstrate that this specific learning outcome has been achieved, students are encouraged to prepare and present a lesson about each phase of the process. Therefore, after teacher has introduced the topic and encouraged students with questions for reflection (two lessons), students are invited to prepare and present their own lessons on the phases of customer relationship management. Finally, this topic is closed with another class where the professor presents and discusses with the students some important metrics to determine the implementation degree of each phase of the managing customer relationships process.

In what respects to the second learning outcome, on successful completion of the course, students have to be able to recognize the various levels of a CRM system and how they are integrated and related to the organizational objectives of relationship marketing. To demonstrate that this second learning outcome has been attained, students are encouraged to research about case studies describing, totally or partially, experiences on implementation of a CRM system. In this case, in each class and after teacher has presented the background of a CRM module system and has explained the functionalities that should support it in an organizational context, a brief contact with the CRM software is enhanced. In the second part of each class, one group presents the case study and the results of their analysis according to a formatting model previously set by the teacher. In particular, students are oriented to identify the type of situation portrayed, the main theme, the problem outlined and the decisions taken, the qualitative and the quantitative aspects highlighted, the technological solutions used and the functionalities that aim to support them.

While in the third learning outcome, students have to identify, distinguish and use the various features of each module of a CRM system and recognize how the modules are intertwined, in the fourth leaning outcome, students have to design and monitor a program of implementation of a CRM system (including the definition of the business plan, the analysis and the selection of a technological tool according with the business' objectives), and to manage the several projects that can be integrated in the process. The validation of these two learning outcomes is organized in two complementary parts, with students working in groups. On the one hand, students are asked to develop a summary report that conceptually characterizes the CRM systems. This is done using a wiki collaborative tool available on an e-learning platform. On the other hand, students are encouraged to simulate a business environment and the management of customers relationships using a complete open source software available on the market (VTigerCRM). This software allows the use in collaborative mode. In the end of course, the groups of students presented their business in class and deliver to the professor the portfolio describing the main results of their experience with the software. All these activities are also supported by discussion forums restricted between each group, and available through the e-learning platform.

Finally and in the last class, students are encouraged to answer one more questionnaire to register their opinion about the teaching-learning methodology used. It is important to notice that, in this case, the answers are pre-oriented on a Likert scale with 6 points, forcing the respondent to take a negative or positive position about his own perceptions. This is the unique anonymous questionnaire. A total of 28 students that attended the curricular unit in continuous assessment were included in the study. Data was collected through questionnaires available on the e-learning platform Moodle. Descriptive statistical techniques were used to analyze quantitative data.

4. RESULTS AND DISCUSSION

Within the methodology previously defined, nine groups were found; three with 4 members, four with 3 members and two with 2 members.

4.1. Self-assessment and hetero-assessment of groups' activities

Data analysis concerning self and hetero-assessment of the groups' activities was organized around the four main learning outcomes previously defined: presentation of a lesson [Table 1], analysis and presentation of a case study [Table 2], and simulation of a business environment [Table 3].

Table 1:. Results of self- assessment and hetero-assessment by groups concerning the presentation of a lesson

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members)	Deviation between coordinator and other	Grade of self-assessment (coordinator)	Average grade of self-/hetero-
A	4	4	6	8,3	-2,3	4	4,4
B	4	3	7	4,0	3,0	4	4,0
C	3	3	22	20,0	2,0	4	4,7
D	4	4	37	26,3	10,7	4	4,8
E	2	2	10	10,0	0,0	5	5,0
F	3	3	12	12,5	-0,5	4	4,0
G	3	3	15	9,5	5,5	5	4,7
H	3	3	10	10,0	0,0	5	4,3
I	2	2	10	7,0	3,0	4	3,5

In what concerns the presentation of a lesson, the results of self- assessment and hetero-assessment by groups show that 27 out of 28 (96%) students did answer the questionnaire [Table 1]. Noteworthy is the fact that the majority of the groups present a positive deviation between the time spent by the coordinator and the average time spent by other members, which seems to indicate that the coordinator did responsible shoulder his role. In fact, we can assume that if it was not like that, all the group work would have been compromised and the necessary time to fulfill the task proposed (prepare the presentation of the lesson) would be longer. However, the substantially different results between the groups relatively to the average time spent in the activity, makes us wonder about the relative merits of the work done. However this aspect does not seem to have occurred since all groups self-assessed with a 4 or even a 5 grade (good or very good performance). So, maybe the collaborative task did really get students actively involved in the learning process.

Table 2:. Results of self- assessment and hetero-assessment by groups concerning the analysis and presentation of a case study

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members)	Deviation between coordinator and other	Grade of self-assessment (coordinator)	Average grade of self-assessment
A	4	4	4	3,7	0,3	4	4,3
B	4	3	3	4,0	-1,0	5	4,3
C	3	3	6	5,5	0,5	4	3,7
D	4	3	8	7,5	0,5	4	4,3
E	2	2	10	11,0	-1,0	5	5,0
F	3	3	20	7,5	12,5	4	4,0
G	3	1	-	3,0	-	-	4,0
H	3	3	10	11,5	-1,5	4	4,0
I	2	2	5	4,0	1,0	4	4,0

As regards to the analysis and presentation of a case study, Table 2 shows that 24 out of 28 (86%) students did answer the questionnaire. In this situation there are more cases of discrepancy between the time spent by the coordinator and the average time spent by other members. In fact, in three situations the deviation is negative. One more time, most groups self-assessed their performance as grade 4 or 5. Eventually, one can assume that the empirical nature of this task is much more appropriate to group discussion than the presentation of a lesson assumed to be much more in compliance with theoretical concepts and, consequently, easier to prepare.

Table 3:. Results of self- assessment and hetero-assessment by groups concerning the use of a wiki tool and the simulation of a business environment

Group	Number of members.	Number of respondents' members.	Time spent (coordinator) (h)	Average time spent (other members)	Deviation between coordinator and other	Grade of self-assessment (coordinator)	Average grade of self-assessment
A	4	2	25	12,0	13,0	5	4,5
B	4	3	-	9,7	-	-	4,3
C	3	3	20	32,5	-12,5	5	4,6
D	4	3	24	24,0	0,0	4	4,3

E	2	2	40	35,0	5,0	5	5,0
F	3	2	-	30,0	-	-	4,0
G	3	3	20	7,0	13,0	5	5,0
H	3	3	8	50,0	-42,0	4	3,9
I	2	2	6	48,0	-42,0	3	3,5

The Table 3 shows that the rate of respondents concerning to the last activity (use of wikis and CRM software) was of 82%, answering 23 students. In this case, the discrepancy between the time spent by the coordinator and the average time spent by other members is much higher and is verified in most groups. The performance is in most case classified as 4 or 5. The verified decrease of respondents in consecutive surveys could be explained either by saturation with consecutive requests to fill out questionnaires, or because the last questionnaire was completed by the end of the semester. Nevertheless, this isn’t significant. Similarly to the previous results, and also probably, the complexity of the task (simulation of a business environment) seems to justify the greater involvement of the students and, consequently, the more time required to complete the mission. Another important conclusion is the possibility to perspective the role of collaborative tools at the level of working groups: less pragmatic tasks are more likely to be easily prepared by groups while more practical ones not only need more time but, more important, need the discussion inside the group.

Noteworthy is the fact that, in some groups, there is a big and negative deviation between the time spent by the coordinator and the average time spent by other members. We think that, maybe, this can be a symptom that, in these groups and consecutively, the same student performs a more role active even in activities where he isn't the coordinator. That conclusion seems even more important as this situation occurs in small groups of 2 or 3 elements members. Finally, it seems that data reflects the level of effort expected for each activity: the use of a wiki tool and the simulation of a business environment take more time than the presentation of a lesson and this, in turn, takes more time than the analysis and presentation of a case study.

4.2. Self-assessment of the teaching-learning methodologies used in class

In order to realize students’ opinions on the teaching and learning methodologies used in the class, students were invited to answer a last and anonymous questionnaire available on the Moodle platform. In this questionnaire answered nineteen students aged between 20 and 39 years, eight males and eleven females. More, eleven students reclaim to be registered in “ordinary” scheme, seven as “student employee” scheme, and one as “leader associative”. Concerning to their ability to write or communicate orally, in Portuguese language, all the students reported to have a satisfactory level, with the great majority assuming a good or very good ability. However, and in what concerns the ability to understand written and oral English, roughly a quarter of students reported that their ability was not satisfactory, Roughly half of the students rated their ability as "satisfies well" or "satisfies very well" [Table 4]. This is an important issue, because all the activities proposed implied to read and analyze literature, in English language, and consequent oral exposition, in Portuguese language, in class.

Table 4: Ability of expression/understanding of portuguese/english languages

	Number of students			
Scale	Ability to write (in Portuguese)	Ability to communicate orally (in Portuguese)	Ability to understand written English	Ability to understand oral English
Satisfies very well	6	10	3	4
Satisfies well	11	7	8	8
Satisfies	2	2	4	2
Satisfies little	0	0	2	3
Satisfies very little	0	0	0	1
No satisfies	0	0	2	1

Finally, we tried to understand the perceptions of the students about the resources and teaching and learning methodologies used in the class. As we can confirm in Table 5, the central tendency metrics show that students considered the use of collaborative tools very useful (average and mode 4). Considering each specific activity, we can conclude that the students considered the methodology used in the activity “simulation of a business” as the most suitable, followed by the “presentation of a lesson”, and in last, “analysis and presentation of a case study”.

Table 5:. Resources and methodologies used in support of teaching-learning process

Resources and methodologies	Average	Mode
Use of collaborative tools (e.g. forums, wikis, etc.)	3,8	4
Presentation of a lesson	4,1	5
Analysis and presentation of a case study	3,5	4
Simulation of a business	4,6	6

It is important to notice that all the activities proposed had a component in the final grade on the CRM systems curricular unit. In fact, 40% from assessment on the evaluation test about the first learning outcome, 40% from assessment on the evaluation test about the second, third and fourth learning outcomes altogether, and 20% on the classification obtained in the following three items: activity of presentation a lesson, activity of analysis and presentation of a case study, and attitude in class during the semester (weights 50%, 20% and 30%, respectively). Also, we enhance that this class had the particularity to include students aged from 20 to 50 years, and obviously with different availabilities of time, given that many of them were employed. Furthermore, as the majority of the students were in the last year of the course, they were also doing their internship programs in different companies.

Despite the heterogeneity of the class and the constraints expressed in the preceding paragraph, students were receptive and motivated to carry out the proposed activities. Nevertheless, the two aspects denoted by Judd *et al*. (2010) of that the majority of students' contributions were made late in the activity, which made the possibility of extensive collaboration unlikely; and that students made little use of the wiki's commenting feature - a critical tool for contextualizing and coordinating their contributions for and with others - which also made the possibility of extensive collaboration unlikely, was completely verified in this case. In general, and as specified in literature by Judd *et al*. (2010), students delayed their contributions to the activities (especially in the last one) and ended up making little use of the potential for content development collaboratively via wiki tool, given the backward state of work in most groups.

5. CONCLUSIONS

More than a few authors (e.g. Neo & Neo, 2004) give emphasis to the infusion of the multimedia technology into the education arena. Particularly, traditional educational materials are been translated into interactive electronic forms through the use of multimedia tools, with the purpose of convening the message in an interactive learning environment. So, the conventional chalk-and-talk method is moving away to one which uses multimedia platform in teaching and learning. And, as the present generation becomes more familiar with computers and the internet, they are going to expect information in the classrooms to be delivered in the same design. Within the research questions proposed, one can say that the study, although it did not embrace a huge number of participants, points toward some understanding of how a collaborative learning environment seems to get students actively involved in the learning process mainly if the tasks to be perform have an empirical component. More, one can say that the study also has shown that students seem to identify themselves with the need to be involved in simulations of their future professional activity, as well as with the need to regulate their own learning (preparation and presentation of lessons) and to promote discussion not only between peers but also with the teacher.

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DEVELOPMENT OF ONLINE COURSEWARE ON THAI FOOD GOOD HEALTH

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ABSTRACT
The objectives of this research were to1) develop the online courseware on Thai Food Good Health to support the Thai Kitchen to the world project; 2) evaluate the courseware by the learners toward the courseware integrated using in aboard. The research sample were sampling for chefs, Thai restaurant owners, and the students who were studying at the TAFE culinary school in Sydney. The research instruments were a questionnaire to find out the needs and readiness to attend the online learning, and a questionnaire for the learners. Courseware was designed and developed on website www.thaifoodtolearn.com by applying the 5 steps model. Firstly, the synthesis of the research results done by the researcher team. Secondly, organizing focus group of the experts in food and nutrition and public relation field discussion on the essential contents and courseware format which would be used to develop the lessons. Thirdly, the survey of needs and readiness of the respondents. Fourthly designing the media in the courseware. Fifth, testing the courseware at TAFE Northern Sydney College in Sydney, Australia. The participants registered and studied from online courseware on thaifoodtolearn.com website as well as the set of multimedia “Thai food good health distributed to the participants with the learner’s active participation in demonstration and practices. The research result found that the respondents were readiness to study online courseware. They needed to learn as 1-2 weeks short course in the morning and evening. The topics they needed to learn were Thai food ways, Thai food cooking techniques, Thai healthy food such as Thai herb, fruit and vegetable, the characteristics of Thai food, safety Thai food, and basics knowledge of Thai food respectively. After learning online courseware, the learners’ opinion mostly showed that the lessons were totally good level. In case of the contents and presentation of video, image, graphics, hyper media links in each pages, the usefulness and benefit of the lessons mostly showed in very good level.

INTRODUCTION
Thai government launched the new policy called “Thai Kitchen to the World Project” in 2004 upon 2008 with the aim of increasing the number of Thai restaurants aboard and to make Thailand the largest food exporter in the world. In this regard, Kasetsart University, under the support of National Research Council of Thailand was given a research grant to study the “Development of Thai Food Products and Proactive Promotion of Thai Food to the World”. The researchers studied about the standards and characteristics of Thai food, the product status and taste of foreigners, production process for export and extending the reach of Thai food restaurants to the owners and consumers abroad (Varanyanond, 2008). The research was also found the significant of Thai food promotion to the government sectors. The research project investigated the model of multimedia integration. This study concluded that the next step of technology transfer could be implemented under an online study for target audiences in any part of the world, so Thais and foreigners would be able to access this information anywhere and anytime. Moreover, an online study would be cost effective because there would be no need for researchers or learner to travel (Sompong, 2010). For these reasons, the researcher then continuingly study furthermore on the development and testing the Courseware through internet on Thai food to the target audiences aboard who were the Thai restaurant owners, Thai and foreigner chefs and the instructors and students who were involved Thai cuisine.

THE STUDY
This study focused to the develop the online courseware on Thai Food Good Health to support the Thai Kitchen to the world project by using purposive sampling of Thais and foreigners who were the owners of Thai restaurant, chefs, instructors and students of culinary institute aboard. The sample of this study was purposive sampling at TAFE Northern Sidney Institute in Australia. The contents composed of 5 topics which were synthesized from the result of Thai food research under the project of Thai government on “Thai Kitchen to the World” Project. The lessons composted of 5 chapters: 1) Thai cuisine overview, 2) basic knowledge about Thai cuisine, 3) Thai food for health, 4) food safety and 5) the way of Thai cuisine.

Objectives
The objectives of this research were to: 1) develop the online courseware on Thai Food Good Health to support the Thai Kitchen to the world project; 2) evaluate the courseware by the learners toward the courseware integrated using in aboard.

Review of Related Literature

E-learning is the process of instruction that apply the new digital technology regarding technology of computer, and tele-communication. E-learning may require to learn through computer both online learning with network and offline learning by single computer or non-network linkages. Clark and Myer (2008) defined e-Learning as instruction delivered on a computer by way of CD-ROM, Internet, or intranet with the following features: includes content relevant to the learning objective, uses instructional methods such as examples and practice to help learning, uses media elements such as words and pictures to deliver the content and methods, may be instructor-led (synchronous e-learning) or designed for self-paced individual study (asynchronous e-learning) and build new knowledge and skills linked to individual learning goals or to improved organizational performance. E-learning is essentially the computer and network-enabled transfer of skills and knowledge. Its applications and processes include Web-based learning, computer-based learning, virtual classroom opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.(Wikipedia, 2554)

In case of online courseware design, Sanders (2001) mentions that it must be envisioned in a learning context. The student will learn from the Web page, but it can be a central locus of learning such as it may be a side bar-a review session, extra help, or adjunct to the book or classroom presentation and virtual simulation interface in the first page. In the fundamental design considerations, Siegal (1997) emphasize that the third generation Web site is one that invites the viewer into the site with lure and metaphors. They are none linear and alluring. They should be attractive and interesting to get the viewer's attention. Siegal also notify that "no matter how important and content rich your message, if no one is going to look at it, they're not going to get the message".

From the literature review, it showed that online courseware become the effective way of learning but it should be in well design and development to match with the target audiences or learners.

Methodology

1. Sample of the Study was the learners in online courseware. They are Thais and foreigners who voluntarily fill out the questionnaire on the readiness and need for online study on Thai food. The second group of sample was the Thai restaurant owners, Thai and foreigner chefs, instructors and students of culinary institute. TAFE Northern Sidney Institute in Sydney, Australia was selected to be a site for studying because of suitable of facilities and its voluntary to corporate the research project.

2. Research Instruments

2.1 Online courseware was designed and developed for training on Thai food in 5 steps model as this follows:
First. Study and synthesize the results in Thai food researches from 2005-2008 for 4 years study. The researcher team identified the research into 5 issues. There were technologies in Thai food products for exports, Thai food ready to eat and ready to cook, Thai healthy food, anti-oxidant and prevention cancer substantial in Thai food and strategies for Thai food promotion abroad.

Second. A survey on the readiness and needs of Thai and foreigner respondents who were involved in e-learning through internet was administered. There were 13 respondents voluntarily fill out the data in a questionnaire though the research project website thaifoodtoworld.com.

Third. Twelve experts focus group in food and nutrition was organized and determine the manuscript of the contents to prepared for the Web-based instruction.

Forth. Design the courseware on Thai food with the course content through **Moodle** Learning Management System (LMS) open source software. The component of contents was mainly presented by Flash images, video clips, exercises, pretest at beginning of each chapter and achievement tests at the end.

Fifth, the lessons were tested and tryout with 20 learners who were undergraduate program students in home economics in Kasetsart University, Thailand. The contents and program errors were corrected and revised before using with the sample in Australia.

2.2 Questionnaires were developed into two sets for collecting data from the respondents. The first questionnaire aimed to explore the readiness and needs in e-Learning through internet of the target group. The second questionnaire explored the opinions of the learners about the quality of online courseware systems and media uses for learning. It focused on personal information, the development of instructional media on the Web such as format, contents, presentations, video clips, web linkages, benefits and usefulness of courseware, and the appropriate issues in each chapter.

3. Data collection and analysis the courseware contents were uploaded to website **www.thaifoodtolearn.com** for testing with the samples at TAFE Northern Institute Campus in Sydney, Australia. The samples attended the training program namely "E-Learning: Innovative Channel of Thai Cuisine and Health Benefit" during November 2010. Thirty eight participants were given instruction on how to use the LMS program for registration, log-in, studying, doing pretest and posttest. The participants were requested to fill out a questionnaire at the final study. Data were analyzed by SPSS for windows. Statistical uses were mean, standard deviation, and percentage.

FINDINGS

1. The readiness and needs in e-Learning through internet

The result showed that the respondents were readiness for online learning Thai cuisine by using computer at their home 84.6 % and their office 76.9 %. They almost uses e-mail 100% following by MSN 61.5%, Skype 53.8%, blog 23.1% and web board 15.4%. They expected the usefulness of e-Learning on Thai food mostly for their business, healthcare, occupation and food consumption respectively. They needed to learn by following contents in the highest level: Thai food ways, Thai food cooking tips, Thai food for health, Nutritional and functional information of Thai food. However, they also needed to learn the uniqueness of Thai food, history and culture of traditional Thai food and hygiene and sanitation in high level respectively. They preferred to learn a short course for 3-6 days.

2. The output of the experts' focus group

The experts suggested that the content presentation should use multimedia for drawing attention and gave the highest effective learning. For instants, video clips showed demonstration and sound, the online management systems should be controlling and checking the learners. The online courseware should be the pilot projects which could be cooperated with the Thai Hotel and Thai Chef Association.

3. Online courseware and feedback from the respondents

The participants who registered to online courseware at TAFE Northern Sydney Institute gave the response about the format of online learning on website www.thaifoodtolearn.com in good and very good level. Their opinions were almost in good level in terms of its contents, however, there were in very good level only on the presentation items such as the color contrast of text and background, and the clarity of images. Format and method of presentation, leading into lessons, text format, graphics design and communication were mostly in good level. For video presentation in case of size, corresponded and clarity of narrative, and easy to control as well as the linking of lesson components were in good level.

The available supported program as chat room, web board and help is almost in good level. They accepted that e-Learning on Thai food could be used for learning resources and promoted in the international contexts in very good level. Nevertheless, they realized that gaining knowledge could be used after taking lessons in good level.

Finally, online courseware in five chapters were totally in good level for 5 items. There were the clarity of images, appropriateness of the text size, colors, and background, images charity and narrating sound in video.

The learners gave the additional suggestion that the program would be easy to learn with the Thai learners aboard, they suggested that the lessons should be bi-lingual program; TAFE Northern Sydney Institute was interested to collaborate to testing the online lessons within an Asian food course in the future.

CONCLUSIONS

Online courseware on Thai food good health was really the new innovative. The methods and techniques deal with the new technologies for online learning. This could be proved that it was workable and compatible for the strategies of "Thai Kitchen to the World Project" of Thailand. Because this learning systems was highly benefits to the learners under the international context. The learners can learn from anywhere, at anytime with the various types of online media. They can communicate with the Instructors and experts in Thailand via the available tools on the internet. In doing so, the learners can achieve their knowledge and apply to their business improvements with high performances in Thai food promotion aboard. **However, the factors to achievable learning may depend on many factors such as the readiness and needs of the target audiences accessibility** to learn by self-pace.

In terms of the design and development of online courseware, it requires the format and knowledge of pedagogy science to design the program matching with the various learners. The learning management program is one of the choices to select the efficiency platform in web designing. For this study, Moodle could be confirmed that it is one of the LMS open source program which is the very useful and convenience to manage online learning.

In conclusion, the learners who use online courseware accepted all the lessons as the good program and consensus opinion was showed that all components in the designed program was in good and very good level. However, according to the participants suggestion if the project had a chance to continue studying, the lessons should be produced the bi-lingual program in Thai and English version so this online courseware would be usefulness for the learners worldwide.

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EDUCATIONAL TECHNOLOGY ACCEPTANCE ACROSS CULTURES: A VALIDATION OF THE UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY IN THE CONTEXT OF TURKISH NATIONAL CULTURE

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ABSTRACT
The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003, 2012) proposes a major model of educational technology acceptance (ETA) which has been yet validated only in few languages and cultures. Therefore, this study aims at extending the applicability of UTAUT to Turkish culture. Based on acceptance and cultural data from a large sample (N = 1723) of Turkish educational technology users of diverse profession, geographical location, age and gender, the UTAUT questionnaire displays good convergent and discriminant validity. Structural equations modeling confirms the model validity. Cross-cultural differences are explored within Turkey both between regions (Istanbul area vs. other regions) and between professional cultures (STEM, i.e. science, mathematics, engineering and mathematics, vs. non-STEM professions). The comparison uses measurement results from other European countries as a reference. Conclusions are drawn with respect to UTAUT applicability in educational practice, and to interconnections between ETA and culture.

INTRODUCTION
Significant efforts are sustained all over the world to enhance learning by the use of educational technology. However, a successful implementation primordially depends on the acceptance and diffusion of the used educational technology. This is why educational technology acceptance (ETA) is a topic of increasing importance in educational research and practice. After more than two decades of acceptance research (Šumak, Heričko & Pušnik, 2011; Venkatesh, Thong & Xu, 2012), Straub (2009) establishes that the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh, Morris, Davis & Davis, 2003; Venkatesh et al., 2012), a prominent acceptance theory synthesizing its major predecessors, is still insufficiently validated. In line with this statement, Nistor, Lerche, Weinberger, Ceobanu and Heymann (in press) find the shortcomings of acceptance research laying in the unilateral sample choice. Most of the previous acceptance studies were carried out in Western countries with strong technological infrastructure, and involved young participants with technology-related professions, hence with extensive corresponding knowledge and skills. In particular, the increasing internationalization of education calls for cross-cultural validation of ETA theories and models.

Against this background, due to special cultural, economical and political features, Turkey appears particularly interesting as a context for cross-cultural validation. In contrast to Western countries such as the United States of America or Germany, the Turkish national culture values more power distance, collectivism and uncertainty avoidance (Hofstede, 2001; also Barton, 2010; Parnell, Koseoglu & Dent, 2012). From economical and political point of view, Turkey is engaged in a powerful development that is likely to result in major changes of technological and educational infrastructure, and even in cultural changes. As a cultural context for ETA research, all these local conditions extend the sample diversity and, potentially, the applicability of the examined ETA models. Therefore, the study at hand examines ETA on the basis of UTAUT (Venkatesh et al., 2003, 2012) in the context of Turkish national culture. The study is part of a larger ETA study carried out first in Germany and Romania, and extensively presented in Nistor et al. (in press). Preliminary follow-up results collected in Turkey were presented at the International Educational Technology Conference (IETC), Taiwan, 2012 (Göğüş & Nistor, in press). Further results are expected to allow wider comparisons between cultures. For educational practice, the study provides educational designers and developers of educational software with a description of acceptance profiles of e-learners, and with recommendations about more effective ways to support technology use in education.

After this introduction, the paper goes on with a literature review on ETA theories and models, and on national and professional culture. The empirical section starts with research questions and presents methodology and results. Finally, the findings are discussed and conclusions for educational research and practice are drawn.

THEORETICAL BACKGROUND

Educational Technology Acceptance

Technology acceptance models are based on the view of acceptance as an attitude towards technology. As stated by the theory of reasoned action and its expanded version, the theory of planned behavior (Ajzen & Fishbein, 2000), human action is guided by three categories of attitudes: beliefs about likely consideration of behavior (behavioral beliefs), beliefs about the normative expectation of others (normative beliefs), and beliefs about the presence of factors that may help or hinder the behavioral performance (control beliefs). In combination, behavioral, normative and control beliefs lead to a behavioral intention. The more favorable the beliefs, and the greater the perceived control, the stronger a person’s intention to perform the behavior in question should be.

In the context of technology adoption, the reasoned action and planned behavior approach resulted in several theories, of which the most frequently studied in educational settings is the Technology Acceptance Model (TAM; Davis, 1989), with two extended versions TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh & Bala, 2008). Venkatesh and his colleagues (2003) formulate their Unified Theory of Acceptance and Use of Technology (UTAUT) as a synthesis of its predecessors and describe technology use under the influence of use intention, further determined by performance expectancy, effort expectancy, and social influence. Additionally, facilitating conditions directly determine technology usage. The influence of the predictors named above on behavioral intention and use behavior is moderated by users’ age, sex, experience, and by the voluntariness of use. On this ground, the UTAUT model explains up to 40% of the variance in the technology use behavior. By adding further acceptance predictors, from which habit seems to be the most important, an extended UTAUT version (Venkatesh et al., 2012) explains 52% of the same variance.

The studies cited so far are positioned in the domain of Information Systems. Only few efforts have been made to analyze technology acceptance from the perspective of technology-enhanced learning. Thus, Straub (2009) emphasizes that the UTAUT is still a relatively new model, with yet limited impact in educational research; further validation and replication of the UTAUT model appears to be essential. In a recent study, Nistor, Wagner, Istvánffy and Dragotă (2010) report findings that are consistent with Venkatesh and colleagues (2003), but increase the explanatory power of the UTAUT model by additionally considering the role of computer anxiety for ETA (cf. Beaudry & Pinsonneault, 2010; Conti-Ramsden, Durkin & Walker, 2010). However, the ecological validity of previous findings is limited by the low diversity of samples. The majority of the participants appear to be young technology users from Western countries, mostly with technological professions and displaying a high acceptance level. Some recent studies (see below) involve cultural diversity. In spite of limitations, UTAUT appears to provide a robust and reliable model that can be used to gain deeper understanding ETA. Additional validation is nevertheless necessary.

The Cultural Context of Educational Technology Acceptance

There are numerous definitions of culture, in general (Triandis, 1972), as well as of organizational culture (Schein, 2004) and technological culture (Leidner & Kayworth, 2006). Hofstede (2001) defines culture as patterns of thinking, feeling and potential acting, which have been learned throughout a lifetime, and which are likely to be used repeatedly and unlikely (or difficult) to be changed by the individual. Cultural patterns are shared within a social environment such as nation, ethnicity or profession. In available cross-cultural ETA research literature (e.g., Barnett & Sung, 2006; Leidner & Kayworth, 2006; Li, Chau & Van Slyke, 2010; Li & Kirkup, 2007; Nistor et al., 2010; Teo, Luan & Sing, 2008; Veltri & Elgarah, 2009; Venkatesh & Zhang, 2010; Zakour, 2007), different cultures are compared using samples from different countries, thus tacitly equating culture with national culture, i.e. geographical location. This is a rough approximation, since timely stable patterns of thinking, feeling and potential acting may strongly vary within national borders. However, for the purpose of this research, we speak of *national cultures* defined by geographic location. Additionally, we examine *professional cultures*, defined by individual education and professional practice in a given domain.

Hofstede describes culture using five dimensions that were initially identified in a study among IBM staff in 72 countries (Hofstede, 2001; Hofstede & McCrae, 2004):

- PDI: Power distance index represents the extent to which the less powerful members of a culture accept the unequal distribution of power within the same culture.
- UAI: Uncertainty avoidance deals with the intolerance for unstructured, i.e. novel, unknown, surprising or unusual situations that the members of a society show.
- IDV: Individualism (vs. collectivism) refers to the quality of ties between individuals, and to the degree of integration into cohesive groups within society.
- MAS: Masculinity (vs. femininity), is a preference for assertiveness, achievement and material success; contrasted with femininity, which emphasizes relationships, modesty and caring.
- LTO: Long-term orientation (vs. short-term orientation) comprises values such as thrift and perseverance, as opposed to respect for tradition, the fulfillment of social obligations and face-saving, which are representative of short-term orientation.

Culture and Educational Technology in Turkey

Turkey is a Eurasian country located in Western Asia (the Anatolian peninsula) and in Southeastern Europe. It has a population of 74.72 million people, from which 13.59 million (18,2%) live in Istanbul. Turkey has 81 cities, in which 77% of the population lives. Turkey is a democratic, secular, constitutional republic with an ancient cultural heritage. The Islamic religion, recent political developments and its history link Turkey to Asia, while its memberships in the Council of Europe, NATO, OECD, OSCE and the G-20 major economies link it to Europe. Turkey's move towards Europe has begun with the acceptance of Western civilization at the turn of the 19^{th} into the 20^{th} century. More intensive and specific efforts have been done in the past two decades, aimed at entering the European Union (Bonnett, 2002). Actually, this process is still going on, major economical and cultural changes have been reported in the past decade (Parnell et al., 2012). Strongest development is observed especially in and around the capital, where 18% of the total population of Turkey resides (Barton, 2010).

Hofstede (2001) describes Turkish culture as follows:

- PDI = 66, moderately high level of power-distance, with group interactions affected by status and economic power
- IDV = 37, still moving from closely collectivist to individualist culture
- MAS = 45, moving from being strictly masculine to more feminine characteristics, with less emphasis on gender in work roles
- UAI = 85, moderately strong level of uncertainty-avoidance related to occupations and benefits
- LTO not provided as a numeric index, however described as slowly moving away from short-term orientation characteristics such as respect for tradition, the fulfillment of social obligations and face-saving.

Historically, the use of educational technologies in Turkey is largely connected with distance learning, which is a response to challenging topographical and demographic aspects, resulting in a high number of Internet users (estimated to approx. 24 milions, i.e. more than a third of the population) and high e-readyness, ranked to place 43 in the world (Barton, 2010). Examining several case studies of adoption and use of educational technology in the context of distance learning, Barton (2010) characterizes Turkish users of educational technology "by a very forward-looking, progressive outlook that optimistically looks to the future" and "generally keen to continue with development" (p. 192). In line with these conclusions, Gök & Erdoğan (2010) study preservice teachers' attitudes towards technology, and reports three most frequent, hence representative views, according to which technology is both harmful and beneficial (15.6%); technology is continuously developing and improving performance (15.0%); technology is a generally needed help (13.8%). TAM-based acceptance research was conducted in Turkey by Ramayah (2010), however her results are based on a relatively small sample, hence little representative.

Aydin and McIsaac (2004) suggest that the future of information technology in Turkey depends on the extent to which the infrastructure is put in place, the access that people have to networked technologies, and the training opportunities that teachers in schools have to use the new technologies. Recently, the Turkish government has been promoting the use of educational technology for several years at all levels. In Turkish schools, Özdemir and Kılıc (2007) analyse a technology-based educational program in the early 2000s and observe successful integration of information and communication technologies (ICT) in the primary school system, however with several shortcomings caused, among other factors, by lacking necessary cultural changes, placing an emphasis on technology rather than on pedagogy, and limited knowledge and skills of the school personnel. Şerefoğlu Henkoğlu and Yıldırım (2012, p. 23) assert that "the most important of these problems are results of the elective status of computer education course and the limited time allocated for this course". From another perspective, Çağlar and Demirok (2010) demonstrate the positive effect of students using a computer at home on their computer skills, as opposed to using a computer at school, which proved less effective. In Turkish universities, Turan (2010) as well as Yurdakul (2011) find both positive attitudes toward technology use, and essential technology skills and knowledge to feel adequate in a technology-enhanced learning environment. Notably, this state-of-the-art was reported from less technological domains, such as social sciences and teacher education, which may be less expected to promptly adopt new technologies.

Professional Culture and Educational Technology

Professional cultures are usually regarded in educational research as a typical context for acquiring and applying knowledge and skills; hence they are omnipresent in research literature. However, professional cultures are less studied from the perspective of Hofstede's (2001) cultural dimensions. Nistor et al. (in press) find cultural differences between STEM and non-STEM professionals from Germany and Romania in the dimensions PDI, IDV and UAI. These differences are not as strong as those between national cultures; nevertheless they reach statistical significance.

Unlike the interconnections between ETA and national culture, there is scarce evidence of the relationship between ETA and professional culture. It seems to be unanimously accepted that professions in the domains of science, technology, engineering and mathematics (STEM) will promptly adopt top technologies, including educational applications, in a fashionable way (Wang, 2010). Presumably, the fast technology diffusion is due to the fact that STEM professionals will possess more extensive ICT knowledge and skills. Venkatesh and colleagues (2003, 2012), as well as numerous other authors, regard ICT knowledge and skills as a moderator variable of the technology acceptance model. Accordingly, ICT knowledge and skills reduce users' dependence of facilitating conditions, thus reducing the influence of facilitating conditions on use behavior. Also, with increasing ICT experience, technology use becomes routine, which is less dependent on individual use intention. Recently, Venkatesh et al. (2012) introduced the construct of habit in ICT use, which has a positive effect both on use intention and on actual usage of technology. ICT experience and habit are very likely to be associated with STEM professions, and thus display all the effects stated by UTAUT.

Nistor et al. (in press) find differences in acceptance profiles of STEM and non-STEM professionals that are consistent with Venkatesh et al. (2012). STEM professionals display higher performance expectancy, lower effort expectancy, stronger perceived social influence, better facilitating conditions, lower computer anxiety, higher use intention and higher use behavior. With respect to the UTAUT path coefficients, the use behavior of STEM professionals is somewhat weaker influenced by use intention, facilitating conditions and computer anxiety. As for the predictors of the use intention, there is a significant difference in the influence of the effort expectancy, which is stronger for non-STEM professionals.

Towards the Integration of Culture in ETA Models

Several researchers discuss cross-cultural aspects of acceptance models, usually by comparing samples from two different countries (e.g. Li & Kirkup, 2007; Li et al., 2010; Teo et al., 2008; Venkatesh & Zhang, 2010). However, these are isolated research results; an overall picture of the relationship of ETA and culture, which would integrate cultural dimensions and UTAUT, is still missing. Providing empirical evidence for this relationship is confronted with several methodological difficulties and limitations. The causal relationships between the culture dimensions and the UTAUT variables are still ambiguous (Leidner & Kayworth, 2006).

RESEARCH MODEL

To make a first step towards the integration of culture into the UTAUT model, we examine both the direct influence on the UTAUT variables and their moderating influence within the model (cf. Leidner & Kayworth, 2006). After checking *generic results* such as mean values of the model variables, path coefficients and moderating effects of sex, age and degree for the entire sample, we examine the following aspects of ETA in Turkey and compare them with available values from Germany and Romania.

The influence of national culture. To what extent do Turkish users of educational technology, as compared with Romanian and German users, differ with respect to (a) their cultural values sensu Hofstede, (b) their attitudes towards educational technology, and (c) the corresponding relationships between acceptance variables as described by UTAUT?

The influence of professional culture. To what extent do Turkish participants with professions in STEM vs. non-STEM fields differ with respect to (a) their cultural values sensu Hofstede, (b) their attitudes towards educational technology, and (c) the corresponding relationships between acceptance variables as described by UTAUT?

METHODOLOGY

A correlation study was conducted, recording transversal data in a one-shot survey, from Turkish learning technology users. In order to increase the probability that the participants are familiar with learning, in general, and specifically with learning technology, we chose academics (i.e. people with an academic degree, including faculty and teachers, from universities, schools and adult education centers) and university students. The sample was chosen randomly within a range aimed at overcoming the limits of the previous studies, i.e. sample size and sample diversity in terms of age, profession and acceptance level.

The collected sample consisted of N = 1723 participants. From these, n = 962 were from Istanbul area and n = 761 from other regions. Concerning participants' educational status, the survey participants had a highschool diploma (i.e. university students, n = 64), a university diploma (n = 1208) or a master or doctoral degree (n = 451). The participants had professions either in STEM fields (i.e. science, technology, engineering, and mathematics; n = 702) or in non-STEM fields (n = 1021). The sample provided further diversity in terms of sex (895 male and 828 female participants) and age (537 participants were under 30, 1005 between 30 and 50, and 182 over 50). An overview of the sample structure is provided in Table 1.

The independent variables performance expectancy, effort expectancy, social influence, facilitating conditions, computer anxiety and computer literacy were measured, as well as the dependent variables use intention and use behavior. Additionally, the demographic variables age, sex, geographic location and profession were registered. The research instrument consisted of a Turkish translation of the questionnaire proposed by Venkatesh et al. (2003, 2012) with variable values ranging from 1 = very low to 5 = very high acceptance (Appendix 1). Aimed at surveying general attitudes and intentions towards technology, the questions were framed about "the computer as a learning tool", with specific references to office software, information search on the Internet, communication and interactions between Internet users (e.g. e-mail, discussion forums, chat etc.), and e-learning. Computer literacy was self-assessed based on the statement "I know what the following are and how they work", related on the technologies mentioned above. The participants' cultural values were measured using the Values Survey Model VSM94 (Hofstede, 2012).

Table 1 Sample Description

	Geographic location		
	Istanbul area	other regions	Total
Sex			
female	478	350	828
male	484	411	895
Age			
under 30	313	224	537
30-50	544	461	1005
over 50	105	76	182
Profession			
STEM	374	328	702
non-STEM	588	433	1021
Educational status			
high school diploma	18	46	64
university diploma	675	533	1208
master & doctorate	219	182	451
Survey medium			
online	50	57	768
pen and paper	387	381	955
Total	575	380	1723

Data was collected calling for voluntary participation, partially online (n = 768) and partially using pen-and-paper forms (n = 955). Data analysis was performed using IBM SPSS Statistics version 19 and R version 2.11.1 (using Lavaan version 0.4-9 and SEM version 0.9-21). Since Hofstede's (2000) cultural dimensions are defined on group level, the usual statistical tests such as t-test or ANOVA, which are defined on individual level, may not be applied. In order to make more reliable statements on cultural dimensions, i.e. to be able to specify the statistical significance of the results, the Welch t-test was adapted based on Carmer's theorem and a correction factor depending on the sample size (Lerche & Kiel, under review).

RESULTS

Instrument Validity

Although Venkatesh and colleagues (2003, 2012) have already published the validation of their acceptance questionnaire, due to the application of UTAUT in a new cultural context this study reassessed the reliability and validity of the instrument. A confirmatory factor analysis (Mulaik & Millsap, 2000) was performed. Six of the 33 items displayed factor loadings under .20 and were removed. The remaining items had satisfactory factor loadings and the average variance extracted was above 0.5 (Table 2), which demonstrates convergent validity of the instrument at item level. As shown in Table 3 by the principal component analysis with quartimax rotation, chosen because it best separated the variables, the square root of the average variance extracted was higher than any correlation with other constructs, which demonstrates the discriminant validity of the model. The comparative fit index (CFI) of the confirmatory factor analysis was .984, describing a good model fit.

Table 2 Principal Component Analysis with Varimax Rotation (Acceptable Threshold Values in Brackets)

	Factor loading	Cronbach α	Composite Reliability	Average variance extracted
Performance expectancy (PE)		0.86	0.91	0.62
PE 1	0.72			
PE 2	0.73			
PE 3	0.64			
Effort expectancy (EE)		0.81	0.96	0.63
EE 1	0.70			
EE 2	0.74			
EE 3	0.56			
Social influence (SI)		0.90	0.96	0.72
SI 1	0.70			
SI 2	0.71			
Facilitating conditions (FC)		0.75	0.90	0.48
FC 3	0.67			
FC 4	0.61			
Computer anxiety (CA)		0.91	0.96	0.78
CA 1	0.83			
CA 2	0.83			
CA 3	0.86			
CA 4	0.84			
Use intention (UI)		0.86	0.95	0.61
UI 1	0.84			
UI 2	0.77			
UI 3	0.84			
UI 4	0.76			
UI 5	0.65			
Use behavior (UB)		0.97	0.91	0.94
UB 1	0.94			
UB 2	0.95			
UB 3	0.95			
Computer literacy (CL)		0.89	0.97	0.70
CL1	0.84			
CL2	0.82			
CL3	0.85			
CL4	0.81			
CL5	0.69			

Table 3 Discriminant Validity for the Measurement Model (Bold Values: The Square Root of the Average Variance Extracted for Each Construct)

Construct	PE	EE	SI	FC	CA	BI	UB	CL
PE	**0.79**							
EE	0.56	**0.79**						
SI	0.22	0.43	**0.85**					
FC	0.08	0.14	0.25	**0.69**				
CA	0.37	0.23	0.05	0.09	**0.88**			
BI	0.22	0.25	0.28	0.12	0.05	**0.78**		
UB	0.64	0.45	0.14	0.10	0.41	0.19	**0.97**	
CL	0.59	0.39	0.09	0.05	0.41	0.14	0.76	**0.83**

Generic results

The mean values of the UTAUT variables are displayed in Table 4, along with comparative values measured by Nistor et al. (in press). The extended UTAUT model (i.e. containing the computer anxiety as additional variable compared to Venkatesh et al., 2003, 2012; cf. Nistor et al., in press) was tested for the entire sample. Due to the complexity of the verified model, the method of structural equations modeling with latent variables was chosen (Bentler & Weeks, 1980; Bollen, 1989). The resulting path coefficients are shown in Figure 1 and the fit indices of the research model in Table 5. The model's goodness of fit is good (Hu & Bentler, 1999).

Driven by the low path coefficients between use intention and its predictors, the influence of computer literacy on other model variables was closer examined. In a multiple regression model having use behavior as dependent variable and use intention, facilitating conditions, computer anxiety and computer literacy as independent variables, the influence of computer literacy was very strong ($\beta = 0.70$, $p < 0.000$), while all other predictors had very weak influence ($\beta < 0.12$). The model explained $R^2 = 0.61$ of the variance of use behavior, while in a simplified model version computer literacy alone explained $R^2 = 0.59$ of the same. Further, this influence was not affected by participants' geographical region or profession.

Hofstede s profiles were calculated for the entire Turkish sample (Table 6). Turkish culture scored very low in power distance index, relatively high in individualism and feminity, moderately in uncertainty avoidance and long-term orientation. As a reference frame, the German culture was moderately power-distant, highly individualistic, feminine and uncertainty avoidant, and moderately long-time oriented. The Romanian culture was characterized by lower power distance and individualism, higher masculinity, less uncertainty avoidant, and similarly moderate long-time oriented.

Table 4 Values of the UTAUT variables for the entire sample and for the cultural subgroups, compared with Germany and Romania

	Turkey (N = 1723) M (SD)	Comparative values: Germany M (SD)	Romania M (SD)
Performance expectancy	4.44 (0.69)	3.94 (.85)	4.31 (.66)
Effort expectancy	4.13 (0.74)	2.10 (.84)	1.80 (.62)
Social influence	3.44 (1.05)	3.23 (.89)	3.92 (.71)
Facilitating conditions	3.17 (0.89)	3.88 (.74)	3.78 (.61)
Computer anxiety	2.07 (0.98)	1.80 (.88)	2.21 (.96)
Use intention	3.56 (1.23)	3.60 (1.21)	4.09 (.90)
Use behavior	4.38 (0.68)	4.34 (.46)	4.07 (.84)
Computer literacy	4.52 (0.66)	4.61 (0.54)	3.38 (1.53)

Table 5 Fit Indices of the Extended UTAUT Model

Fit index	Level of acceptable fit	Fit of the extended UTAUT model
χ^2	$p < .05$	541.846; $p < .000$
CFI	> .900	.984
RMSEA	< .060	.039
SRMR	< .050	.028

CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual

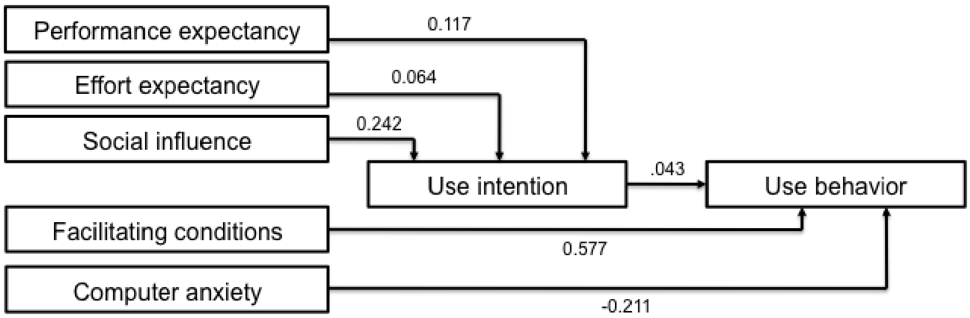

Figure 1 Verification of the Extended UTAUT Model with Path Coefficients for the Entire Sample

Table 6 Hofstede's Cultural Dimensions Scores in Turkey, Compared with Germany and Romania

	Turkey (N = 1723)	Comparative values Germany	Romania
Power distance index (PDI)	9.6	36.1	20.1
Collectivism vs. individualism (IDV)	76.5	92.5	67.4
Masculinity vs. femininity (MAS)	3.4	-29.9	38.5
Uncertainty avoidance (UAI)	43.7	76.9	65.2
Long-term orientation (LTO)	42.5	45.6	53.7

The Influence of Regional Culture

Regarding attitudes towards educational technology, participants from Istanbul area had significantly higher performance expectations, lower computer anxiety, they used educational technology more intensively, and they evaluated the own computer literacy higher than participants from other regions (Table 7). With respect to Hofstede's cultural dimension scores, no significant differences were found (Table 8). Further details concerning participants' acceptance were extracted by repeating the structural equations procedure described above and testing the extended UTAUT model separately for participants from Istanbul area and from other regions.

Table 7 Values of the UTAUT Variables with Regional Differences

	Istanbul area (n = 962) M (SD)	Other regions (n = 761) M (SD)	Differences (Oneway ANOVA) F	df	p
Performance expectancy	4.49 (0.69)	4.38 (0.69)	10.27	1722	0.001
Effort expectancy	4.13 (0.75)	4.12 (0.72)	0.05	1722	0.820
Social influence	3.44 (1.07)	3.43 (1.03)	0.04	1722	0.844
Facilitating conditions	3.20 (0.88)	3.13 (0.89)	2.71	1722	0.100
Computer anxiety	2.01 (0.96)	2.15 (0.99)	9.75	1722	0.002
Use intention	3.57 (1.24)	3.56 (1.20)	0.00	1722	0.975
Use behavior	4.45 (0.67)	4.29 (0.68)	26.45	1722	0.000
Computer literacy	4.59 (0.66)	4.44 (0.66)	20.35	1722	0.000

Table 8 Hofstede's Cultural Dimensions Scores with Regional Differences

	Istanbul area (n = 962)	Other regions (n = 761)	Welch-Lerche two sample t-test		
			t	df	p
Power distance index (PDI)	11.8	6.9	-2.08	1466.13	0.981
Collectivism vs. individualism (IDV)	79.0	73.3	-2.87	1492.18	0.998
Masculinity vs. femininity (MAS)	3.92	2.76	-0.29	1488.80	0.613
Uncertainty avoidance (UAI)	46.0	40.9	-1.75	1487.76	0.960
Long-time orientation (LTO)	42.1	42.9	0.84	1529.47	0.202

As shown in Figure 2, the use behavior of participants from Istanbul area was stronger influenced by facilitating conditions, and their use intention was stronger influenced by effort expectancy, wheres the use behavior of participants from other areas was stronger influenced by computer anxiety, and their use intention more subjected to social influence.

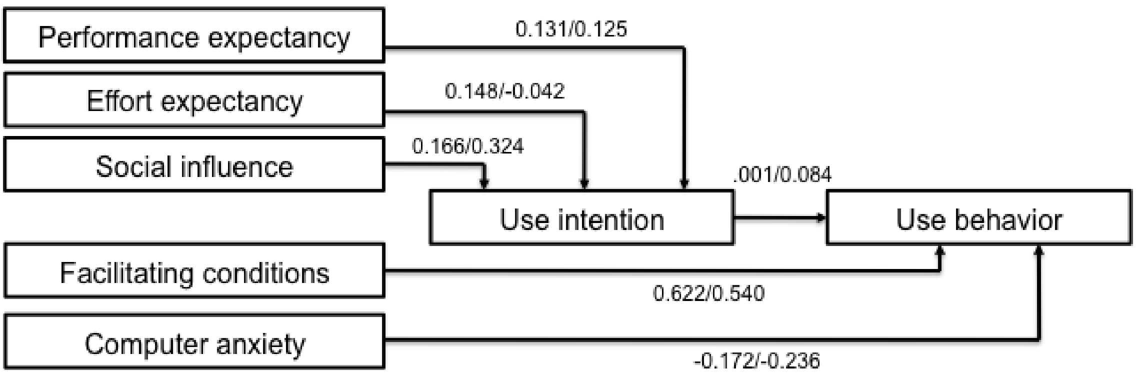

Figure 2 The Extended UTAUT Model with Regional Differences (Istanbul area/other Regions)

The Influence of Professional Culture

Observing participants' attitudes towards educational technology, those with STEM professions showed significantly higher performance and effort expectancy, at the same time lower computer anxiety, they used educational technology more intensively, and evaluated the own computer literacy as higher than participants with non-STEM professions (Table 9). As for the differences between professional groups related to Hofstede's cultural dimensions, the participants with STEM professions were less power distant, exhibited lower values on masculinity, and were less uncertainty avoidant than the participants with non-STEM professions. However, according to the Welch-Lerche test only the difference in PDI proved to be significant (Table 10). With respect to the path coefficients of the extended UTAUT model (Figure 3), the use behavior of the participants with STEM professions was less influenced by facilitating conditions and computer anxiety as compared to non-STEM professions. Their use intention was also somewhat weaker influenced by effort expectancy.

Table 9 Values of the UTAUT Variables for the Entire Sample and for the Participants with STEM vs. non-STEM Professions

	STEM professions (n = 702)	Non-STEM professions (n = 1021)	Differences (Oneway ANOVA)		
	M (SD)	M (SD)	F	df	p
Performance expectancy	4.48 (0.64)	4.41 (0.72)	5.018	1722	0.025
Effort expectancy	4.18 (0.70)	4.09 (0.76)	6.621	1722	0.010
Social influence	3.49 (1.01)	3.40 (1.07)	3.650	1722	0.056
Facilitating conditions	3.19 (0.91)	3.15 (0.87)	0.715	1722	0.398
Computer anxiety	2.00 (0.97)	2.12 (0.98)	5.536	1722	0.019
Use intention	3.53 (1.24)	3.59 (1.22)	1.067	1722	0.302
Use behavior	4.44 (0.66)	4.34 (0.68)	8.208	1722	0.004
Computer literacy	4.59 (0.66)	4.48 (0.66)	12.09	1722	0.001

Table 10 Hofstede's cultural dimensions scores of STEM and non-STEM professionals

	STEM professions (*n* = 702)	Non-STEM professions (*n* = 1021)	Welch-Lerche two sample t-test		
			t	df	*p*
Power distance index (PDI)	6.08	12.01	2.55	1354.61	0.006
Collectivism vs. individualism (IDV)	77.0	76.1	-0.44	1296.95	0.669
Masculinity vs. femininity (MAS)	-0.26	5.93	1.52	1320.63	0.064
Uncertainty avoidance (UAI)	41.23	45.44	1.43	1289.87	0.077
Long-time orientation (LTO)	42.91	42.17	-0.71	1287.87	0.762

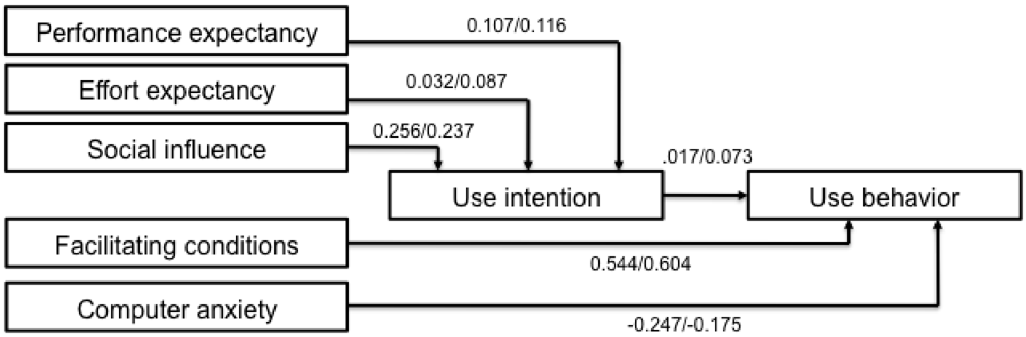

Figure 3 The Extended UTAUT Model with Path Coefficients for Participants with STEM vs. non-STEM Professions

Summary of Results and Discussion

Generic results. This study validated UTAUT and the corresponding measurement instrument for Turkish language and culture, proving thus evidence of the applicability of educational technology acceptance as conceptualized by Venkatesh and colleagues (2003, 2012). Thus, the applicability of UTAUT was extended to a new cultural context. Also, UTAUT was extended from the Information Systems domain, where it was initially developed to Educational Sciences.

Applying this to the Turkish sample of educational technology users reveals a collective acceptance profile that differs from similar findings in other European countries (Nistor et al., in press). Turkish users of educational technology displayed substantially higher scores in both performance and effort expectancy, and lower scores in perceived facilitating conditions. While they evaluated the own computer literacy at similar levels as German and Romanian users, their computer literacy was the main determinant of the use behavior. This profile suggests a very strong correlation between technology use, computer literacy and expectations, in the sense that an intensive use of educational technologies is associated with higher computer literacy (probably based on experiential and self-directed learning), and with (probably knowledge-based) higher expectations of increasing performance and reducing effort (Çağlar & Demirok, 2010). Further, this suggests a clear separation between intensive and occasional technology users. Another pervasive finding is the very weak or hardly significant effect of use intention on use behavior. At first sight, this contradicts the theory of reasoned action/planned behavior (Ajzen & Fishbein, 2000). At a closer look, however, this can be explained by the high degree of technology diffusion, which leaves little degrees of freedom in participants' choice of educational technology vs. previous learning forms, and practically leads in many cases to forced use of technology (Liu, 2012).

From the cultural point of view (Hofstede, 2001), the study at hand reveals Turkish culture as associated with very low power distance, high individualism, very low masculinity, moderate uncertainty avoidance and long-term orientation. These findings display large differences to Hofstede's measurements and estimations, suggesting cultural changes occurred in recent years. Also, unexpectedly low values of cultural masculinity in this study, corroborated with negative values reported by Nistor et al. (in press) suggest a possible reconceptualisation of cultural masculinity.

Influence of regional culture. In this case, Hofstede's (2001) model of cultural values in connection with the newly developed Welch-Lerche test revealed non-significant cultural differences between Istanbul area and other regions of Turkey. Comparing this result with significant cultural differences reported by Nistor et al. (in press) between Southern and Eastern Germany in the dimensions PDI, UAI and LTO support the interpretation of a culturally homogeneous sample, which contradicts the hypothesis of east-west differences within Turkey. However, there were significant differences in the regional acceptance profiles, i.e. higher scores of performance expectancy and educational technology usage, and lower scores of computer anxiety. The differences in regional acceptance profiles may be then interpreted as caused by differences in technological and educational infrastructure, in the sense that these are better available in the capital than in other regions.

Influence of professional culture. The comparative examination of cultural and acceptance profiles of STEM vs. non-STEM professionals revealed clear differences that support the view of STEM and non-STEM as two different cultures. From cultural perspective, STEM participants appear as more democratic (lower PDI scores), more oriented to feminine cultural values (such as more caring and making less difference between gender roles, which is reflected in lower MAS scores), and tendentially less uncertainty avoidant (lower UAI scores, however the Welch-Lerche test with $p < 0.077$ was tightly above the statistical significance threshold). The differences in PDI and UAI are consistent with those reported by Nistor et al. (in press). However, lower MAS for STEM professionals differs from the same findings. From ETA perspective, STEM professionals score higher in performance expectancy and use behavior, somewhat higher, however not statistically significant, in effort expectancy, and lower in computer anxiety. These findings are consistent with the differences in requirements between professions, and with the findings of Venkatesh and colleagues (2003, 2012). However, according to Venkatesh and Zhang (2010), since STEM culture appears to be more feminine than the non-STEM culture, performance expectancy should be higher for non-STEM, and lower for STEM, which could not be reproduced in this study. As for the UTAUT path coefficients, effort expectancy has a somewhat stronger influence for non-STEM professions, which is similar to Nistor et al. (in press). As a further concordance, facilitating conditions have a stronger influence for non-STEM professions. Finally, the generally weak influence of use intention on behavior is somewhat stronger for non-STEM, which can be interpreted by educational technology diffusion being stronger in STEM than in non-STEM domains, which leves more degrees of freedom for non-STEM professionals in adopting or refusing technology according to their use intention.

CONCLUSIONS

Conclusions on ETA. This study confirms the wide applicability of the ETA concept, as conceptualized by Venkatesh and colleagues (2003, 2012) in UTAUT. The corresponding empirical findings appear robust and reproductible across cultures (Nistor et al., in press; Venkatesh & Zhang, 2010). Given the relative high complexity of UTAUT, a more in-depth discussion of the model would have to consider three different zones of the model: firstly the intention-behavior correlation; secondly the predictors of technology use intention, and thirdly the influence of facilitating conditions and anxiety on use behavior.

With respect to the first zone, Bagozzi (2007, p. 245) describes the intention-behavior correlation as "probably the most uncritically accepted assumption in social science research in general and IS research in particular". Nistor (under review) emphasizes that the majority of previous studies that include this correlation use the same data collection method for both variables, which is prone to statistical arterfacts likely to inflationate the strength of the correlation (Podsakoff, MacKenzie & Podsakoff, 2012). In this study, in spite of common methods, the correlation is extremely low, which calls for alternative explanations to Ajzen and Fishbein's reasoned action and planned behavior, such as restrained degrees of freedom in media choice or participants' insufficient information on performance and effort in technology use. Future research should clarify these open issues.

The predictors of technology use intention are designated in previous research (e.g., Nistor et al., in press; Pynoo, Tondeur, Braak, Duyck, Sijnave & Duyck, 2012; Schaupp, Carter & McBride, 2010; Venkatesh et al., 2012) as the strongest predictors in the entire acceptance model. The study at hand shows a simple alternative in which computer literacy, previously considered to be merely a moderator variable of the UTAUT model, can gain weight, become the strongest predictor and throw the other predictors at the lower limit of significance.

Finally, facilitating conditions embody a main acceptance predictor in this study as well as in previous studies. Venkatesh et al. (2003, 2012) understand this variable as including also computer anxiety. On the other hand, many authors (Beaudry & Pinsonneault, 2010; Conti-Ramsden et al., 2010; Nistor et al., in press) emphasize the meaning of computer anxiety for the adoption of educational technology. In order to enhance the explicative power of UTAUT, the authors of this study sustain the explicit representation of computer anxiety as a separate predictor. Its impact on educational technology usage is then expressed both in absolute values of the UTAUT variables and in the path coefficient leading from computer anxiety to use behavior.

Conclusions on the integration of cultural dimensions in UTAUT. This study shows once again that different definitions of culture apply in the context of ETA, and have different impacts on acceptance. Besides national culture, professional culture such as STEM vs. non-STEM can impact acceptance profiles. Several publications (Li et al., 2010; Li & Kirkup, 2007; Nistor et al., in press; Teo et al., 2008; Veltri & Elgarah, 2009; Venkatesh & Zhang, 2010; Zakour, 2007) are available suggesting how cultural dimensions can be integrated in acceptance models such as UTAUT. However, the present findings are still insufficient for proposing an acceptable model. Comparing acceptance profiles across national and professional cultures, as the study at hand does, may result in the progress of this research line.

In this study, progress in integrating culture in ETA models was done with respect to the cultural dimension of uncertainty avoidance. Both in this study and in Nistor et al. (in press), STEM professionals appear less uncertainty avoidant; in the Turkish, as opposite to the measurements in Germany and Romania, STEM professions are associated with significant higher computer anxiety and with a stronger influence of computer anxiety on use behavior. This reinforces the assumption of a correlation between UAI and computer anxiety, but also suggests that additional variables may be involved here in a more complex relationship that should be further explored.

An additional variable that may be highly relevant for acceptance models together with culture may be the availability of the technological infrastructure. The particularly strong correlation between technology use, computer literacy, computer anxiety and performance/effort expectancy, on the one hand, and the non-significant cultural differences between regions of Turkey, on the other, suggest regional differences in the technological and educational infrastructure availability. Hence, future acceptance research should also consider infrastructure availability along with cultural differences.

Conclusions for educational practice. As a general conclusion, which is not new at all, this study evidentiates the importance of computer literacy, which is tightly intertwined with the acceptance and use of educational technology. This may be directly supported by computer skills training, and indirectly by supporting self-directed experiential learning (Çağlar & Demirok, 2010).

With respect to culture, this study suggests that acceptance and Hofstede's culture dimensions are appropriate starting points when dealing with cultural discrepancies in the context of educational technology. The use of educational technology requires taking into consideration the individual differences in ETA, especially when members of different – national and professional – cultures are involved. Different learners may have different expectations with respect to the design and outcome of computer-enhanced learning environments, and need different support, e.g. in order to successfully deal with computer anxiety. In mixed, STEM and non-STEM learner groups, probably STEM professionals will initially expect more performance. However, the influence of performance expectations will be similar for both STEM and non-STEM. Educational technology designers should provide means of communicating these expectations, as well as possibilities to fulfill them.

In general, forced use of educational technology should be avoided (Liu, 2012), no matter what the profession of the learners is. Notably, technology use may implicitly become compulsory, if there is no alternative in using technology in order to reach an educational goal. Forced technology use contradicts personal attitudes and intentions, and may thus increase comptuer anxiety and impair learning motivation (Deci & Ryan, 2000). Therefore, learning environments should be provided along with technology-free alternatives, or at least include face-to-face components.

Individual learners' characteristics, from which acceptance profiles are most important, should be considered in association with design elements of learning environments. Relying on the paradigm of mass-customization (Nistor, Dehne & Drews, 2010), technology-enhanced learning environments may be designed for specific groups of users defined by national and professional culture.

Limitations of the study and open research questions. While this study, corroborated with former studies, provides robust evidence of UTAUT and its associated measure instrument's validity across cultures, the findings still have some limitations. One of them is due to the subjective character of the data, hence future research should also include objective data gained by methods such as observation or artifact analysis. As already mentioned, the comparative study of ETA across cultures should be continued in order to provide deeper insight in the complex relationship between ETA and culture.

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APPENDIX 1

Acceptance Questionnaire (Turkish translation, cf. Venkatesh et al., 2003, 2012)
Aşağıdaki durumlara ne kadar katılıyorsunuz?
kesinlikle katılıyorum-katılıyorum-tarafsızım-katılmıyorum-kesinlikle katılmıyorum

UTAUT-Subscale Computer knowledge (UTAUT-Altölçek Bilgisayar bilgisi)
Aşağıdakilerin ne olduğunu ve nasıl çalıştıklarını biliyorum:
1. bilgisayar
2. ofis yazılımları (Word, Excel vb.)
3. Internet'te bilgi araması yapmak
4. Internet kullanıcıları ile iletişim ve etkileşim içinde olmak
5. e-öğrenme (teknoloji destekli öğrenme)

UTAUT-Subscale Computer usage (UTAUT-Altölçek Bilgisayar kullanımı)
Aşağıdakileri düzenli olarak kullanıyorum:
1. bilgisayar
2. ofis yazılımları (Word, Excel vb.)
3. Internet'te arama yapmak
4. Internet kullanıcıları ile iletişim ve etkileşim içinde olmak
5. e-öğrenme (teknoloji destekli öğrenme)

UTAUT-Subscale Performance expectancy (UTAUT-Altölçek Performans beklentisi)
Bilgisayarı işimde faydalı olan bir öğrenme aracı olarak görüyorum.
Bilgisayarı işlerin üstesinden daha kolay gelmemi sağlayan bir öğrenim aracı olarak kullanıyorum.
Bilgisayarı üretkenliğimi arttıran bir öğrenim aracı olarak kullanıyorum.
Bilgisayarı öğrenme aracı olarak kullanırsam, maaşımda artış olma ihtimalini artırabilirim.

UTAUT-Subscale Effort expectancy (UTAUT-Altölçek Girişim beklentisi)
Bilgisayarla bir öğrenme aracı olarak etkileşimim daha açık ve anlaşılır olacaktır.
Bilgisayarı öğrenme aracı olarak kullanırsam kişisel yeteneklerimi geliştirmem kolay hale gelecektir.
Bilgisayarı öğrenme aracı olarak kullanmak zamanla daha kolay hale gelecektir.
Bilgisayarı öğrenme aracı olarak kullanmayı öğrenmek benim için kolaydır.

UTAUT-Subscale Social influence (UTAUT-Altölçek Sosyal etki)
Benim davranışlarımı etkileyen insanlar bilgisayarı öğrenme aracı olarak kullanmam gerektiğini düşünüyorlar.
Benim için önemli olan insanlar benim bilgisayarı öğrenme aracı olarak kullanmam gerektiğini düşünüyorlar.
Çalıştığım kurumun deneyimli yöneticisi, bilgisayarın öğrenme aracı olarak kullanılmasında yardımcı olmuştur.
Çalıştığım kurum genel olarak, bilgisayarın öğrenme aracı olarak kullanımını desteklemiştir.

UTAUT-Subscale Facilitating conditions (UTAUT-Altölçek Olanak sağlama koşulları)
Bilgisayarı öğrenme aracı olarak kullanmak için sunulan yeterli kaynağa sahibim.
Bilgisayarı öğrenme aracı olarak kullanmak için sunulan yeterli bilgiye sahibim.
Bir öğrenme aracı olarak bilgisayar, öğrenme aracı olarak kullandığım diğer araçlar ile uyumlu değildir.
Bilgisayarı öğrenme aracı kullanırken yaşadığım sorunları çözmeme yardım edecek özel biri ya da bir grup insan var.

UTAUT-Subscale Computer anxiety (UTAUT-Altölçek Bilgisayar korkusu)
Bilgisayarı bir öğrenme aracı olarak kullanırken kendimi endişeli hissediyorum.
Yanlış bir tuşa bastığım zaman bilgisayarımdaki birçok bilgiyi kaybedebilecek olmak beni korkutuyor.
Düzeltemeyeceğim bir hata yapacağım korkusuyla, bilgisayarı öğrenme aracı olarak kullanmaktan çekiniyorum.
Bilgisayarı öğrenme aracı olarak kullanmak biraz gözümü korkutuyor.

UTAUT-Subscale Behavioral intention (UTAUT-Altölçek Davranışsal niyeti)
Birkaç ay içinde bilgisayarı öğrenme aracı olarak kullanmak niyetindeyim.
Birkaç ay içinde bilgisayarı öğrenme aracı olarak kullanabileceğimi tahmin ediyorum.
Birkaç ay içinde bilgisayarı öğrenme aracı olarak kullanmayı planlıyorum.

EFFECTS OF IMPROVEMENT ON SELECTIVE ATTENTION: DEVELOPING APPROPRIATE SOMATOSENSORY VIDEO GAME INTERVENTIONS FOR INSTITUTIONAL-DWELLING ELDERLY WITH DISABILITIES

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ABSTRACT
The purpose of this study was to develop appropriate somatosensory video game interventions on enhancing selective attention of institutional-dwelling elderly with disabilities. Fifty-eight participants aged 65~92 were recruited and divided into four groups, 4-week and 8-week experimental and two control groups, for evaluating the one-month carry-forward effects by Vienna Test System. Fourteen participants in experimental groups voluntarily completed 30-minute Xbox games 3 times per week for a total of 4 and 8 weeks. The results showed that: (1) except sum of incorrect reaction, a majority of participants whose selective attentions had significant improvements in immediate effect, carry-forward effects and overall effect in 8-week group ($p < .05$); (2) 5 out of 8 items in selective attention tests had significant immediate and carry-forward effects and one overall effect in 4-week intervention ($p < .05$) and (3) The results conclude that using somatosensory video games is a viable approach to promote selective attention of institutional-dwelling elderly with disabilities. The present study also found that this approach could motivate elderly to participate with a variety of sound, music and sensory stimulations and is a viable and valuable direction to promote quality of life in long-term care system.
Keywords: somatosensory video game, aging and aged, attention, Xbox Kinect

INTRODUCTION

Significance of Selective Attention of Elderly

The issue of an aged and ageing population is of international concern and considered one of the foremost challenges globally. According to UN investigation, aged and aging populations increase 2.6% every year and will be more than child population in 2045 (United Nation [UN], 2009). In Taiwan, more than 2 million older adults aged more than 65 years also old reached 10.7% of total population in 2010 (Directorate-General of Budget, Accounting and Statistics, Executive Yuan, 2011). Therefore, with this dramatically growing trend, the concept of health promotion for aged and aging population has been one of the significant issues to address in Taiwan. Among all health promotion concerns of older population, selective attention has been noticed in recent studies because its positive contribution on fall prevention (Liu-Ambrose, Nagamatsu, Hsu, & Bolandzadeh, 2012).

Somatosensory Video Game Interventions for Elderly

With the massive attentions of medical and allied health professions, somatosensory video games had changed its roles from "toys for fun" to "therapy tools for rehabilitation/health promotion". Green and Bavelier (2003) stated that playing video games effectively increases players' visual skills and attentions. Related research also identified that video games have positive outcomes on promoting short-term memory, selective attention and motivation for older adults (Gamberini, Barresi, Majer, & Scarpetta, 2008; Ijsselsteijn, Nap, de Kort, & Poels, 2007). Miller (2005) also used the "HiFi" video game on 95 health older adults (mean = 80 years old) and found the significant improvements on memory and attentions with one hour per day for 8 weeks. Therefore, this study proposes to use a somatosensory video game to enhance selective attention of institutional-dwelling elderly with disabilities. Flynn and associates (2007) used a somatosensory video game, Eye Toy, in stroke patients and found that its significant impacts on assessments of physiological functions (Berg Scale, timed up and go, functional stretching, Dynamic Gait Index) and effectively improved upper and lower limbs coordination, motor recovery capabilities and reduced the levels of spasticity.

Recent studies also identified that somatosensory video games uses images, sounds and videos images to create dynamic and visual interactions also have strengths in improving cognitive function, visual performance skills, hand-eye coordination and reaction ability (Chiang, Tsai, & Chen, 2012; Liu, 2011; Rosenberg et al., 2010). Chiang and his associates (2004) began to use a somatosensory video game, Dance Dance Revolution, for older adults in the community and found that its effectiveness of balance improvements. With Bluetooth technology advances, the research team continued the study line by using Wii Fit to train institutionalized elder adults' balance and also found its values on health promotion (Chang & Chiang, 2010; Chiang, Chen, & Chang, 2011). Recently, the team started to use Xbox Kinect and found that the game have its benefits not only on physical but also on emotional functions (Chen, Huang, & Chiang, 2012). According to Chiang (2012), somatosensory video games had its unique characteristics which include immediately feedback, competition, companionship, challenges, close to grandchild and fun, to attract older adults to keep involved. For older adults who do not know how to exercise or do not have motivation to exercise, somatosensory video games have great potentials to develop as useful tools for rehabilitation/health promotion.

METHODOLOGY

Theoretical Framework

Treisman's attenuation theory was used in this study to illustrate the mechanism of the trainings because theories are constructed in order to explain, predict and master phenomena (e.g. relationships, events, or behavior) to make generalizations about observations and to consist of an interrelated, coherent set of ideas and models (Treisman, 1960). The attenuation theory states that unattended stimuli sometimes will be faded and barred unattended inputs from entering awareness when there are layers of sophistication to Broadbent' filter model. According to a previous study, selective attentions will be affected by aging processes because of the distracted by external irrelevant noises (Brink & McDowd, 1999). Therefore, this study proposed that the intervention were tried to add/strength older adults' filters and layers for environmental noises (voices, people, conversations, etc.) and have better selective attentions by practicing somatosensory video games.

Participants

A total of 58 participants were recruited at the beginning of this study but 10 subjects withdrew in the first month and another 10 subjects withdrew in the second month because of health issues and the willingness to join. Non-random purposive sampling was utilized in this study and all participants with disabilities were pre-approved by the medical/managing staffs and signed informed consent forms approved by the human subjects committee at the Taipei Physical Education College (Approval Reference No. 20110023) before participating in the study. In order to complete video game interventions and tests in the study, participants were required to have verbal communication ability and basic physical functions to participate and to be approved by head nurses. After receiving both consent forms from the participant and his/her family member, the elderly were asked to choose to be in the control group or experimental groups. According to their willingness and health condition during the three months period, 8, 8, 10, and 9 older adults completed 4-week experimental and control group and 8-week experimental and control group, respectively (Table 1).

Table 1. Participants' demographics in four groups before intervention (N = 35)

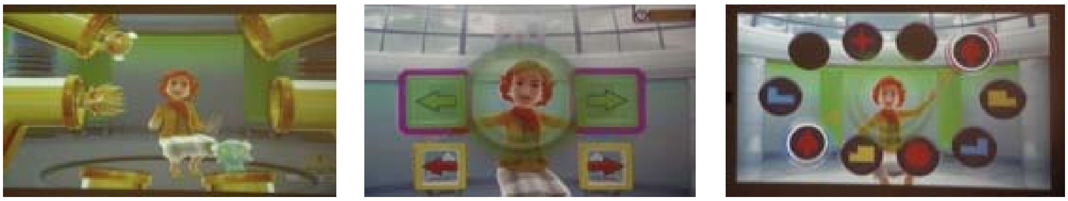
Groups	Gender (M:F)	Age (SD)	MMSE (SD)	Body Weight (SD)
4EG	0:8	77.25 (7.15)	19.50 (5.53)	57.59 (12.88)
4CG	3:5	80.50 (6.61)	21.00 (1.77)	62.03 (15.17)
8EG	2:8	81.20 (6.22)	26.70 (4.08)	56.35 (7.53)
8CG	4:5	77.44 (6.46)	26.44 (2.46)	60.73 (11.95)

4EG: 4-week experimental group
4CG: 4-week control group
8EG: 8-week experimental group

8CG: 8-week control group

Intervention

A quasi-experimental design was used in this study. The two experimental groups voluntarily agreed to complete 4- and 8-week somatosensory video game trainings three sessions per week, for 30 minute each session which included 5-minute warm up, 20-minute interactive gaming, and 5-minute cool down during their free time. Control group did not receive any additional training but maintained regular daily schedules and programs that were provided by the nursing home. In the study, "Xbox-360 Kinect" was selected to be the interventional modality. Three games, mouse mayhem, following the arrow, and matchmaker, were three chosen games in "Dr. Kawashima's Body and Brain Exercises" which were appropriate for older adults with wheelchair (Figure. 1).



(a) (b) (c)

Figure 1. Snapshots of three games while participants were playing in this study: (a) Mouse mayhem; (b) Follow the arrow; (c) Matchmaker

Those games were selected by the exercise- and sport-related professionals and staff who had long-term care professional working experiences with this population. Mouse mayhem is a game to "touch" mice that will pop out from four different pipes located at four different corners on the TV screen. In the game, there are three kinds of mice. Regular green and gold mice are allowed to touch and get points, but the gold mouse with hedgehog hair shall not be touched or points will be deducted. The total time allowed for one game is one minute. In Follow the arrow, red arrows pop out from five different directions and players have to point out those arrows within 5 seconds to get points. Totally 20 questions within one minute shall be answered in each game. Matchmaker uses lots of colorful pop-out figures on the screen and asks players to match the same figures by using both hands to get points. There are 15 pop-outs in each game, and time will be recorded to justify players' performance. Table 2 showed the training plans in this study.

Table 2. Somatosensory video games training plan

Time	Intervention program
week 1	Mouse mayhem x 12
week 2	Mouse mayhem x 5 Follow the arrow x 5
week 3	Mouse mayhem x 3 Matchmaker x 3 Follow the arrow x 5
week 4	Mouse mayhem x 4 Matchmaker x 4 Follow the arrow x 4
week 5-week8 (only 8-week group)	Mouse mayhem x 4 Matchmaker x 4 Follow the arrow x 4

Measurement: Vienna Test System (COG-S9)

The selective attention in this study was measured by Vienna Test system that is based on the theoretical model of Reulecke (1991). Energy, function and precision are three components, which demonstrated their selective attention by showing their demanding energy, performing a task, and the quality of task performance. Examinee uses the response panel as the input device. An animated instruction phase and an error-sensitive practice phase lead on to the task itself. In the test forms with flexible working time the respondent's task is to compare an abstract figure with a model and to decide whether the two are identical. Once the answer has been entered the next item follows automatically. In the test forms with fixed working time a reaction is required only if the figure is identical with the model. Once the presentation time has expired the next item follows automatically. It is not possible to omit an item or to go back to a preceding one.

The majority of reliability being over r = .95. Many studies of different aspects of validity (content validity, convergent and discriminant validity, construct validity, criterion validity) have been carried out. A number of studies carried out in the field of traffic psychology also confirm the validity of the test (Schuhfried, 2010). S9 is one of seven test forms contains very simple, unvarying stimulus questions which have a seven-minute time limit. The scoring of S9 includes total "reactions" (correct and incorrect reactions) and percentage "incorrect reactions". The results includes eight scores which are sum reactions, sum correct reactions, sum incorrect reactions, sum hits, sum correct rejections, percentage incorrect reactions, mean time correct reactions, and mean time incorrect reactions.

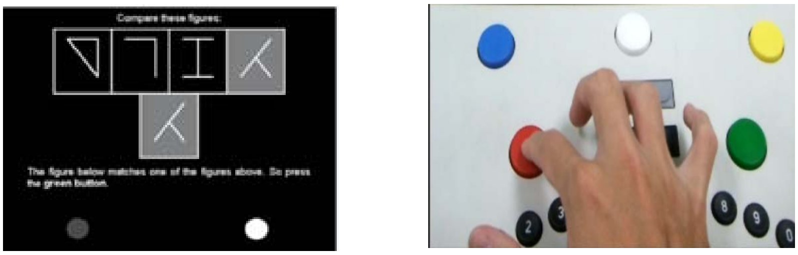


Figure 2. Vienna Test System (a) examination screen; (b) response panel

Measurement: Mini-Mental State Examination (MMSE)
The mini-mental state examination (MMSE) test is a 30-point questionnaire that is used to screen for cognitive impairments and dementia in nursing homes and other older institutions. MMSE is also used to estimate the severity of cognitive impairments at a specific time and to follow the course of cognitive changes in an individual over time. The current standard MMSE form published by Psychological Assessment Resources is based on its original 1975 conceptualization with minor subsequent modifications by the authors and translated into 10 different languages. Within 5 to 10 minutes, examinees are requested to complete questions in five areas included orientation to time, registration to place, attention and calculation, recall, language, repetition and complex commands. According to Folstein, Folstein, and Fanjiang (2001), the scores ranged from 24 to 30 means no cognitive impairment (NCI), 18 to 23 stands for mind cognitive impairment (MCI) and 0-17 represents severe cognitive impairment (SCI). Therefore, it is an effective way to document an individual's cogitative impairments and mental states. In this study, traditional Chinese version were used and administrated by registered nurses.

Data Collection and Analysis
SPSS 18.0 was used for statistical analysis that included descriptive statistics, Chi-square test, Kruskal-Wallis Test, Mann-Whitney U test, Spearman rank correlation coefficients, and Wilcoxon matched-pairs signed-rank test.

RESULTS & DISCUSSION
Demographic Background, Selective Attention and MMSE
According to the results (Table 3), selective attention and mental states demonstrated significant correlation, except percentage incorrect reactions (p < .05). Therefore, four groups were filtered again by their MMSE scores. In this study, we found that participants in both 4-week groups had mind cognitive impairment (MCI) and both 8-week groups had no cognitive impairment (NCI). In order to increase the similarity of the participants' mental states, Table 4 showed the participants' demographics in four groups with their scores of MMSE.

Table 3. Relationship between selective attention and mental states (N = 31)

Items	MMSE
Sum reactions	.61***
Percentage incorrect reactions	-.18
Sum correct reactions	.59**
Sum incorrect reactions	.39*
Mean time correct reactions	-.59***
Mean time incorrect reactions	-.56**
Sum hits	.53**
Sum correct rejections	.51**

*p < .05; **p < .01***p < .001

Table 4. Participants' demographics in four groups with MMSE (N = 31)

Items	Groups	Means (SD)	χ^2
Age(y)	4EG with MCI (n = 6)	74.33 (5.50)	6.42
	4CG with MCI (n = 8)	80.50 (6.61)	
	8EG with NCI (n = 8)	83.13 (5.33)	
	8CG with NCI (n = 9)	77.44 (6.46)	
Weight(kg)	4EG with MCI (n = 6)	60.63 (13.71)	1.13
	4CG with MCI (n = 8)	62.03 (15.17)	
	8EG with NCI (n = 8)	56.75 (7.84)	
	8CG with NCI (n = 9)	60.73 (11.95)	
MMSE	4EG with MCI (n = 6)	20.50 (1.38)	23.35***
	4CG with MCI (n = 8)	21.00 (1.77)	
	8EG with NCI (n = 8)	28.25 (2.43)	
	8CG with NCI (n = 9)	26.44 (2.46)	

***p < .001
4EG: 4-week experimental group
4CG: 4-week control group
8EG: 8-week experimental group
8CG: 8-week control group

Effects of 4-week Interventions for elderly with MCI on Selective Attentions

According to the results (Table 5), 4-week experimental group with MCI demonstrated significant immediate effects in five items of selective attention before and after the intervention (p < .05). This group was also examined differences of scores before and after withdrawal in order to understand the carry-forward effects. Sum reactions, sum correct reactions, sum hits, sum correct rejections had significant regression after one-month withdrawal. In terms of comparison of pre-intervention and after withdrawal, this group only had one significant effect in sum correct reaction. However, in the 4-week control group, participants showed significant increases in sum incorrect reactions and decreases in mean time correct reactions (Table 6).

Table 5. Changes of scores in 4-week experimental group with MCI (n = 6)

Items	Immediate Effects		Carry-forward Effects		Overall Effects	
	z score	ΔX	z score	ΔX	z score	ΔX
Sum reactions	-0.98	+33.7%	-1.68	+55.5%	-0.98	+33.7%
Percentage incorrect reactions	-1.12	+34.5%	-1.68	+66.7%	-1.12	+34.5%
Sum correct reactions	-0.70	+16.0%	-1.26	+37.0%	-0.70	+16.0%
Sum incorrect reactions	-1.47	+118.8%	-2.38*	+144.2%	-1.47	+118.8%
Mean time correct reactions	-0.70	-4.7%	-2.24*	-31.4%	-0.70	-4.7%
Mean time incorrect reactions	-0.70	-9.1%	-1.68	-31.3%	-0.70	-9.1%
Sum hits	-0.14	+2.7%	-1.40	+37.7%	-0.14	+2.7%
Sum correct rejections	-0.70	+22.4%	-1.12	+36.6%	-0.70	+22.4%

*p < .05

Table 6. Changes of scores in 4-week control group with MCI (n = 8)

Items	Immediate Effects		Overall Effects	
	z score	⊿X	z score	⊿X
Sum reactions	-0.98	+33.7%	-1.68	+55.5%
Percentage incorrect reactions	-1.12	+34.5%	-1.68	+66.7%
Sum correct reactions	-0.70	+16.0%	-1.26	+37.0%
Sum incorrect reactions	-1.47	+118.8%	-2.38*	+144.2%
Mean time correct reactions	-0.70	-4.7%	-2.24*	-31.4%
Mean time incorrect reactions	-0.70	-9.1%	-1.68	-31.3%
Sum hits	-0.14	+2.7%	-1.40	+37.7%
Sum correct rejections	-0.70	+22.4%	-1.12	+36.6%

Effects of 8-week Interventions for elderly with NCI on Selective Attentions

According to the results (Table 7), the 8-week experimental group with NCI demonstrated significant immediate effects in seven items of selective attention before and after the intervention (p < .05). In order to understand the carry-forward effects, the differences of selective attention before and after withdrawal were examined and found that 8 items of selective attention did not have significant regression and demonstrate its carry-forward effects (p < .05). In terms of comparison of pre-intervention and after withdrawal, 8-week group with NCI demonstrated significant overall effects, except sum correct reaction (p < .05). In the 4-week control group, participants did not show any significant difference in all measurements (Table 8).

Table 7. Changes of scores in 8-week experimental group with NCI (n = 8)

Items	Immediate Effects		Carry-forward Effects		Overall Effects	
	z score	⊿X	z score	⊿X	z score	⊿X
Sum reactions	-2.38*	+33.2%	-0.56	-1.8%	-2.10*	+30.8%
Percentage incorrect reactions	-2.10*	-42.5%	-1.12	-16.7%	-2.10*	-52.1%
Sum correct reactions	-2.52*	+44.6%	-0.42	+0.7%	-2.52*	+45.5%
Sum incorrect reactions	-1.75	-40.8%	-0.85	-22.6%	-1.40	-54.2%
Mean time correct reactions	-2.38*	-32.5%	-0.28	+1.0%	-2.17*	-31.8%
Mean time incorrect reactions	-2.52*	-42.3%	-0.84	+18.8%	-1.54	-31.5%
Sum hits	-2.52*	+39.8%	-0.14	+1.9%	-2.24*	+42.5%
Sum correct rejections	-2.38*	+46.7%	-0.35	+0.1%	-2.52*	+46.9%

*p < .05

Table 8. Changes of scores in control group with NCI (n = 9)

Items	4-weeks later		8-weeks later	
	z score	⊿X	z score	⊿X
Sum reactions	-0.30	-32.7%	-0.42	-26.8%
Percentage incorrect reactions	-0.06	-15.3%	-0.53	-11.7%
Sum correct reactions	-0.77	-13.7%	-0.30	-0.2%
Sum incorrect reactions	-0.24	-58.9%	-1.05	-63.6%
Mean time correct reactions	-1.24	+51.1%	-0.89	+40.6%
Mean time incorrect reactions	-1.24	+96.2%	-1.00	+44.8%
Sum hits	-0.18	-29.1%	-0.65	-38.0%
Sum correct rejections	-0.06	+0.7%	-0.42	+28.2%

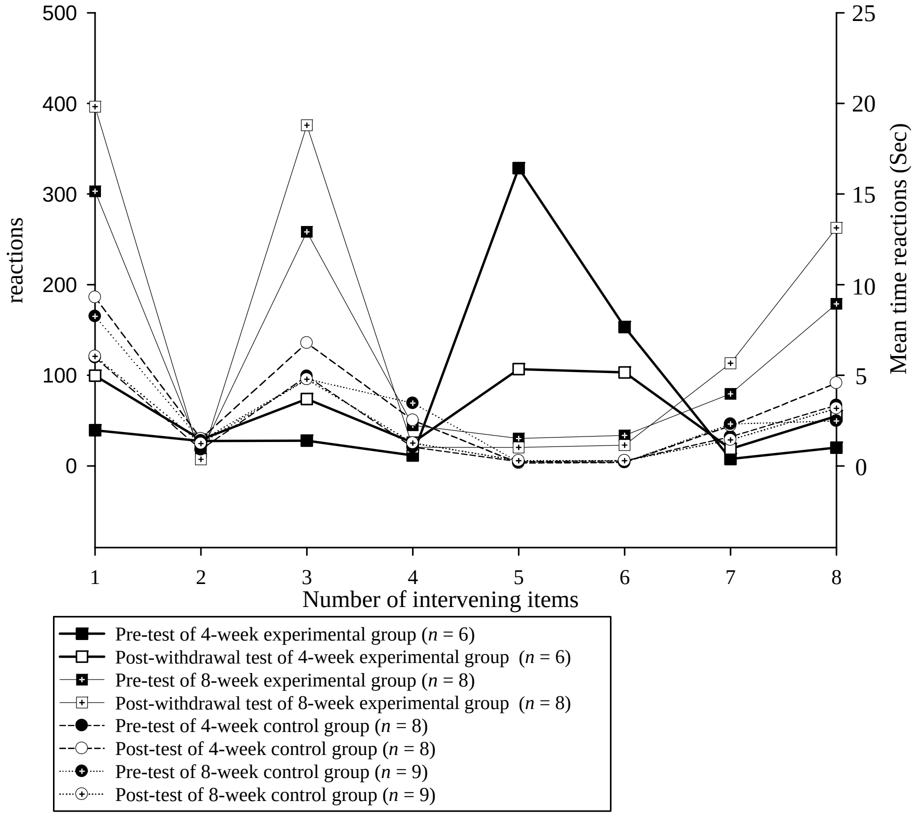


Figure3. Overall Effects. 1. Sum reactions; 2. Percentage incorrect reactions; 3. Sum correct reactions; 4. Sum incorrect reactions; 5. Mean time correct reactions; 6. Mean time incorrect reactions; 7. Sum hits; 8. Sum correct rejections. a, 8-week experimental group with NCI (n = 8) improved significantly on number 1,2,3,5,7,8 (p < .05). b, 4-week experimental group with MCI (n = 6) improved significantly only on number 3.

Overall Effects of 4-week and 8-week Interventions on Selective Attentions

In order to understand the impacts of interventions with different durations, three groups were examined their differences in 8 items (Figure 3). Sum reactions, sum correct reactions, sum hits, sum correct rejections, percentage incorrect reactions, mean time correct reactions, and mean time incorrect reactions are 7 items had significant improvements in 8-week experimental group with NCI. Sum correct reactions were the only one item significantly changed in 4-week experimental group with MCI. In the control group, there is no significant improvement in all 8 items.

CONCLUSIONS

In this study, we found that somatosensory video game trainings can significantly improved some aspects of selective attention on elderly with MCI and had limited carry-forward and overall effects with 4-week intervention. However, 8-week intervention had much better promising outcomes on immediate, carry-forward and overall effects on elderly with NCI. The findings suggested that more than 8 weeks somatosensory video game interventions are valuable to promote selective attention for older adults. However, there is still a strong need to continue somatosensory video game related research on older adults with different levels of MMSE. Furthermore, continuing innovative clinical-/intervention-type studies and practice-based somatosensory video game interventions in different settings (e.g. community, home-based) are recommended to explore sustainable health promotion strategies for this aged and aging society.

Several matters arising from the research methodology may have impacted on these final results. First, this study only can gather information from four short stays and the lack of directly empirical long-term data (e.g. real interdependent homes) to support the model may be criticized due to the nature of exploratory study design. Nevertheless, the study still provides valuable contributions to stipulate possible practical solutions for non-working time and services in the interdependent homes by having solid theoretical framework support and critical literature review. Secondly, another potential challenge would question on the legitimacy of borrowing concepts of complexity theory as a metaphors from the physical and biological sciences. In order to overcome this challenge, a great number of previous studies in health-related and educational professions on complexity theory have been critically reviewed. Satisfactory in predicting solutions on multidisciplinary collaborations was found because complexity theory provides a new angle in looking at how complex environment and structures form, adapt, and change. The academic nature of the research was emphasized in this study.

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EMPLOYING TEXTUAL AND FACIAL EMOTION RECOGNITION TO DESIGN AN AFFECTIVE TUTORING SYSTEM

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ABSTRACT
Emotional expression in Artificial Intelligence has gained lots of attention in recent years, people applied its affective computing not only in enhancing and realizing the interaction between computers and human, it also makes computer more humane. In this study, emotional expressions were applied into intelligent tutoring system, where learners' emotional expression in learning process was observed in order to give an appropriate feedback. Emotional intelligent not only gives high flexibility to the interaction of tutoring system, it also to deepen its level of human interaction.

This study uses dual-mode operation: facial expression recognition, and text semantics as the main elements in affective computing to understand users' emotions. Text semantics are used to understand learner's learning status, and the results would contribute to course management agents in order to choose the most appropriate teaching strategies and feedback to the users. Facial expression recognition allows interactive agents to provide users a complete sound and animation feedback..

INTRODUCTION
Affective computing means to obtain facial expressions and signals of physical change aroused by emotions and feelings via various sensors and to recognize these signals so as to understand human emotions to give proper feedback (Li & Cheng, 2011; Li & Huang, 2007; Liao et al., 2010; Manovich, 2001). This is an emerging academic field, concerning the study of detecting human emotions and establishing proper emotional models so that emotions may be expressed in every possible way and even be transmitted on the Internet (MIT Media Lab, 2008). In this case, affective computing is regarding two aspects: affection and emotion. Therefore, it will also need to detect information from both physical and psychological resources. According to Ammar et al. (2010), the latest scientific study has proved that emotions do exert great influence on decision making, perception, and learning.

For the time being, most "intelligent tutoring systems (ITS)" place more emphasis on providing users with a highly flexible and interactive learning environment. Moreover, they may present users with proper learning materials along with teaching strategies based on their background knowledge. For example, when users do not reach desired grades, the tutoring system may lower the learning level timely to suit the users' needs. Nevertheless, studies concerning the learning status of users are rare to be found. For instance, when a user's learning capability is in decline, the cause for his/her weakened learning motivation may come from the individual's mood swings rather than his/her poor capability of learning. In this case, it is hoped that the involvement of affective computing may help to observe users' emotions and learning status so that the fluctuation may help the tutoring system to provide users with suitable courses and feedback (Lin et al., 2011a; Lin et al., 2011b; Tsai et al., 2010).

However, humans have a complicated way to express their emotions, such as facial expression, eye contact, body language, physiological phenomenon, and even words. In this case, any single method is not likely to obtain affection or situation in a complete manner. Therefore, this study suggests adopting facial expression recognition and text semantics as a dual-mode operation so that information regarding a user's emotions and learning status may be discovered and understood better (Willems, 2011; Abulibdeh & Hassan, 2011; Yeo & Que, 2011). This study is aimed at applying affective computing to ITS so that a user's learning status as well as immediate emotions may be considered an index for the reference of flexible tutoring courses.

LITERATURE REVIEW

Kort et al.(2001) proposes a fundamental learning framework, whose abscissa means “Emotion Axis,” while the ordinate suggests “Learning Axis.” The farther an axis value on the right side of Emotion Axis is, the higher the positive energy will be and the further it on the left side is, the stronger the negative energy will be. On the other hand, the higher the “Constructive Learning” is, the stronger learning interests the use will have. Otherwise, the higher the “Un-Learning” is, the lower learning interests the user will have.

It is made up of four models: interface pattern, expert pattern, student pattern, and tutor pattern (Koedinger and Corbett,2006). In recent years more and more tutoring systems focus on creating learners’ emotions in a tutoring environment, including emotional expression, empathy (Lester et al., 1999), and learners’ affection recognition(Conati et al., 2002). Besides, there are other studies concluding that the introduction of emotions to study is very likely to arouse users’ motivation. Emotions play a vital role in knowledge acquisition for humans (Vesterinen, 2001). They have been regarded as a considerably important factor to intrigue learners’ motivation, whereas motivation plays a vital role in knowledge acquisition (Mao & Li, 2010). In this case, “Affective Tutoring Systems (ATS)” is developed to detect students’ situations of learning and affection so as to give them timely emotional feedback and to correct their emotions of learning (Mao and Li, 2010). ATS is, in fact, designed based on the concept of ITS, aimed at mimicking real human reaction so as to adjust to students’ affection and situation in an effective manner(Sarrafzadeh et al., 2003; Sarrafzadeh et al., 2004; Vicente, 2003). According to Gerald (2004), negative emotions will weaken the learning status, while positive ones do benefit learning achievement. Moreover, Ammar et al., (2010) argues that the establishment of facial expression may strengthen the affective tutoring system in terms of the relationship of ATS and users. This study has proved that affective computing is good for monitoring users’ behavior in the learning process (Ammar et al., 2010; Lin et al., 2011a; Lin et al., 2011b; Tsai et al., 2010).

In early days, emotion recognition used to focus on mainly recognizing face and speech. Speech recognition detects mostly the frequency and energy of voices so as to generate a set of rules to identify emotions by means of statistics or machine learning. As for facial expression recognition, a great number of experts and researchers have conducted many relevant studies in these years. Among of them, “Facial Action Coding System (FACS)” developed by Ekman et al. (1978) may be the most well-known. This system identifies dozens of “action units (AUs)” based on facial muscles. It adopts facial contour beforehand to detect the positions of face, eyebrows, mouth, and nose. These positions are then served as points spreading into a plane so as to form an expression of features. Based on the movement of these feature points, each point’s displacement vector is carefully caculated. With respect to the recognition part, the collected data is added to various detectors such as SVM, Neural Network, and HMM for facial expression identification or hypothesis developed in accordance with psychologists’ definition.

“Active Shape Model (ASM)” was firstly proposed by T.F. Cootes in 1992. Its former idea was “Active Contour Model (ACM).” The main concept of ASM is to establish an active shape model by training images of similiar objects. By applying the iterative method to decreasing the difference between the shape of model and that of the targeting object, the shape model can finally match the shape of targeting ojbect by means of adjusting the parameters. In this way, the extraction of feature points will be more likely to be accurate and precise.

Digital art is an emerging genre of arts. It comes from Technical art, integrating computers, network, and multi-media altogether to present various aspects (Liao, 2003). Lin et al. (2004) believes that artistic works shall be able to reach viewers’ inner feelings. In addition to the affection demonstrated by the work itself, viewers are supposed to have deeper thoughts (Lin, et al., 2012; Wang et al., 2011). In this case, this art course may include art history, art appreciation, art creation, and art criticism (Liao, 2003). Moreover, lecturers may try to integrate information technology into art courses and to overcome issues of network connection in order to increase their teaching performance on art and culture, improve their instruction, and exert the positive effects of education (Lu, 2009).

AUTHOR ARTWORK

Research Method

This system is divided into two parts: (1) Course and Interactive mechanism; (2) Emotion and Learning Status Recognition mechanism. Moreover, the two main parts are divided into smaller modules seen as Figure 1.

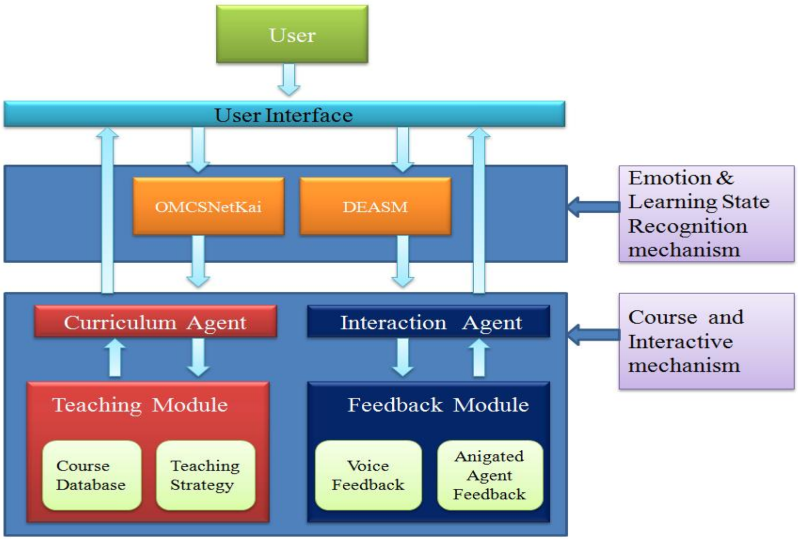

Figure 1 Flowchart of Affective Tutoring System

Ontology-based Semantic Learning Status Recognition System
The OMCSNet is served as the database for semantic hypothesis. After generating a hypothesis concerning the user's learning status value, this study applies a semi-automatic voting mechanism to obtain the final learning status. This data will then become an indication for system agent to choose courses for users. To develop an ontology-based semantic learning status recognition system, this study adopts the OMCSNet (Open Mind Common Sense corpus, a semantic Network, 2003), a creation developed by Massachusetts Institute of Technology (MIT) Media Lab, to work with the voting mechanism so that this study is able to create the OMCSNetKai to complete the task (Lin et al., 2011a; Lin et al., 2011b; Tsai et al., 2010).

Algorithm of Facial Expression Recognition
This mechanism of facial expression recognition and learning status recognition is created in accordance with the Detected Emotion based on Active Shape Model (DEASM) developed by this study. DEASM is the creation generated by Active Shape Model Library (ASMLibrary 5.0) SDK and the algorithm proposed by Ammar (2010). DEASM is applied to extract information of instant images via the webcam so that this study may match each frame with the active shape models to obtain the coordinates of feature points needed for the algorithm. Afterwards, this study conducts the algorithm of facial expression recognition to recognize users' emotions. After extracting the necessary targeting feature points, this study conducts the definition of six spans of facial feature points (Di) proposed by Ammar (2010) to go with the six fundamental human emotions and develops the algorithm of facial expression recognition.

Intelligent Tutoring System
This study is aimed at developing an ATS on the basis of ITS, capable of detecting users' emotions and giving them proper feedback. ATS suggests that the system is able to recognize a user's learning and emotional status so that it may give the user a timely emotional feedback to help him/her back on track (Mao and Li, 2010). Despite the fact that many researchers have attempted to apply ITS to teach all sorts of fields such as algebra, geometry, mathematics, physics, and computer programming, rarely does it be applied to teach art courses, or even digital art. The following part is concerning the introduction of how this study makes use of the ATS it develops to teach digital art course (Lin et al., 2011a; Lin et al., 2011b; Tsai et al., 2010).

The interactive user agent module is divided into two subordinate modules: sound feedback and animation feedback. Based on six fundamental emotions, agents may react to users' emotions in various sounds and animation. For instance, if the user has an expression of sadness, the agent will comfort him/her by wearing a caring look and asking, "Are you alright?" In accordance to the six fundamental emotions defined by Ekman & Friesen (1978) plus the "Neutral" emotion, The snapshot of the system is shown in Figure 2.

Figure 2: A snapshot of the system

System Design and Evaluation

This study intends to establish a more humane interactive mechanism by recognizing users' emotions so that learners may enjoy a more flexible process of knowledge acquisition. Therefore, this study designs its system and evaluation as follows: (1) concept model; (2) prototype design; (3) expert-based heuristic evaluation; (4) ATS—A combination of emotion recognition and feedback; (5) triangulation evaluation on the final system, including questionnaires, observation, and interviews. The flowchart of system design and evaluation is seen as Figure 3.

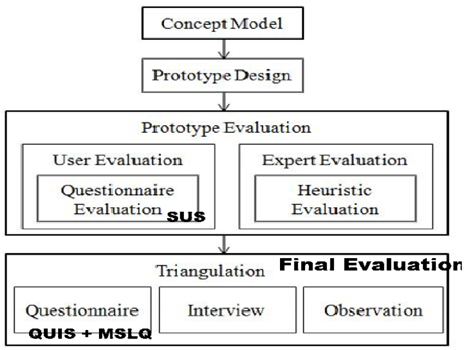

Figure 3 Flowchart of System Design and Evaluation

Prototype Design

Expert-based Heuristic Evaluation on the Prototype

After the cognitive walkthroughs, the heuristic evaluation process was performed then. Heuristic evaluation (Nielson & Molich, 1990) (Nielson, 1994) was developed by Jakob Nielsen according to usability exploring rules. These rules were called heuristics and used to evaluate whether the elements which made up the user interface were based on these principles. In Nielsen's research, it was proved that experts can usually check out around 75% usability problems and skilled experts were able to observe a lot of usability problems on their own. Also, based on Nielsen's advice, there should be four to six experts. In the research, we had five experts.

Each expert spent one to two hours examining the prototype at least twice. First, experts grasped the procedure of the whole interactive interface manipulation and gained some knowledge about the work. Then, experts checked the usability problems of the entire artwork. Finally, experts discussed their evaluation results together, prioritized the problems, and offered solutions to them.

Expert-based Heuristic Evaluation on the Prototype

In the part of system estimation, it mainly evaluated system usability of the users on the research. We utilized the well-known questionnaire System Usability Scale (SUS) to evaluate the system usability. The questionnaire was revised with help from experts with significant experiences in the related fields. A 5-point scale ranging from 1 as strongly disagree to 5 as strongly agree was used for the measurement. The revised version of the SUS questionnaire is in table 1 (Brooke, 1986; Tullis, 2004; Lutes, 2006; Isman, 2010). The revision majorly focused on making SUS more suitable to artwork evaluation.

SUS is a questionnaire to estimate users' subjective feelings of the system and further know their degrees of satisfaction. In the aspect of system usability evaluation, the SUS is an efficient, time-conserving, and labor-saving way of subjective estimate. At present, it is widely applied in the system usability. After users finishing answering ten questions, the scale offers a formula which transfers the subjective feelings of users into the objective data information for analysis. That is, the score of SUS is used to evaluate usability of the system. The range of estimate score is from 0 to 100. The higher the score is, the more useful the system is and the more easily users can interact with it.

Table 1: SUS Questionnaire

System Usability Scale	
1.	I think that I would like to interact with this work frequently
2.	I find the work unnecessarily complex
3.	I suppose the work is easy to use
4.	I think that I would need the support of a technician to help me use this work
5.	I find the various functions in this work are well integrated
6.	I suppose there is too much inconsistency in this work
7.	I would imagine that most people may learn to use this work very quickly
8.	I find the work not very user-friendly
9.	I feel very confident while using the work
10.	I need to learn a lot of things before I can get used to this work

Expert-based Heuristic Evaluation on the Prototype
By making use of the QUAN + QUAL Model, a better understanding can be provided for the phenomenon of interest (Creswell, 2008; Creswell & Clark, 2007; Gay, et al., 2009). Triangulation Evaluation consists of questionnaires, observations, and interviews. The final questionnaire was composed of QUIS and MSLQ. "Questionnaire for User Interaction Satisfaction (QUIS)" is issued to discover the subjective satisfaction of participants toward the user interface. This measurement tool can be used to measure satisfaction of the entire system, and to measure specific interface factors, such as screen visibility, terminology and system messages, learning factors, as well as functionality of a system. On the other hand, this study issues the "Motivated Strategies for Learning Questionnaire (MSLQ)" to discover how participants' learning motivation is stimulated after using ATS. MSLQ is developed by Printric et al. (1991) and divided into six aspects with 30 questions in total. They are 4 questions of inner motivation, 4 of outer motivation, 6 of work value, 4 of control belief, 8 of self-efficacy, and 4 of learning anxiety respectively. Moreover, this questionnaire enquires participants in the manner of the five-point Likert Scale.

After the end of the experiment, this study conducted focus group interviews and used Grounded Theory (Strauss & Corbin, 1990) to code and log the findings. Since most of the interview content correlate with enhancing learning interest, learning incentives, learning motivation and learning effect, coding schema was developed around these dimensions to organize user feedback and views, and to understand which research issues will be satisfied by the system developed in this research.

Usability Evaluation Results on the Prototype
After conducting the SPSS reliability analysis, this study concludes that its SUS reaches a Cronbach's value of 0.792, exceeding the overall reliability value of 0.7. The overall mean of SUS is 75 and the standard deviation is 10.64. On balance, the result is determined as skewed left mesokurtic (skewness=-.492, kurtosis=.789), indicating that the cluster with high scores account for a high percentage among all users. In this case, most users are highly sensitive to the system usability of ATS. Afterwards, this study creates a final questionnaire and processes all users' answers into a data shown as Table 2, which indicating participants are satisfied with the usability of ATS

Table 2 Statisitic Result of SUS Scores

Number of samples	average	median	Maximum value	Minimum value	Standard deviation
20	75.00	78.75	87.50	50.00	10.64

Based on the statistic data, this study selects the first and second top scores appearing in this five points scale and puts these two percentages together. As it is seen in Table 3, the overall subjective feeling is 78.50%. In Q1, there are 65.0% of users willing to use such a learning system as ATS. Moreover, in Q2, 80.0% of users agree that this system is not complicated. In Q3, there are 90.0% of users consider this system easy to use, while in Q4, 40% of users think that they need extra assistance from the technicians to operate this system. In Q5, over 90% of users consider the system functions well-integrated. What's more, in Q6, 80% of users do not think the system contains many contradictions. In Q7, there are 85% of users believing they do not need much time to learn how to use this system and in Q8, over 90% of users think of using the system as not difficult. In Q9, 85% of users have strong faith in operating this system, while in Q10, 80% of users believe that they need to have some background knowledge prior to using this learning system. Based on the mean of SUS, 75.0, as well as the question analysis from Q1 all the way through to Q10, it is concluded that this system has good usability.

Table 3 Descriptive Statisitcs of SUS

Mean, standard deviation, skewness, and kurtosis					Question Percentage of the Five Point Scale(%)				
					1	2	3	4	5
Q1	3.80	.696	.292	-.734	0	0	35.0	50.0	15.0
Q2	3.85	.489	-.442	1.304	0	0	20.0	75.0	5.0
Q3	4.15	.587	-.004	.178	0	0	10.0	65.0	25.0
Q4	3.30	.923	.214	-.595	0	20.0	40.0	30.0	10.0
Q5	3.95	.394	-.531	4.985	0	0	10.0	85.0	5.0
Q6	4.00	.795	-.699	.807	0	5.0	15.0	55.0	25.0
Q7	4.30	.733	-.553	-.834	0	0	15.0	40.0	45.0
Q8	4.35	.813	-1.42	2.379	0	5.0	5.0	40.0	50.0
Q9	4.40	.754	-.851	-.609	0	0	15.0	30.0	55.0.
Q10	3.90	.852	-.930	1.012	0	10.0	10.0	60.0	20.0
Overall	4.00	.703	-.492	.789	0	4.0	17.50	53.0	25.50

Analysis of Questionnaire for User Interaction Satisfaction (QUIS)

In this study, the result of QUIS reliability analysis in terms of its six aspects is seen as Table 4. Among the six aspects, except the reliability value of "terminology and system information" being 0.535, which is less than 0.7, the rest all reaches the general desired value 0.7.

Table 4 Reliability Analysis of User Interaction Satisfaction Aspect

Overall User Feedback	Screen Presentation	Terminology and System Information
0.869	0.799	0.535
Learning operation system	System performance	User interface usability
0.719	0.833	0.757

As it is shown in Table 5, the score of "user interface usability" is much lower than the mean. On the other hand, the reason why the score of "terminology and system information" is slightly lower than the mean is probably because the interface layout is not user-friendly enough. Besides, the interface contains more English explanation than Chinese. In this case, to students who are native Chinese speakers, they may have difficulty operating the system in a direct method. Nevertheless, the score of "learning operation system" and "system performance" is 6.17 and 6.40 respectively, indicating that this ATS is still acceptable to users. It is concluded that (1) the usability of ATS is good.

With respect to "overall user feedback" and "screen presentation," the score is 7.05 and 7.30 respectively. They have the best two scores, indicating that though the interface usability may not be the most satisfying element, screen presentation does improve this weakness. Therefore, users have positive feedback concerning the operation of ATS as a whole. Since the "overall user feedback" scores as high as 7.05, it is concluded that (2) users are satisfied with ATS.

However, in the aspect of "overall user feedback," the non-experienced group scores 7.11, higher than the experienced group scoring 6.89. This may be the result that the non-experienced group has never experienced such a learning system before; therefore, their first experience is totally new and interesting to them. That's why the system arouses their positive feedback. Therefore, it is concluded that (3) the interaction of ATS is indeed attractive to users. Table 4-6 demonstrates the result of descriptive statistics and T-test analysis of QUIS aspects.

Table 5 Descriptive Statisitcs of QUIS

	Experienced(22 people)		Non-experienced(18 people)		total(40people)		P-value (double -tailed test)
	average	Standard deviation	average	Standard deviation	average	Standard deviation	
Overall user feedback	6.89	1.01	7.11	0.49	7.05	1.03	0.415
Screen presentation	7.19	0.732	7.43	0.77	7.30	0.94	0.324
Terminology and	6.51	0.47	5.97	0.40	6.27	0.91	0.000*
Learning operation system	6.50	0.70	5.76	0.41	6.17	1.106	0.000***
System performance	6.34	0.50	6.47	0.66	6.40	1.25	0.481
User interface usability	5.88	0.64	5.30	0.58	5.62	1.09	0.005**
Average	6.55	0.68	6.34	0.55	6.47	1.05	0.204

(P-value suggests the comparison between the experienced group with the non-experienced group.)
Notice: * means p<0.05, ** means p<0.01, and *** means p<0.001

CONCLUSION

This study is aimed at creating and developing a reliable process of design and evaluation plus the digital art course of Affective Tutoring System. Based on the study objectives and questions stated in the very beginning, this study has concluded the following conclusion after compiling the user feedback:

(1)ATS is easy to use. Moreover, the interaction is outstanding. Therefore, the compatibility of affective computing in the tutoring system is considerably good. (2)When interacting with ATS, users do achieve their desired objectives. Therefore, users are highly satisfied with ATS.(3)Since users have strongly positive feedback with respect to the affective recognition and agent feedback of ATS, it is indicated that the interaction of ATS is attractive to users. (4)Since users are interested in this informative digital art course, it is suggested that ATS is helpful in terms of increasing users' motivation in learning the digital art course.

This study attempts to follow the process of design and evaluation to establish a tutoring system based on the affective recognition and to teach digital art course via this system. This system combines two various recognition methods, OMCSNetKai and DEASM, to identify the user's emotional status while he/she is inputting words and to provide the user with a suitable course level as well as agent feedback. It is expected that users may maintain good emotional status in the process of learning so as to increase their learning motivation. Besides, this study adopts an evaluation method combining both quality and quantity altogether to help this study better understand the true feelings of users toward the system. Therefore, the concluded feedback may serve as a reference for the system feasibility.

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EXAMINING FRESHMEN BELIEVE CONCERNING ICT USAGE IN K-12 AND UNIVERSITY SETTINGS

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ABSTRACT
Information and communication technology usage in school settings has increased significantly. Most of the teacher education colleges realized this situation and change their education programs and give technology and educational technology classes to their students. In this research it is aimed to reveal pre-service teacher believe concerning ICT usage in K-12 and university settings. Results show that gender, internet connection and compute usage do not affect ICT usage believe.
Keywords: ICT usage, freshmen, believe,K-12;

1. INTRODUCTION

New millennium learners communicate, collaborate and learn in different ways. Dede (2005) state contemporary learning style contain studying with multimedia, appreciating different communication styles, working, analyzing and synthesizing data from multiple resources, active participation to learning process. As can be understood from the definition of new learners learning style, new learner learn in different ways and they are different from elder person. Thereby teachers, who educate new millennium learners, should educate as teachers that know how to use new technologies and that use these technologies in productive ways. Today's educational system was intended to teach in the era, which was not appearing, and generation has changed but educational system did not (Prensky, 2001). Goverments realized this need and they have changed the quantities and amount of educational investment. Prensky (2001) state new learner characteristics as they can work multitasking, they prefer multimedia than text, they can process information rapidly and they name technology as friend not evil. If teachers, who educate digital natives, know the digital native abilities, educational process becomes productive. To educate sufficiently pre-service teachers, who are also digital native, regarding technology, pre-service teachers opinion and idea should be comprehended and interpreted, in addition to digital native's characteristics.

Information and Communication Technologies (ICT) is the main part of the new society (Meng & Li, 2002). Humans lives have affected from ICT transform and humans started to use ICT in almost every action. People have brought ICT and computer technology in the center of their life (Mills, 2006). Electronic devices, internet and computer has become pervasive and transformed humans daily actions and habits (Littlejohn, Margaryan & Vojt, 2010). While people's social environment changes, it transforms school environments and computer and other technological tools has integrated to school environments.

Schools either private or public provide technological tools, computer and various software and students can interact with computer and use different software and so they can learn how to use these technologies (King, 2002). Similar other schools, education colleges offer some courses related computer and software and offer some other courses how to use technology in classroom. By this way pre-service teachers can learn skills, which are required in their professional life. ICTs are believed as tools which shape teaching and learning activities and can enhance their teaching activities (Keser & Özcan, 2011). To use technological devices in effective way require educating teachers trained how to use technological tools and how to use them in educational settings. Increasing in the use of ICT and other technological tools in learning environments has caused to change in in-service teacher education, colleges and universities offer more courses related ICT, technology and educational technology (Sang, Valcke, Braak & Tondeur, 2010). The easiest way to form upcoming generations is educating pre-service teachers (Huanga, Lubinb & Gec, 2011).

Gender difference in technology usage has become an attractive issue recently. Li & Kirkup (2007) investigate both culture and gender difference on using technology and they found male Chinese students use more internet than female Chinese students and men reported more confidence in using internet. Vekiri & Chronaki (2008) state that computer and other technologies are dominant activities for most boys' acitivites and male students have more self-efficacy concerning computers. Meelissen & Drent (2008) state that boys reported more positive judge regarding self-efficacy in ICT usage. Imhof, Vollmeyer & Beierlein (2007) reported male students chat more than female students, they play more online games, the shop online more often, they share more files and they do more internet research.

2. METHOD

This study seeks to define is there any difference freshmen's belief's concerning ICT usage in K-12 and university settings by gender, ownership of connection to internet at home and freshmen's computer usage status in their high school settings. Study population was all freshmen's who attend one of the Turkish college of education. In order to obtain research data a survey was developed by researchers. Survey contains two main sections. First section of survey consists of nine questions concerning demographic characteristics of the participants. The second section questions are concerning freshmen's beliefs usage ICT in K-12 and college settings. Paper survey administered voluntarily and after explaining the aim of the research freshmen were asked whether they would like to participate to study or not. Freshmen, who stated would like to participate, were given survey and one week was provided to complete survey. After one week, 425 freshmen returned to survey. To analyze freshmen's demographic data frequency analyze was done, and to analyze differences freshmen's belief's concerning ICT usage in K-12 and university settings by gender, ownership of connection to internet at home and freshmen's computer usage status in their high school settings independent samples t-test was run.

3. FINDINGS

In this section participants demographic data and t-test results regarding difference freshmen's belief's concerning ICT usage in K-12 and university settings by gender, ownership of connection to internet at home and freshmen's computer usage status in their high school settings. Participants demographic data can be seen in table 1. And gender differences freshmen's belief's concerning ICT usage in K-12 and university settings in can be seen in table 2, ownership of connection to internet difference can be seen in table 3 and freshmen's computer usage status differences can be seen in table 4.

Table 1 Participants demographic characteristics (N=425)

		Female	Male
Where do you come from?	Rural Area	14.5%	28.1%
	Urban Area	85.5%	71.9%
Personal Monthly Income	0 - 100 $	54.2%	54.7%
	101 - 200 $	29.5%	28.8%
	201 - 300 $	7.6%	10.8%
	301 - 400 $	4.0%	3.6%
	401$ and more	4.8%	2.2%
Do you own a laptop?	Yes	43.9%	39.4%
	No	56.1%	60.6%
Do you own a cell phone?	Yes	98.2%	99.3%
	No	1.8%	0.7%
Do you own data plan for your cell phone?	Yes	55.9%	53.5%
	No	44.1%	46.5%
Do you own Internet access at home?	Yes	72.8%	50.0%
	No	27.2%	50.0%
Did you use computer in your high school classroom?	Yes	63.7%	56.3%
	No	36.3%	43.7%

As can be seen in table 1, most of female participants (85.5%) and most of the male participants (71.9%) came from urban area, most of the female participants (83.7%) and most of the male participants (83.5%) have monthly income less than $200. When looked at the laptop ownership 43.9% of the female and 39.4% of male participants have their own laptop. Almost all of the male and female participants have their own cell phone, but just 55.9% of the female and 53.5% of the male participants have data plan for their cell phone. When we look at the internet access at home status almost one third of the female participants have internet access at home just half of the male participants have internet access at home. And 63.7% of the female participants used computer during their high school education and 56.3% of the male participants used computer during their high school education.

Table 2 T-test results related gender differences in freshmen's belief's concerning ICT usage in K-12 and university settings

	Female	Male	t	df	Sig. (2-tailed)
desktop computer in my classroom	4.19 (0.86)	4.20 (1.12)	-0.086	420	0.93
laptop computer in my classroom	4.15 (0.88)	4.15 (1.12)	0.052	421	0.96
tablet (computer) in my classroom	3.62 (1.05)	4.06 (1.08)	-4.064	417	0.00
cellular phone in my classroom	2.79 (1.31)	3.10 (1.49)	-2.152	416	0.03
mobile device in my classroom	3.34 (1.17)	3.66 (1.17)	-2.655	416	0.01
smart board in my classroom	4.22 (0.95)	4.28 (1.04)	-0.52	416	0.60
camera in my classroom	3.51 (1.18)	3.46 (1.30)	0.377	421	0.71
data projector in my classroom	4.37 (0.85)	4.28 (1.07)	0.874	422	0.38
slide projector in my classroom	4.33 (0.81)	4.25 (1.09)	0.799	423	0.42
overhead projector in my classroom	3.96 (1.05)	3.99 (1.13)	-0.258	420	0.80
desktop computer in University	4.09 (0.93)	3.94 (1.24)	1.389	420	0.17
laptop computer in University	3.99 (0.99)	3.80 (1.28)	1.68	420	0.09
tablet (computer) in University	3.44 (1.14)	3.26 (1.33)	1.502	417	0.13
cellular phone in University	3.91 (1.13)	3.68 (1.34)	1.816	417	0.07
mobile device in University	3.77 (1.01)	3.55 (1.25)	1.986	418	0.05
smart board in University	3.74 (1.12)	3.55 (1.38)	1.519	420	0.13
camera in University	3.56 (1.10)	3.18 (1.37)	2.994	420	0.00
data projector in University	4.05 (0.91)	3.91 (1.23)	1.367	420	0.17
slide projector in University	4.08 (0.89)	3.87 (1.24)	1.959	420	0.05
overhead projector in University	3.67 (1.13)	3.49 (1.41)	1.474	421	0.14

Table 2 summarize the t-test results, which run to compare female and male freshmen's beliefs concerning whether technological tools can be used in their future classroom and their university courses. According to results male participants have more positive believe concerning tablet computer usage in their future classroom (M=4.06, SD=1.08) than female participants (M=3.62, SD=1.05); $t_{(417)}$=-4.064,p=0.00. Male participants have more positive believe concerning cellular phone usage in their future classroom (M=3.10, SD=1.49) than female participants (M=2.79, SD=1.31); $t_{(416)}$=-2.152,p=0.03. Male participants have more positive believe concerning mobile device usage in their future classroom (M=3.66, SD=1.17) than female participants (M=3.34, SD=1.17); $t_{(416)}$=-2.655,p=0.01. Concerning usage of other seven tools in their future classroom there was no difference between male and female believe.

According to results there was a significant difference between male and female participants believe concerning usage of camera in university classroom. Female participants have more positive believe concerning camera usage in university classroom (M=3.56, SD=1.10) than male participants (M=3.18, SD=1.37); $t_{(420)}$=2.294,p=0.00. Concerning usage of other nine tools in their university classroom there was no difference between male and female believe.

Table 3 T-test results related internet access ownership differences in freshmen's belief's concerning ICT usage in K-12 and university settings

	Yes	No	t	df	Sig. (2-tailed)
desktop computer in my classroom	4.19 (0.86)	4.21 (0.89)	-0.194	280	0.85
laptop computer in my classroom	4.15 (0.84)	4.16 (0.97)	-0.033	279	0.97
tablet (computer) in my classroom	3.61 (1.04)	3.63 (1.08)	-0.125	276	0.90
cellular phone in my classroom	2.86 (1.30)	2.62 (1.32)	1.325	274	0.19
mobile device in my classroom	3.37 (1.12)	3.27 (1.30)	0.597	274	0.55
smart board in my classroom	4.18 (0.98)	4.33 (0.87)	-1.131	275	0.26
camera in my classroom	3.50 (1.16)	3.53 (1.24)	-0.236	279	0.81
data projector in my classroom	4.32 (0.86)	4.48 (0.82)	-1.397	280	0.16
slide projector in my classroom	4.29 (0.84)	4.44 (0.73)	-1.431	281	0.15
overhead projector in my classroom	3.91 (1.06)	4.08 (1.00)	-1.19	279	0.24
desktop computer in University	4.10 (0.95)	4.07 (0.88)	0.281	279	0.78
laptop computer in University	4.07 (0.95)	3.78 (1.08)	2.248	278	0.03
tablet (computer) in University	3.51 (1.13)	3.25 (1.14)	1.69	276	0.09
cellular phone in University	3.88 (1.15)	4.00 (1.09)	-0.822	275	0.41
mobile device in University	3.75 (1.03)	3.82 (0.96)	-0.457	277	0.65
smart board in University	3.68 (1.14)	3.9 (1.071)	-1.442	278	0.15
camera in University	3.59 (1.08)	3.47 (1.19)	0.814	279	0.42

data projector in University	4.03 (0.89)	4.11 (0.97)	-0.578	278	0.56
slide projector in University	4.09 (0.90)	4.04 (0.88)	0.454	279	0.65
overhead projctor in University	3.65 (1.13)	3.72 (1.15)	-0.461	279	0.65

Table 3 summarize the t-test results, which run to compare freshmen who have internet access and who have not, beliefs concerning whether technological tools can be used in their future classroom and their university courses. According to results there was no significant difference in freshmen believe who have internet access at home and who have not, concerning ICT usage in future classroom.

According to results there was a significant difference between participants have internet access and participants do not have internet access believe concerning usage of laptop computer usage in university classroom. Participants who have internet access at home have more positive believe concerning laptop computer usage in university classroom (M=4.07, SD=0.95) than participants who do not have internet access at home (M=3.78, SD=1.08); $t_{(278)}$=2.248,p=0.03. Concerning usage of other nine tools in their university classroom there was no difference between participants who have Internet access at home and participants who do not have internet access at home.

Table 4 T-test results related computer usage in high school settings differences in freshmen's belief's concerning ICT usage in K-12 and university settings

	Yes	No	t	df	Sig. (2-tailed)
desktop computer in my classroom	4.33 (0.86)	3.94 (0.82)	3.693	278	0.00
laptop computer in my classroom	4.29 (0.87)	3.91 (0.84)	3.542	277	0.00
tablet (computer) in my classroom	3.68 (1.08)	3.49 (1.00)	1.461	274	0.15
cellular phone in my classroom	2.76 (1.31)	2.86 (1.32)	-0.634	272	0.53
mobile device in my classroom	3.33 (1.15)	3.35 (1.22)	-0.188	272	0.85
smart board in my classroom	4.27 (0.96)	4.14 (0.94)	1.102	273	0.27
camera in my classroom	3.48 (1.23)	3.54 (1.12)	-0.415	277	0.68
data projector in my classroom	4.45 (0.81)	4.24 (0.90)	2.041	278	0.04
slide projector in my classroom	4.38 (0.83)	4.25 (0.78)	1.242	279	0.22
overhead projector in my classroom	3.98 (1.09)	3.90 (0.96)	0.636	277	0.52
desktop computer in University	4.11 (0.98)	4.05 (0.85)	0.552	277	0.58
laptop computer in University	4.04 (1.01)	3.89 (0.96)	1.25	276	0.21
tablet (computer) in University	3.41 (1.19)	3.47 (1.04)	-0.436	274	0.66
cellular phone in University	3.91 (1.13)	3.90 (1.15)	0.1	273	0.92
mobile device in University	3.81 (1.02)	3.7 (1.00)	0.882	275	0.38
smart board in University	3.70 (1.22)	3.81 (0.92)	-0.797	276	0.43
camera in University	3.49 (1.18)	3.68 (0.97)	-1.346	277	0.18
data projector in University	4.10 (0.92)	3.98 (0.90)	1.061	276	0.29
slide projector in University	4.15 (0.89)	3.96 (0.90)	1.736	277	0.08
overhead projctor in University	3.65 (1.19)	3.71 (1.03)	-0.473	277	0.64

Table 4 summarizes the t-test results. T-test was run to identify differences between freshmen beliefs that used computer in high school settings and freshmen beliefs that did not use computer in high school settings. Freshmen who used computer in high school settings have more positive beliefs (M=4.33, SD=0.86) concerning desktop computer usage in their future classroom than freshmen who did not use computer in high school settings (M=3.94, SD=0.82); $t_{(278)}$=3.692,p=0.00. Freshmen who used computer in high school settings have more positive beliefs (M=4.29, SD=0.87) concerning laptop computer usage in their future classroom than freshmen who did not use computer in high school settings (M=3.91, SD=0.84) ; $t_{(277)}$=3.542,p=0.00. Freshmen who used computer in high school settings have more positive beliefs (M=4.45, SD=0.81) concerning data projector usage in their future classroom than freshmen who did not use computer in high school settings (M=4.24, SD=0.90) ; $t_{(278)}$=2.041,p=0.04. Concerning other seven tools usage in their future classroom freshmen believe did not show differences by computer usage status in their high school settings. Other t-test results concerning ICT tools usage in their university class can be seen in table 4. Freshmen believe concerning ICT usage in university class did not change by computer usage status in their high school settings.

4. RESULTS AND DISCUSSION

In this research; freshmen believe concerning ICT usage in K-12 and university settings was tried to reveal. According to findings; most of the participants came from urban area, most of the participants have monthly income less than $200, while almost half of the participants have their own laptop, more than the half of the participants have Internet access at reside location. Another finding concerning demographic data, almost all of the participants have cell phone, just half of the participants have data plan for their cell phone.

Concerning t-test results by gender, internet access ownership and computer usage in high school settings, freshmen believe concerning ICT usage in K-12 and university settings did not show big differences. For each three independent variables, freshmen believe differ in few ICT tools. Depending on findings;

- Colleges and faculty can use indifferences among freshmen believe. Thus colleges can reduce awareness of pre-service teachers.
- Pre-service believes concerning ICT usage in both settings relatively high and if pre-service teachers are encouraged concerning ICT usage and educational usage of ICT. Pre-service teachers can acquire more knowledge and skills concerning ICT.

Recommendations for the future researcher;

- Research can be design to research differences between pre-service teachers technological literacy level and believe concerning ICT usage in K-12 and university settings
- Research can be design to research differences between pre-service teachers millennial learners characteristics and believe concerning ICT usage in K-12 and university settings
- Research can be design to research differences between pre-service teachers various (computer, media, etc.) literacies level and believe concerning ICT usage in K-12 and university settings

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HOW LEARNING ENVIRONMENTS CAN STIMULATE STUDENT IMAGINATION

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ABSTRACT
The purpose of this study was to investigate an array of environmental factors that can stimulate imagination and explore how these factors manifest in different design phases. The participants of this study were students in the field of educational technology from four universities across Taiwan. The instructional design process was divided into three major phases: analysis, design/development, and implementation/evaluation. Influences in the learning environment were deconstructed into four factors: physical component, organizational measure, social climate, and human aggregate. The results of this study indicated that environmental factors have varying effects during the three phases of instructional design. The social climate was claimed to have the greatest effect on stimulating imagination, followed by organizational measure, human aggregate factor, and lastly physical component. These effects were seen in the development process, especially in phase two and with a lesser effect in phase three.
Keywords: educational technologist, imagination stimulation, instructional designer, learning environment

INTRODUCTION

Given the recent infusion of technology in almost every aspect of human lives, educational technologists are struggling with integrating technology into a variety of educational settings. Furthermore, highly advanced ICT infrastructure and the government's implementation of e-learning policies have accelerated the nationwide development of e-learning and forced educators to face a large number of tasks and related problems. One major problem that has emerged is the fast growth of technological applications without the necessary transformation of conventional pedagogical practices, or the assistance to learners in gaining the skills, knowledge, and attitudes for having a better quality of life.

AECT (2004) defined the field of educational technology as "the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources." The definition suggests that educators should take technological resources and learning activities into account to extend the curriculum for students. Students thus could use technology as a system to make content more engaging and meaningful. However, design is iterative and involves ill-structured rather than well-formed problems (Ertmer et al., 2008; Jonassen, 2008). Therefore, Roschelle & Jackiw (2000) contended that designing educational experiences is an imaginative art.

Instructional designers construct activities and anticipate conversations and actions that will bring learners' inquiry to fulfillment, enabling their growth toward desirable skills and understandings. Fabricating such meaningful experiences not only requires a significant amount of expertise, but also creativity and imagination. It involves imagining how learners learn; how they respond to a task; where, with whom, and how they work; using which resources under which circumstances; and over what timescale (Goodyear & Retalis, 2010). Moreover, designers need to have imagination to forecast emerging technologies and their potential applications. However, until now, few studies have clearly discussed imagination in the field of educational technology, let alone developed an evaluation tool for assessing imagination stimulation.

Educational technologists are always interested in how the digital world changes the educational landscape. They need to care more about how learners use these technologies to gain knowledge and skills, and how physical component and social environments where the technologies are used would influence their learning. With these concerns in mind, this study aims at exploring what environmental factors influence imagination of students majoring in educational technology, how these factors influence students in different design phases, and how demographic backgrounds manifest themselves in these influences. In this study, "imagination" refers generally to the process of transforming the inner imagery of educational technology students, when they face an instructional design task. Such images are usually developed from the individual's image memory and shaped into something new.

IMAGINATION STUDIES

Imagination enables people to go beyond actual experience and construct alternative possibilities in which a fragmented situation becomes a meaningful whole (Passmore, 1985). Individuals have the potential to make creative discoveries through their imagery. Therefore, imagination can be perceived as the basis for cultivating creative thinking, and thus is the driving force of innovation (Finke, 1996). In addition to fantasy, imagination has several noticeable characteristics, some of which are related to psychology aspects, such as: exploration, intuition, sensibility, and crystallization; while some are more practice-oriented, such as: effectiveness, novelty, transformation, elaboration, and productivity (Liang, Chang, Chang, & Lin, 2012).

Valett (1983) indicated that children *explore* the world through playing, and Thomas (1999) followed that the process of controlled perceptual exploration takes individuals from a vague appreciation to a detailed understanding of reality. Colello (2007) also asserted that imagination allows one to explore, dare, challenge institutional order, and thus overcome limits. *Intuition* also has a place in human imagination. Intuition makes imagination concrete as a judgment and equivalent to a conclusion, which leads to a foresight of the future (Ribot, 1906). Townsend (2003) believed that if people utilize more intuitive representations, then their imagination would last longer. Reichling (1990) contended that knowledge is gained directly as an insight, or a grasp of the whole through intuition. She further claimed that most of imagination is emotive content, with an intuitively *sensible* meaning. Vygotsky (2004) supported that the ability to control imagination comes with the maturation of emotion. Another psychology-related characteristic of imagination is *crystallization*. DeVries (1988) illuminated Hegel's theory of mental activity and added that imagination connects "abstract properties" and "concrete universals" by law of association. Vygotsky (2004) concluded that all objects of common life appear as crystallization of the imagination.

Accordingly, *effectiveness* is one of the practice-oriented characteristics of imagination. It can be said that every invention has resulted from a particular human need and has its own special purpose (Ribot, 1906). Betts (1916) added that people are in danger of drifting into daydreams, unless their imagination is guided by some purpose. Reiner and Gilbert (2000) further confirmed that imagination is goal-oriented, based on prior experiential imagery and internal coherence. The imaginative effectiveness has its link to *novelty*. Betts (1916) held that imagination is an inventive power which allows the ability to see the old in new relations, and thus build new constructions out of old materials. Beaney (2005) indicated that someone who is imaginative is good at creating new possibilities, and can offer fresh perspectives on what is familiar. *Transformation* thinking will also bring useful outcomes to novel combinations (Lombardo, 2010). Imagination assists people in transferring a function from one object to another that did not previously have such a function (Vygotsky, 1978). This ability helps people in dealing with unpredictable problems by using existing experiences.

Besides providing intuitive insight, an individual's imagination can also take time. When people *elaborate* ideas, imagination becomes a long, laborious, and painful personal moment (Ribot, 1906). Through acts of dissociation and association, an inventor's imaginative constructs are challenged, corrected, and united, until they are adapted to a social consciousness. The process of elaboration is similar to the ideas of 'zooming in and out' described by Reiner et al. (2000), and the focusing-defocusing structure proposed by Folkmann (2010). *Productivity* is another characteristic of imagination, especially in terms of quantity, intensity, and duration of mental images (Ribot, 1906). Concerning the design process, Folkmann (2010) claimed that imagination starts as either an overall conception of the design as a whole, or a more experimental exploration for details. Both positions clearly state the success criteria for the design task in terms of imagination productivity, continuity, and fluency. In the current study, "imagination" refers specifically to the process of transforming the inner imagery of educational technology students when they face an instructional design task. Such transformation is assessed in terms of the characteristics identified above.

LEARNING ENVIRONMENT

Huebner (1989) indicated that “behavior is best understood and predicted through the transactions of individuals and their environment (p. 165).” Through the works of behavioral scientists, psychologists, and sociologists, research has shown that the environment can facilitate, modify, and hinder certain human behaviors and emotions (Speller, 2006). Thus, it could be viewed that student behavior is shaped and influenced by the multi-dimensional campus environment and vice-versa (Strange & Banning, 2001). Accordingly, the campus environment can be divided into four dimensions: physical component, organizational measure, social climate, and human aggregate (American College Personnel Association, 1994). There are a myriad of variables related to each of these dimensions, which accounts for the complexity of the campus environment.

The *physical component* dimension of a campus consists of its natural environment (location, weather, temperature, etc.) and its man-made environment (architecture, sound, facilities, messages, etc.). Both components shape attitudes toward the campus and influence its inhabitants’ experiences in powerful ways. They also define space for activities and events, thereby encouraging some phenomena while limiting others, thus influencing students’ preferences and behaviors (Strange, 2003). The major components of a physical environment include: (1) ambient environment, (2) environmental load, (3) personal space, (4) territories, and (5) crowding (Gifford, 2007; McAndrew, 1993). There are numerous follow-up studies which indicate that the environment has a profound impact on students’ imagination (e.g., Büscher, Eriksen, Kristensen & Mogensen, 2004; Claxton, Edwards, & Scale-Constantinou, 2006).

The *organizational measure* dimension arises from the myriad of decisions made about environmental purposes and functions (Strange, 2000). Who is in charge? How will resources be distributed? What must be accomplished and how quickly? How will participants be rewarded for their accomplishments? The complex nature of universities results in the need to maintain a sense of order and generate various arrangements that define the organizational characteristics of an environment. As a result of this need, rules and regulations are formed, rewards systems are developed, and reports become necessary for resource allocation (Strange, 2003). Such organizational measures could raise or lower the morale of participants. Many studies by modern scholars (e.g., Claxton et al., 2006; Kangas, 2010) also give evidence to the influence of organizational measures on students’ creativity and imagination development.

The *social climate* dimension focuses on the “subjective views and experiences of participant observers, assuming that environments are understood best through the collective perceptions of the individuals within them” (Strange et al., 2001, p. 86). Environments can also be described in terms of organizational climates, which are composed of relationships, personal growth, and system maintenance (Moos, 1979). The social climate usually has intrinsic influence (such as members’ motivations) as well as external impact on the environment (such as control over the members) (Peterson & Spencer, 1990). McMillan (1995) held that the emotional factor is the key to cultivate student imagination, such that all schools should create an educational climate that is full of encouragement and support.

The *human aggregate* dimension is the collective characteristics of people who inhabit the environment. This dimension creates features in an environment that reflect varying degrees of consistency, especially in terms of organizational culture, tradition, or style (Huebner et al., 1990; Strange et al., 2001). These features stress the uniqueness of the organization and provide a sense of belonging for its members. This dimension affects the students’ performance, restricts their behaviors, creates campus culture, and produces a stable impression of the school (Peterson, & Spencer, 1990). Modern research (e.g., Claxton et al., 2006; Treadaway, 2009; Trotman, 2006) also echoes the impact of human aggregate on an individual’s imagination. For the purposes of the current study, the learning environment is categorized into the four dimensions reviewed in this section.

METHOD

The current study adapted the ADDIE model and divided the instructional design process into three phases: Analysis, Design/Development, and Implementation/Evaluation. Since measures of the influence that environmental factors had on stimulating imagination in different design phases were unavailable, new scales needed to be developed. Based upon the literature reviewed previously, nine items were created to represent imagination characteristics, and 21 items were created to represent various environmental influences. The environmental items were grouped into four dimensions: physical component, organizational measure, social climate, and human aggregate. The items were scored on a five-point Likert scale ranging from 1= *strongly disagree* to 5= *strongly agree*. Face validity of these items were examined by five research associates and a small group of graduate students to clarify its comprehensiveness and meanings. A pilot study was also conducted consisting of 60 students in the educational technology field to examine the constructed scale. Based on the satisfactory analytical results, the formal questionnaire was confirmed.

Participants involved in this study were students from four universities across Taiwan. Students had to satisfy two requirements in order to participate for this study. They had to be currently majoring in educational technology field, and have similar assignments in instructional design based on the agreement between the instructors and this research team. In order to ensure the quality of this study, the research team communicated the survey with instructors in the target universities first, and then arranged similar schedules and assignments. In other words, this study could be implemented across multiple campuses under comparable timetables and similar design tasks.

The investigation process delivered in each university followed the same procedure. Each participant received a cover page and a questionnaire in a package. On the cover page, all participants were informed that their involvement was voluntary and they were guaranteed anonymity. In the questionnaire, students were asked to determine the level of agreement with each imagination characteristic, and the strength of influence that each environmental item had on their imagination in the current design phases. Although the design process is iterative, a systematic approach of instructional activities that allow students to gradually grasp complicated concepts is often times needed. The questionnaire was thus distributed in three different periods which represented the three instructional design phases of analysis, design/development, and implementation/evaluation during the fall semester of 2011. Data collection of each survey was conducted by well-trained graduate assistants who were accompanied by the class instructor.

Due to prior communication between the instructors and the research team, the valid samples collected in three different phases were well-controlled to be the same. Within these 402 subjects, 61 were freshmen, 116 were sophomores, 89 were juniors, 19 were seniors, and 117 were in their master programs. There were 152 men and 250 women. Data was analyzed using SPSS version 17.0 software. The measured items were organized by item analysis on the mean of imagination (3.21-3.92), the mean of learning environment (3.55-4.23), standard deviation (> .75), skewness (< ±1), extreme value test results ($p < .05$, $t > \pm1.96$), correlation coefficients (> .3), and factor loading values (> .3) of the data acquired during the formal survey. The reliability test of the scale was conducted and found to be satisfactory to warrant confidence in internal consistency reliability (refer to Table 1).

Table 1: Demographical information of the sample

Demographical information		Phase 1 to Phase 3	
		Frequencies	Percentage
N		402	
Gender	Male	152	37.8%
	Female	250	62.2%
Academic standing	Freshmen	61	15.2%
	Sophomores	116	28.9%
	Juniors	89	22.1%
	Seniors	19	4.7%
	Master Program	117	29.1%

RESULTS AND DISCUSSIONS

Due to the novelty of this research topic, a Principal Component Analysis (PCA) with promax rotation was conducted to determine the most appropriate structure of the developed scales. The number of factors to be extracted for this analysis was determined 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. 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 integrative single-factor solution (explained variables of 33.27%) with an oblique rotation provided the better factor structure both conceptually and statistically. The concept of imagination included items related to productivity, transformation, sensibility, intuition, novelty, exploration, effectiveness, crystallization, and elaboration. The results also showed that the internal consistency of imagination (.81) was considered stable (refer to Table 2).

Table 2: Factor loading and descriptive statistics of the imagination characteristics

Characteristic (Item)	Factor	*M*	*SD*
Productivity (I constantly have ideas toward my designs)	.73	3.27	.80
Transformation (I am flexible in my thinking and can transfer ideas to multiple fields of tasks)	.67	3.55	.76
Sensibility (I often help myself imagine by arousing personal feelings)	.63	3.70	.73
Intuition (I often come up with new ideas leading by my intuition)	.60	3.78	.76

Novelty (I often have uncommon ideas compared to others)	.57	3.21	.78
Exploration (I like to explore unknown areas of knowledge and experience)	.57	3.92	.69
Effectiveness (I often complete my tasks by focusing on effective ideas)	.52	3.57	.71
Crystallization (I am good at expressing abstract ideas by using concrete examples)	.46	3.50	.81
Elaboration (I improve my thoughts by focusing on formalizing ideas)	.37	3.44	.82

In reality, design activities are compound processes that often include iterations or re-definitions of the problem. In order to gain a holistic view of factor structure, the research team combined all the data regarding environmental influence of the three phases and made an integrative factor analysis. The results indicated that the 21 items could be organized into four learning environment factors. The first factor, *social climate*, a seven-item scale (M = 4.04, SD = .54), measured the extent of which participants reported being influenced by the climate of the class. The second factor, *physical component*, a five-item scale (M = 3.55, SD = .48), measured the degree to which participants considered the facilities and messages in an environment would stimulate imagination. The third factor, *organizational measure*, a six-item scale (M = 3.99, SD = .51), assessed participants' perceptions of the influence from the institutional structure and organizational measures. The fourth factor, *human aggregate*, a three-item scale (M = 3.91, SD = .67), indicated the degree to which participants felt that their imagination was influenced by the environment's organizational culture, tradition, or style. This four-factor solution accounted for 50.05% of the variance. Table 3 reports eigenvalues, factor explained variance, cumulative accounted variance and Cronbach's α. Table 4 presents factor loading values of the integrative factor analysis.

Table 3: Eigenvalues, cumulative accounted variance, and Cronbach's α of the four factors

Factors	Eigenvalues	Cumulative variance	Cronbach's α
1: Social climate	8.646	38.86	.87
2: Physical component	1.645	44.31	.79
3: Organizational measure	1.157	47.76	.82
4: Human aggregate	1.009	50.05	.89

Table 4: Factor analysis of the 21 items in learning environment

Factor / Item	Phase 1 to Phase 3			
	F1	F 2	F 3	F 4
Factor 1: Social climate				
Mutual support between teachers and classmates	.85			
Teacher's attention over the design process	.80			
Communication and discussion with classmates	.48			
The willingness to accept challenges in class	.46			
Competitive learning climate	.44			
Climate of respecting diversity and free expression in class	.39			
Pleasant learning climate	.38			
Factor 2: Physical component				
Environmental factors such as materials, furnishings, and other interior design		.81		
Dynamic audiovisual stimuli such as rhythm, sound, and movies		.76		
Static visual stimuli such as content, composition, and proportion of images		.70		
Environmental factors such as lighting, sound, and other infrastructure design		.62		
Public spaces for exhibitions and discussion		.43		
Factor 3: Organizational measure				
Teacher's tolerance for error			.66	
Rich learning resources provided by the department			.58	
Teacher's encouragement and praise for taking risk			.57	
A personal space for creation provided by the department			.52	
Explanation and guidance offered by teachers during the design process			.47	
Opportunities provided by teachers for concentration and solitary thinking			.39	
Factor 4: Human aggregate				
There is a culture on campus of putting imagination into practice				.84
There is a tradition of encouraging imagination in the department				.80
Teacher's respect for individual differences				.33

Overall, the *social climate* was claimed to have the greatest effect on stimulating the student's imagination, followed by *organizational measure* and *human aggregate*. Although the *physical component* had the smallest effect, its mean (3.78) was high enough to be considered influential. This result suggests that a soft mechanism like a welcoming climate is the most powerful stimulus to facilitate imagination. Harder factors like institutional measures, intangible factors such as tradition or culture, and physical environment like space and its facilities, are also effective stimuli.

Furthermore, a regression analysis was conducted to analyze whether or not gender and academic standing would result in differences on imagination stimulation. There were no significant differences between genders but there were differences depending on academic standing. The graduate participants claimed that their imagination was greater than the undergraduate subjects. This result may be partially because graduate students are more mature in both personality and expertise, and tend to be more independent, more disciplined and show more initiative. Their life and professional experiences are also richer than undergraduates. All of these qualities allow them to be more confident on this survey.

In the aspect of environmental influence, statistics showed that there was a significant effect which *physical component* had on different genders at the $p < .05$ level. The mean of female participants was significantly greater than that of the male. There was not enough evidence to conclude that the imagination of female students was more easily influenced by surrounding environment, but this study opens up a valuable issue to be inquired in the future. In addition, the means of graduate participants were significantly greater than those of the undergraduate subjects in both factors of *social climate* and *organizational measure*. Taken together, the results suggest that special attention should be paid to the physical environment for the female students, and the organizational measure and social climate to the graduates (refer to Table 5).

Table 5: Regression analysis on gender and academic standing differences

Variance	Gender	Academic standing
Imagination		0.13*
Learning environment		
Social climate		0.17*
Physical component	-0.11*	
Organizational measure		0.17*
Human aggregate		

Note: A paired-comparison technique was employed to observe differences among academic standings.
*$p < .05$.

Moreover, the results of the F test and paired comparison technique indicated that means of both phase 1 (analysis) and phase 2 (design/development) were greater than those of phase 3 (implementation/evaluation) in the *social climate* and *human aggregate* factors. The results of *organizational measure* were similar, but mean of phase 2 here was significantly greater than that of phase 1. In addition, the mean of phase 2 was significantly greater than those of both phases 1 and 3 in the *physical component* (refer to Table 6). The results suggest that environmental variables have significant effects on imagination stimulation, especially in the first two phases. Specially, the effect of the *organizational measure* in the second phase was significantly greater than in the other phases.

According to personal experiences, the results of this study are compatible with the reality of the educational technology system. For example, both discussion with classmates and free expression in class are important for stimulating imagination in the phase one in order to clarify the design task and initiate action. Having a pleasant learning climate and rich learning resources are critical for concept development in phase two. Mutual support between teachers and classmates and teacher's tolerance for error are crucial for the third phase. The results also imply that a set of unique instructional strategies applied during both phases one and two could be particularly beneficial to students. These results also echo the study done by Büscher et al. (2004) in which the work environment, the tools to be used, and the nature of the task were sought out to form the best combinations for designers to utilize their imagination.

Table 6: F test and paired comparison for environmental influences on the three different phases

Factors	Mean			F	Paired comparison
	Phase 1	Phase 2	Phase 3		
Social climate	4.06	4.08	4.00	12.56*	1 > 3; 2 > 3
Physical component	3.74	3.90	3.70	24.41*	2 > 1; 2 > 3

Organizational measure	4.01	4.06	3.89	26.93*	2 > 1 > 3
Human aggregate	3.93	3.96	3.85	11.28*	1 > 3; 2 > 3

*$p < .05$.

The research team examined the relationship between the imagination and environmental factors, and found it reached a significance level, $p < 0.05$. In the integrative analysis of the different design phases, the averaged correlation coefficient is .3, and the individual coefficients are between .23 and .35 (refer to Table 7). The averaged correlation of the first phase is .25, .28 for phase two, and .27 for phase three. The results also showed that the four environmental factors were significantly correlated, $p < 0.05$. The averaged correlation coefficient of the integrative process is .62, and the individual coefficients are between .45 and .74 (also see Table 7). The averaged correlation of the first phase is .55, .59 for phase two, and .58 for phase three. Specifically, the correlation of *social climate* and *organizational measure* was noticeably high. This result may imply the interrelationship between these two factors. It also implies that the items of these two factors may be overlapped and thus may need to be modified further.

Table 7: The correlation analysis of the imagination and environmental factors

	1.	2.	3.	4.	5.
1. Imagination	--				
2. Social climate	.35*	--			
3. Physical component	.30*	.57*	--		
4. Organizational measure	.34*	.74*	.53*	--	
5. Human aggregate	.23*	.66*	.45*	.62*	--

*$p < .05$.

The research team further utilized the maximum likelihood estimator of structural equation modeling method with LISREL 8.80 to examine the relationship between environmental factors and imagination. The following indicators recommended by Hu and Bentler (1999), Jöreskog and Sörbom (1996), and Tabachnick and Fidell (2001) was used 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).

The results showed a good fit to match the hypothesis that four environmental factors influence imagination, with $X^2(395)= 1104.13$; CFI = .96, RMSEA = .07, SRMR = .06, TLI = .95. The squared standardized path coefficient of the *social climate* is .0441, the *physical component* is .0144, the *organizational measure* is .0625, and the *human aggregate* is .0225. The residual of this analysis is .81 which makes the total explained variables 19%. This result is possibly because of the high correlations among environmental factors. The high multicollinearity caused an unstable parameter estimation which, in turn, may result in the insignificant prediction result. The other inference by the research team is that, similar to multiple influential factors on human creativity (Shalley, Zhou, & Oldham, 2004), the learning environment is only but one factor stimulating a learner's imagination. Additional factors such as psychology and personality should be added for further inquiries.

CONCLUSIONS

The increasing rate of change in human society and the escalating penetration of advanced technology require us to learn more to cope. As Marshall (2001) claimed, the more quickly things change, the more imaginative we have to be to keep up. Educational technologists need a more radical and holistic imagination to distinguish between enduring fundamentals of learning and teaching, and the transient froth splashed up by new waves of innovation (Goodyear et al., 2010). In other words, educational technologists not only need technological imagination to make predictions about the future, but also need to engage with the practical problems of educational reform in a rapidly changing society. Even more, educational technologists today need to foster a hybrid imagination, mixing scientific and technical skills with a sense of social responsibility (Jamison & Mejlgaard, 2010). Bearing these expectations in mind, this study inquired imagination under a certain societal environment, and tried to learn how this environment influences the inhabitants' imagination. This particular environment is the higher education system.

Imagination in this study is defined as the process of transforming an instructional design student's inner images. The results of this study indicated that imagination is consisted of several characteristics: productivity, transformation, sensibility, intuition, novelty, exploration, effectiveness, crystallization, and elaboration.

However, we ask ourselves, can these nine characteristics represent imagination in full? In other words, are there any other characteristics together with the present ones which can signify imagination thoroughly? According to the recent studies, the research team proposed that the indicator of elaboration could be divided into two independent items for further study namely, dialectics and focusing (e.g., Cartwright & Noone, 2006; Folkmann, 2010).

On the other hand, the learning environment is composed of four factors: social climate, physical component, organizational measure, and human aggregate. The *social climate* was claimed to have the greatest effect on stimulating the student's imagination, followed by the *organizational measure*, *human aggregate* and *physical component*. This study also found that there was a significant relationship between imagination and environmental factors, thought the correlation coefficients were not considered high. In addition, according to the recent studies in learning environments (e.g., Gislason, 2010; Kember, Ho & Hong, 2010), student learning should be separated as an independent variable to be studied. This notion, therefore, casts light on the direction of scale revision.

The graduate participants declared to have a higher imagination than the undergraduates. The female participants weighted the influence of *physical component* on imagination stimulation to be greater than the male; and graduates weighted the influences of both *social climate* and *organizational measure* to be greater than the undergraduates. The possible explanations and suggestions are presented in the previous section. The environmental influences of the first two phases (analysis and design/development) are greater than those in the final phase (implementation/evaluation). Specifically, the physical and organizational influences of phase 2 were significantly greater than those in phase 1. All of these findings have implications for instructional strategies of imaginative education in the educational technology field.

It is the authors' belief that an excellent designer who is capable of simulating invisible possibilities is only able to because he or she has an exceptional imagination. Compared to concepts such as personal characteristics and inner psychology, external environments are factors which are easier to grasp and shape. It is also easier to adjust the learning environment with different instructional strategies than to change an individual's characteristics or psychology. The learning environment and curriculum must inspire students' passion for excellence, nurture their curiosity, develop their imagination, empower their professional life, and awaken their spirit for an unknown future.

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TANGIBLE MULTIMEDIA: A CASE STUDY FOR BRINGING TANGIBILITY INTO MULTIMEDIA LEARNING

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ABSTRACT
Multimedia augmented with tangible objects is an area that has not been explored. Current multimedia systems lack the natural elements that allow young children to learn tangibly and intuitively. In view of this, we propose a research to merge tangible objects with multimedia for preschoolers, and propose to term it as "tangible multimedia". To evaluate the feasibility of such multimedia prior to actual research, a prototype named *TangiLearn* has been developed for a case study. This paper is the report of what we discovered during the study. The study concluded that *TangiLearn* enhanced the preschoolers' enjoyment and learning performance.

1. INTRODUCTION
Tangible systems have been in existence across many computing domains nowadays, such as tangible user interface (TUI), augmented reality, and mixed reality, but there has not been any research on tangibility in multimedia learning for preschoolers. Even though some TUI researches have been observed to explore the coupling of tangible objects and multimedia objects, multimedia objects are not their main emphasis. The multimedia objects merely serve as testing elements for evaluating the usability of their physical user interfaces. The whole TUI research is on issues pertaining to tangible interaction, with the target to replace mouse, keyboard and computer screen (Marco, Cerezo, Baldassarri, Mazzone, & Read, 2009, Chau, Toh, & Zarina, 2012c). In response to this, a "new genre" of multimedia learning system for preschoolers called "Tangible Multimedia Learning System" (or in short, tangible multimedia) that greatly capitalizes on "tangibility" of multimedia expression via tangible objects is conceived. We adopt the use of the term "tangible" from Ullmer and Ishii's researches (Ullmer & Ishii, 2001; Ishii & Ullmer, 1997) because the term carries the meaning that physical form is given to digital information. Unlike TUI system, tangible multimedia is designed based on real multimedia perspective. From its inception until prototyping, it was scratched up based on multimedia development model and the rule of multimedia design guidelines. A relevant comparative experimental research for the system has been planned in future. For formative evaluation purposes, we developed a low-fidelity prototype of tangible multimedia named *TangiLearn* for case study and this paper serves as a report for what we have found during the study.

2. PROBLEM STATEMENT
A problem faced in current multimedia learning systems for preschoolers is the lack of natural elements and sense of tangibility that is truly adapted to their characteristics, learning capacities, and underlying cognitive developmental thinking abilities. For preschoolers whose learning abilities are highly dependent on the effective use of external stimuli, using the systems means chances to explore real-life objects and play educative toys does not exist (Jones, 2003). Logical reasoning and abstract thinking are beyond their level of thinking (preoperational stage) (Piaget, 1952, 1972). They need to grip something tangible in order to allow their cognition process to make sense of the concepts, especially ideas outside of their immediate context. In this respect, we observe a large learning gap between the preschoolers and multimedia environment, a phenomenon which could impair their overall motivation and learning performance.

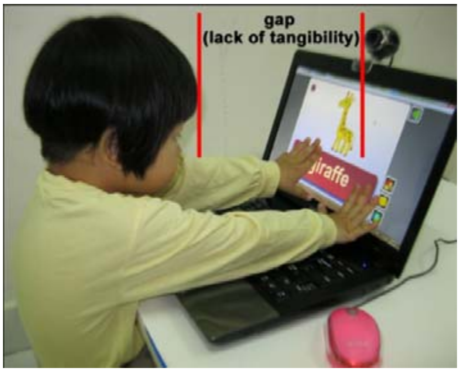

Figure 1. A gap between the multimedia and preschoolers

3. TANGIBLE OBJECTS AS A MEANS OF TANGIBILITY IN MULTIMEDIA LEARNING SYSTEM

Tangible objects surrounding the preschoolers serve as the best means to bridge the learning gap (Chau, Toh, & Zarina, 2012a). This is because they can be designed to realize the sense of tangibility in multimedia by providing simultaneous sensorial stimulation of visual, auditory and tactile of the children (Chau, Toh, Zarina, Wan Ahmad Jaafar, & Lili, 2012a, 2012b). Tangible objects are physical objects that have been augmented with computational power (Manches, 2010) so that tangible objects can be bound to digital multimedia objects. With digital multimedia objects physically embodied in "tangible" form, preschoolers can hold, grasp, feel, move, and manipulate them from the physical environment.

4. THE AIM OF THE CASE STUDY

The main purpose of the case study is threefold. First is to examine the feasibility and usability of the prototyped *TangiLearn* system, a manifestation of tangible multimedia, prior to actual experimental research (Chau, Toh, & Zarina, 2011). We look for preliminary evidence to support the assumption that tangible multimedia can enhance children's learning performance. Second is to gather information required to fine-tune the design of the treatment in full-scale experiment. We seek to identify any necessary refinements to the overall design towards the final *TangiLearn* deployment in the typical preschool classroom setting. Third is to establish an appropriate experimental protocol, such as overall experimental flow, setting, and procedure for full-scale experimental research.

5. PARTICIPANTS

Six preschoolers aged 6 were the participants in the case study. They were chosen because the age group is the primary user group for *TangiLearn* in the final experiment. As there were only a few participants in the case study, we administered the whole study ourselves.

6. USERS' INFORMATION COLLECTION TECHNIQUES

Quantitative and qualitative research methods, namely unstructured observation, unstructured interviewing, and questionnaires were employed in the case study.

Unstructured observation was conducted throughout the study. It is basically a method that is unplanned, informal, watching, and recording of behaviors in a natural environment (Cochen, Manion, & Morrison, 2002). Using observational notes, we recorded the children's natural reaction to *TangiLearn*, the way the children collaborate, and whether the learning activities designed were appropriate. The technical performance of the system was also observed. In unstructured interview, 10 open questions were asked verbally to draw out ideas, impressions, and experiences pertaining to the prototype from the participants. They offered us key insights into issues not obvious in quantitative results obtained from questionnaires.

Quiz and *Smileyometer* (Read, MacFarlane, & Casey, 2002) were used to identify the participants' learning performance and their level of enjoyment respectively. For measuring the level of enjoyment, we adopted the idea of Zaman and Abeele (2004), and referred the enjoyment to "joy-of-use" or "likeability" of using *TangiLearn*. *Smileyometer* was chosen because it has been proven easy to gauge the response from the children in many different situations (Xie, 2008). The self-report instrument was made child-friendly by the use of smiley, a pictorial representation of different kinds of happy faces to represent the different levels of enjoyment. We modified the *Smileyometer* to suit to the level of the participants.

7. SETTING AND IMPLEMENTATION

TangiLearn, a manifestation of tangible multimedia, was developed for case study. This case study was an on-site evaluation took place in one of the kindergarten in Kuala Lumpur. It was conducted in a quiet classroom separated physically and acoustically from other classrooms to limit distractions. The case study was completed in one day. During the study, a laptop equipped with a camera, a set of tangible objects, and a normal display table suited to the participants' anthropometric characteristics was set up. The table was used as a space for participants to place and move the tangible objects (Figure 2). The tangible and multimedia objects binding were implemented through the adaptation of Quick Response (QR) code marker and Flash library. Implementation using open source library entails minimal monetary investments and times for development (Chau, Toh, Zarina, & Wan Ahmad Jaafar, 2012). QR code markers were attached on the tangible objects for binding purposes, and the children simply need to hold the tangible object and align to the camera mounted on the computer monitor.

Figure 2. *TangiLearn* set up

8. LEARNING CONTENTS

National Preschool Curriculum (NPC) of Malaysia emphasizes the mastery of language skills for preschoolers (Challenger Concept, 2009). In line with NPC, the learning content of *TangiLearn* focuses on real-life objects and general knowledge in English. General knowledge in English is chosen because first, embedding literacy learning within knowledge-building activities is engaging for young children (Albert Shanker Institute, 2009). English language curriculum set by the Ministry of Education of Malaysia (2001) stipulated that an enjoyment of the language learning should be developed through the use of interesting means. Second, general knowledge nicely suits the use of tangible objects in *TangiLearn*. For this case study, topics of general knowledge covered are animals, fruits and household items. Abstract concepts were not introduced, consistent with the level of cognitive ability of young children (Piaget, 1952).

9. PROCEDURE

At the beginning of the case study, specific instructions on activities and features of the *TangiLearn* system were described to each participant in accordance with the experimental protocol. Subsequently, participants were arbitrarily grouped into pair because children prefer to work in groups (Africano et al., 2004), and would demonstrate a high level of engagement when learning alongside each other (Inkpen, Ho-Ching, Kuederle, Scott, & Shoemaker, 1999).

Each pair of participants was given 10 minutes for practice. After the practice, two consecutive experimental sessions began. The first session used *TangiLearn*, while the second session used conventional multimedia learning system. To avoid achievability differences, the two systems were made comparable in which both of them contained similar contents, breadth, and depth of the topics. With this, the issue of difference in extraneous cognitive load due to the differences in the contents would not arise. The only difference was that *TangiLearn* was augmented with tangible objects, whereas conventional multimedia learning system was not.

When the first session started, each pair was requested to explore *TangiLearn* freely for 30 minutes. *TangiLearn* consisted of two sections, the Learning section, and Quiz section. The Learning section was the section where the learning contents were delivered to the participants. Participants who entered Learning section in *TangiLearn* would find themselves entering a world consisted of many randomly-placed learning objects (both virtual and tangible), such as animals and household items (Figure 3). Learning object refers to the knowledge unit or concept that the system intended to deliver.

Figure 3. Tangible and virtual learning objects in *TangiLearn*

To proceed, the participants were required to grip a tangible object on the display table in front of them, and point it to the computer camera to trigger the corresponding learning object in *TangiLearn*. If the participants grabbed a tangible lion and showed, the lion learning object would display corresponding animations and videos about the lion on the computer screen, and so the learning process started. Upon completion of learning session, the participants would need to answer the quiz by identifying and picking up the correct tangible object. There were 16 learning objects in total. Understanding these learning objects was the core objective of the prototyped *TangiLearn* system. Therefore, after the learning session, participants were expected to master the name, relevant key terms, and the description of the objects. The learner was free to explore any learning object, or to exit *TangiLearn*.

Right after the first session, the second session followed. Similarly, the pairs of children were asked to explore the conventional multimedia learning system for the same allocated time. After the two learning sessions were completed, pairs were asked to complete the quiz and *Smileyometer* questionnaire. The whole study was concluded with an unstructured interview.

10. RESULTS FROM CASE STUDY

Four participants rated their level of enjoyment of using the *TangiLearn* with the highest score (enjoyed very much) in *Smileyometer*. In our opinion, the use of some of the fascinating tangible objects contributed to this outcome. From their facial and emotional expression, *TangiLearn* seemed to be novel for them as they have not seen any computer system coupled with tangible objects before. They understood the tasks in *TangiLearn* without much problem. They were tinkering with the tangible objects and attempted different positions and alignments to the computer. They discussed most about how tangible objects could be bound to the computer. Discussion on the learning activities and concepts the *TangiLearn* aimed to deliver was relatively lesser, as such, the children were curious about the system more than the learning activities and concepts in *TangiLearn*. Even though towards the end of the learning session, two participants seemed to slightly lose patience in exploring many learning objects, overall, they still maintained a high level of alertness and engagement throughout the learning process. This was not easy as children normally have very short attention span, poor concentration and ease of distractibility (Blanchard & Moore, 2010; Alliance for Childhood, 2000). None of the children indicated that they wanted to stop prior to completion of the allocated amount of time. Based on this situation, we suggest that *TangiLearn* is an engaging multimedia learning system for preschoolers.

We discovered that the most attractive feature in *TangiLearn* to the children was not animations or videos, but the tangible objects. When we asked them whether they liked the animation, they shook their head, implying that animations were nothing for them. They said that the animated series in television were much better than what they saw in *TangiLearn*. Indeed, in today's world, animations and videos are no longer fun in the mind of the "new age" children. They are surrounded by opportunities to the exposure of the realm of digital media (Blanchard & Moore, 2010; Rideout, Vandewater & Wartella, 2003), such as high-end computer games and realistic animations. Therefore, some new paradigm shift in conventional multimedia learning has to be sorted out for the children in this technological age. Based on the result obtained from the case study, *TangiLearn* is able to attract the "new age" children with the tangible objects.

Besides, we observed that there was peer collaboration similar to "parallel play" aroused in *TangiLearn*. "Parallel play" is a classic study of Parten (1932) in social participation. Accordingly, "parallel play" describes activity where children play side by side on the same activity that provokes equal social involvement (Scarlett, 2004, as cited in Xie, 2008). *TangiLearn* was a low-fidelity tangible multimedia prototype, and the Game section in the prototype was not created for evaluation yet. As such, the term "parallel play" was not suitable. Instead, we suggested the term "parallel learning" to reflect the similar kind of collaboration. In this case study, it was obvious that "parallel learning" existed. With pairs of two children sitting side by side using similar tangible objects for similar tasks in *TangiLearn*, they had the opportunity to discuss together, interacted with each other, exchanged ideas, passed around the tangible objects, and worked cooperatively to answer the quiz. We did not observe "sequential turn taking," or other kinds of collaboration such as "directive learning," and "competitive learning" aroused.

Figure 4. Parallel learning observed during the case study

Another important finding we observed was the successful use of direct representation level of tangible objects rather than the abstract or symbolic level. Since the inception of TUI researches in 1995, manipulative materials such as cubes and rods have been utilized in many researches, where many features are scrapped, made less realistic, and their simplified properties are always used to represent other domains, such as shapes for coins and different colours for numbers. They argued that this is the correct way of using manipulatives, otherwise, their effectiveness will be degraded (O'Malley & Fraser, 2004). There are also researches against this idea. They assert that children have problems in interpreting the symbolic representation of manipulatives (Uttal, Scudder, & DeLoache, 1997; Manches, 2010). In this case study, we did not make the tangible objects to represent other domain, instead, we directly map them into the virtual world. They represent themselves; for example, if tangible apple was used, it was apple in the virtual world in *TangiLearn*. The result evidenced that the use of direct mapping of tangible objects to the digital multimedia objects was as good as symbolic mapping in enhancing learning.

Quantitative results had helped support the qualitative results that *TangiLearn* was an educationally valuable system. The quiz results indicated that participants were successful in gaining knowledge from the system. In the *Smileyometer*, 3 participants reported that the quiz was easy, 2 moderate, and 1 difficult. We believed that the participants performed well in quiz due to the iterative hands-on experiences, which reinforced their understanding.

A number of technical problems arose during the case study. The most notable problem was related to difficulties in QR code execution. The QR code recognition engine in *TangiLearn* sometimes failed to response due to the low capacity computers used in the kindergarten. We also observed that the visual marker technology lacked of mobility due to the fact that the participants could not move the tangible objects too far from the camera. This problem must be addressed in the full-scale experimental research; otherwise, interest to use the full-scale *TangiLearn* among the children will be affected. Apart from that, some participants seemed to have difficulties in aligning the visual markers to the camera. However, the issue of physical alignment of visual markers was not totally a bad thing. According to Antle (2007a), orientating the visual marker to camera can also serve as a beneficial training to the preschoolers. It enhances their spatial experience as well as drilling their motor skills.

11. CONSIDERATIONS AND REFINEMENTS FOR *TangiLearn*

After detailed analysis, we realized that there should be design considerations for tangible objects. If tangible objects are arbitrarily used, they may be disadvantaged by multimedia objects, or vice versa. The whole display could be cluttered in *TangiLearn*.

The choice of tangible objects for use in *TangiLearn* highly affected the children’s rating of enjoyment level. The children tended to rate high level of enjoyment for toys. Level of enjoyment went lower for common objects such as books, plates, and erasers. Among all the common objects, animal objects captured more attention from the participants than those household utilities such as spoons and scissors. This may be because the children were more emotionally tied to animals. Famous branded commercial characters such as “Barbie doll,” “Ben 10,” and “Transformers” should not be used as these objects tended to attract children more than any other objects. They might divert their attention from actual learning, and ended up playing around with the toys.

The size of tangible objects chosen should be suitable to preschoolers. If tangible objects are too huge, they will not only block the view of the children to the computer screen, but will also take up a large portion of the space of the display table, and thus giving a very heavy “packed” feeling to the children. Besides, huge tangible objects will tend to be the frequent choice of the children. However, if tangible objects are too small, the sense of holding the tangible objects becomes weaker. From observation, the best size of tangible objects are the size of slightly bigger than the hand palms of the preschoolers, and all tangible objects should be set around this size for consistency. Similarly, the size of the table for displaying tangible objects should not be too large to ensure reachability of points of contact amongst preschoolers. If not, visual search for the desired tangible objects will be affected.

Tangible objects used should be gender-free. In the case study, we intentionally placed a robotic model, “Transformer” as one of the tangible objects in *TangiLearn*. It ended up that the boys competed to play with it. Girls in turn argued why there was no “Barbie” doll available for them. A good multimedia learning system should be able to meet the learning preferences of both male and female learners. Apart from that, the participants were also found tended to choose tangible objects that have more striking color. The colour should be balanced among the tangible objects so that every object has equal chance to be chosen by the preschoolers for learning.

After the case study, we do agree with the guidelines suggested by Pederson, Sokoler, and Nelson (2000) and Antle (2007a, 2007b). According to Pederson and associates, the physical objects chosen for representing digital objects should be the “right” objects in a sense that human is able to grasp, to reason about, essence to the user’s tasks, and meaningful in the use situation. According to Antle, three areas of cognition, namely symbolic reasoning, embodied and spatial cognition should be the criteria for choosing objects as physical instantiation to digital objects. To develop a truly usable tangible multimedia, we plan to apply these guidelines in the final version of *TangiLearn* system.

We were also informed of the change required for the research procedures and setting. We confirmed several alterations on the experimental protocol decisions. The first alteration is to limit the total number of learning objects (both virtual and tangible) to 7 objects in each learning scene, in compliance with Miller’s (1956) idea that they are the limits that a person can remember at one time (Chau, Toh, & Zarina, 2012b). The second alteration is the number of topics covered. While reducing the number of learning objects in each scene, there should be more topics for learning. Such alteration could relieve their load in each learning session while maintaining the amount of learning contents. The third alteration is the elimination of the treatment using conventional multimedia system for participants using *TangiLearn*. As a controlled system, it should be conducted on different group of participants. This was because the result revealed a very large difference in the participants' level of enjoyment on *TangiLearn* and conventional multimedia learning systems. After lengthy duration of time for exploring *TangiLearn*, the participants seemed to feel bored navigating the conventional multimedia learning system due to similarity of learning contents.

On the technical side, due to the problem of execution of QR code flash library in *TangiLearn*, we plan to replace the QR code with other alternative technology. Among the technologies shortlisted for choice is RFID technology (Chau, Zarina, Wan Ahmad Jaafar, Toh, & Lili, 2012).

12. CONCLUSION

This case study sought to uncover the possible role that tangible objects in multimedia learning played in impacting preschoolers' learning performance and level of enjoyment. Despite the technical problems, the overall results of the study were highly positive in terms of the enjoyment, the feasibility and usability of *TangiLearn* system. On the whole, we have successfully elicited ideas from the preschoolers, and the results provided us insightful information about the areas that require refinements in the final full-scale research on tangible multimedia.

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THE EFFECTS OF APPLYING GAME-BASED LEARNING TO WEBCAM MOTION SENSOR GAMES FOR AUTISTIC STUDENTS' SENSORY INTEGRATION TRAINING

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ABSTRACT
This study aims to explore the effects of applying game-based learning to webcam motion sensor games for autistic students' sensory integration training for autistic students. The research participants were three autistic students aged from six to ten. Webcam camera as the research tool wad connected internet games to engage in motion sensor games. Through the motion sensor games, the researchers were able to collect data from physiological monitoring, observation (including sensory integration observation and process observation), and interviews. The findings of the study reveal that: (1) the teacher and the participants possess positive attitude toward applying webcam motion sensor games to sensory integration training; (2) Webcam motion sensor games can enhance autistic students' learning interest; and (3) applying the game-based learning to webcam motion sensor games can improve the effect of autistic students' muscle training and endurance.

1. RESEARCH MOTIVES AND PURPOSES

According to the Ministry of Interior (2011), the census data on the numbers of physical or mentally disabled people show that there were 11,211 autistic patients in Taiwan, and the autism was in second place (4,118 people) among 6 to 11 year old students with physical and mental disabilities. Since autistic patients have difficulty in interpersonal interaction, some people call them "star students." Up-to-date, there is no single method that can fully cure autistic students. In traditional training methods, many game methods are carried out by teachers in individual instruction, learners still cannot actively participate in learning, resulting in shortened learning time, lowered learning intentions, insufficient training obtained by learners, and poor levels of accommodation. Also, current developed methods include drugs, educational therapy, art therapy, and associated new supportive methods of treatments. Among them, the sensory integration training is a very important method of learning in educational therapy. Yu (2006) proposed that the sensory integration training can make up for the shortcomings of brain function, enhance the coordination between senses and perceptions, improve the physical growth and development, and establish the foundation for abilities needed in later social life, which allows autistic patients to exercise and engage in limb training, elicit vestibular sensation, tactile senses, and stimulation to the individual, achieving the purpose of coordinated development of feelings and perceptions.

Additionally, recent development in advanced technology has led information technology to produce support systems, so that training methods have become more diverse. Also, rapid development in human-machine interfaces has produced many new products, such as touchscreens, voice-controlled systems, eyeball tracking systems, and so on. Among them, the motion sensor games, such as wii and kinect have also been developed to make human-machine interfaces highly popular. The concept of game-based learning has constantly been discussed by experts and scholars in the past years. Thus, how to incorporate motion sensor games with training for autistic students in order to improve learner's needs has become an important issue. As a result, the purpose of this study aims to explore the effect of applying game-based learning to webcam motion sensor games for autistic students' sensory integration training.

2. LITERATURE REVIEW

2.1. Autism and sensory integration

Autism is a developmental obstacle caused by abnormal brain function, which usually manifests before three years of age, often accompanied with mental disability, epilepsy, hyperactivity, reclusion, and acting out. Students with autism have three major obstacles in daily life: interpersonal relationship problems, language and expression problems, as well as behavioral problems (Wikipedia, 2012). In the past year, several studies on education and treatment of autistic students, such as game treatment, art treatment, drug treatment, behavioral modification technology, CAI computer assisted instruction, sensory integration, and structural instruction (Special Education Knowledge Web, 2012) have been conducted with the purposes of training students' focus on concentration, emotional stability, and physical coordination. Related studies have shown that the action and sensory integration problems of autistic students are summarized in the three following factors: (1) difficulty in visual space; (2) difficulty in kinesthetic sense; and (3) difficulty in actions that require multisensory integration. Training of sensory integration uses suitable activity stimulation to elicit ideal behavioral performance. In environments with greater structure, autistic students would also have better learning performance.

Sensory integration is the organization and integration of different feelings transmitted by various nervous systems in the brain steam, allowing the different parts of the central nervous system to work together, so the individual can smoothly interact with the environment, and has a sense of satisfaction (Chang, 2010). Additionally, sensory integration training evaluates the neural needs of students, to guide them in training for suitable responses for stimulation. Such training includes providing whole-body exercises that stimulate in vestibular system (gravity and motion), proprioception (muscles and feelings), and the sense of touch. Motor training is most common in sensory integration training, including motor training with many physical action elements, which can give the senses suitable stimulation and promote vitality of the brain's central nervous system (Hua, 2008). Ayres (1972) pointed out that students' sensory integration can proceed with vestibular senses, tactile senses, and proprioception. He also proposed that changes in sensory input should be combined with motor exercise, use limb movement to train and develop sensory integration ability. Thus, sports games should integrate limb movement into game design in order to naturally incorporate ways for students to move their bodies and achieve the objective of integrating sensory perception. For instance, Grandin (1986) used personal research to engage in interviews about the experiences of autistic patients. After integrating various academic papers, Grandin strongly suggested that teachers and parents should arrange sensory integration therapy for autistic students (Grandin, 1996). Furthermore, Chian (2007) suggested that action education training can develop basic sports ability and physical ability through activity, and they can learn through actions, including physical exploration of the surrounding environment, perceived motion ability, and conceptual and emotional development.

2.2. Game-based learning (GBL)

According to Yang (2010), game-based learning (GBL) can be traced back to well-known kindergarten scholar Friedrich Froebel, who asserted the importance of games and Froebel Gifts for students' learning. Also, educational psychologist Piaget proposed that games can help students learn and believe that in games, the assimilation effect is greater than the adjustment effect because games do not need players to change themselves or adapt to environments, but need to use games to repeatedly practice new techniques and become proficient (Wu and Guo, 2003). Ebner and Holzinger (2007) concluded that findings of using game based learning in higher education support the efficacy of game playing. Garris, Ashlers, and Driskell (2002) administered a digital game-based learning model to explain that when digital games are applied to learning with a process of learner input, process, and outcomes (Figure1). The input part includes instructional content (the course content and the core). Game characteristics refer to the fundamental elements in the game, such as competition, challenge, audio-visual, and animation. After the three internal cycles are processed, including the system feedback, user behavior, and user judgment, the learning outcomes will be produced, which match with the learning objectives.

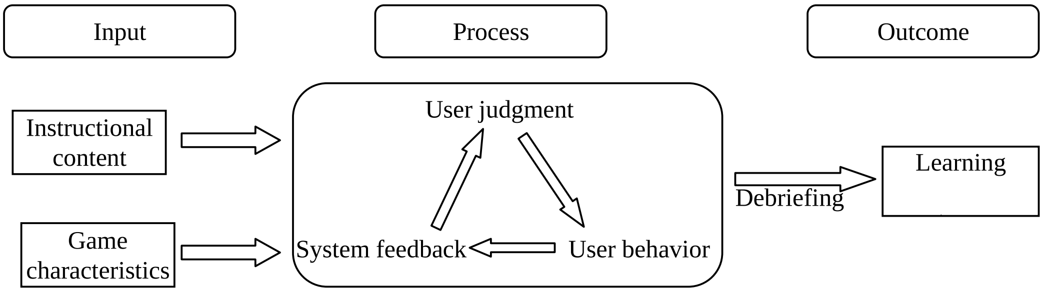


Figure 1 Digital game-based learning model (Source: Garris et al., 2002)

2.3. Research relating to motion sensor games

The development of new technology has produced various new tools, such as wii, wii-fit, and Kinect that might have replaced the traditional human-machine interface tools (mouse and keyboard). The basis of related applications is constructed on the module of human-machine interaction. Cognitive space originates in personal traits, experiences, and culture, in turn form physical space for interactive operations. In physical space, people use the control interface to control events, and in turn elicit interaction in virtual space. In virtual space, manipulation of events in physical space are used to compute and execute, combining with physical space to present the digital virtual interactive information for execution (Huang et al., 2010). Currently, popular motion sensor games such as wii and Kinect are used as major consoles, but wii requires users to hold the sensors, which may not suitable for some special groups (Ministry of Education, 2012). Chiang & Chen (2012) found wii somatosensory games can increase older adults functional physical fitness and social interaction, and to promote their quality of life by gaining fun and enjoyment. Also, Lin, Hong, and Chen (2010) found if used properly, Wii Fit Plus somatosensory games can improve health conditions such as heart rate, fat consumption, oxygen uptake, respiratory exchange ratio, and hand-eye coordination. Furthermore, Chang, Chen, and Huang (2011) found that the participants significantly increased their motivation for physical rehabilitation. Furthermore, Chin (2012) found Kinect sports can enhance youth sports participation motivation and promote health-related fitness. As a result, the researchers decided to employ webcam videoconferencing tool in this study because its technology is similar to that of kinect, but is relative cheaper, along with Sky game online game to conduct this study.

3. RESEARCH PROCEDURES AND IMPLEMENTATION

3.1. Research Method and Procedures

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

3.2. Research Subjects

Three autistic students from special education classes in southern Taiwan were recruited as the participants in the study. Student A's symptoms are autism accompanied by ADHD, aged 8; Student B's symptoms are autism accompanied by muscular dystrophy, aged 10; and Student C's symptoms are autism accompanied by mental disability, aged 8. They have high-functioning learning abilities, and do not also have mental disability. The teachers are two female teachers with master's degrees, who have been working in special education for 6 and 10 years.

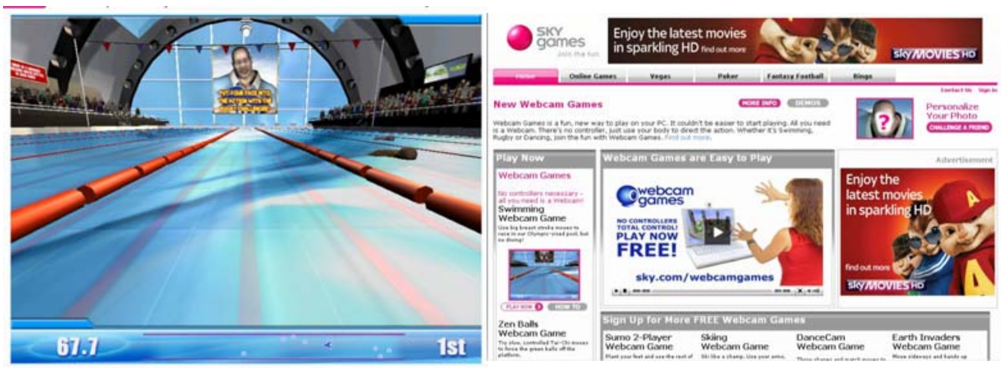
3.3. Research Tools

3.3.1. Research tool

Webcam and motion sensor games were used as the experiment tools. Figure 2 shows the arrangement of the setting. Two meters squared of activity space is maintained in front of the equipment, with a total of four meter squared of sensory space was used to avoid disturbing the research testing process.

Figure 2 Research testing equipment arrangement and game interface

After the hardware and equipment are installed, the site http://webcamgames.sky.com/ is used to connect to the swimming race game with easy level of difficulty. Figure 3 shows the example entries of the websites. The interface of the swimming race game is shown in (a), with the pool lane of the subject; (b) shows the homepage of the game provider, including many types of motion sensor games conducted through the video cameras, such as ball-balancing game, and jumping game.



(a) (b)

Figure 3 Motion sensor games interface

Additionally, the mobile electronic blood pressure and heart beat monitor used for measurement in this study (Figure 4). The semi-structured interview tool was designed by the researchers, including the part for the teacher and the part for the students. The teacher portion consists of background data, usage feedback, and addition of special explanations; the student portion includes usage intention and feelings and special additional explanations.

(1) Teacher's semi-structured interview tool
   a. Teacher background contains 6 questions, including teacher's name, gender, seniority, identity (homeroom teacher, subject teacher), teacher education, and teacher profession (major).
   b. Usage feedback contains 3 questions, including the feasibility of usage in class, assistance for student learning, and intention for teacher usage.
   c. Addition of special explanations contains 2 parts, including the researcher's observation from the interviews and teacher's additional comments.

(2) Student's semi-structured interview tool
   a. Usage intention and feelings: "How do you like this game," "Would you like to use this method in class in the future?" "How does your body feel, is there any discomfort?
   b. Additional comments: recording the students' responses.

(3) Observation chart (observation records are made for physiological monitoring, limb coordination, race time, tempo/accommodation, and game performance). The researcher records and observes associated data while the autistic students playing the game.

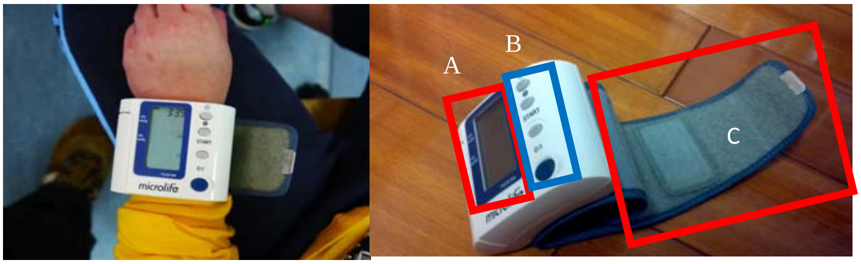


Figure 4 Mobile electronic blood pressure and heart beat motion

3.4 Data Analysis

The recording information is used for post-hoc research. Lin's (2007) four steps of data analysis flow in qualitative research were employed. They are 1) reading and organizing; 2) description; 3) classifying; and 4) interpretation. In order to enhance validity, this study used triangulation and the two classroom teachers (Lin and Hsu) to engage in simultaneous observation and recording for the same student. The researchers mainly focus on analyzing and comparing the three sets of records.

4. RESULTS

4.1Measurement of biological change

Biological change was used to measure the changes in heart beat and blood pressure when the three subjects undergoes 3 times of the webcam motion sensor game. The summary of statistical results is listed in Table 1.

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

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

Table 1 shows that after 10 minutes of webcam motion sensor games were completed, the three autistic students showed an increase in heartbeat, blood pressure, and body temperature, indicating that even though motion sensor games only exercise major muscles in the upper limbs, after multiple repetitions, the movement back and forth also caused clear increases in heartbeat of the subjects. The reason may be because of nervousness over the competition, body temperatures also rose. As a result, the webcam motion sensor game is effective in enhancing cardiovascular function.

4.2. Observation records

Table 2 shows the observation records of the three subjects, including limb coordination, concentration focus time, tempo accommodation, game performance.

Table 2 Observation records of subjects

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

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

(a) (b) (c)

Figure 5 Photographs of actual testing

Figure 5 student A shows a smaller range for opening his left and right hands. Since student A has muscular dystrophy, his muscle is weak, and has relatively poor proprioceptive sensation, so that the stretching range is relatively small. However, the test results show that when the subject discovers that the speed is too slow, he would actively expand the rotation range. Student B shows the distance for "B," whose armpits are closer together, and the opening of arms is relatively smaller, and this may decrease the strength of the exercise as a result. Student C shows that the subject's distance with a relatively greater distance between hands, but there is still poor proprioceptive sensation. Student C also has hyperactivity, and would greatly swing the upper arm, but in a chaotic way, including back of the hand and shoulder blade both facing up, and the body axis would also move forward, showing the distance of "C," which indicates that while the student moves to a greater extent, in the three game tests, he knows to slow down and adjust hand movement. The above findings show that the motion sensor games would produce corresponding splashing noises (in loudness and splashing frequency) to the subject's movement (amplitude and speed), which enable the subjects able to integrate sight, sound, motion, and proprioceptive sensation.

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

Table 3 Analysis of sensory integration observation

Item / Subject	Initial difficulties in sensory integration	Improvement objective	Exhibition of sensory integration improvement or actions
Student A	Show many actions that provide oneself with major amounts of stimulation (poor proprioceptive sensation-body concept). Insufficient action precision (poor proprioceptive sensation -action planning ability).	Lower excessive feedback for physical stimulation. Increase the precision of integrating sound, sight, and, proprioceptive sensation.	Action was stopped in two instances, and rotation began after re-adjustment. Rotation range slightly decreased the distance between hands.
Student B	Poor muscle endurance (poor proprioceptive sensation -body concept). Slow tempo of action (poor proprioceptive sensation -action planning ability).	Strengthen muscle endurance Assist in improving action range and frequency.	Arm raised by about 2cm (visual estimation). Improved action range. Still easily tired
Student C	Inability to flexibly extend (poor proprioceptive sensation). Frequent stubborn unconformity to teacher decisions (poor proprioceptive sensation -action planning ability).	Assist in physical flexibility. Guide him in becoming more agreeable.	Likes motion sensor games, conforms to teacher opinions, relatively higher degree of agreement. Still insufficient physical extension flexibility, but acted precisely about twice.

4.3. Teacher and the students' feedback

Both classroom teachers and students participate in testing, one of the researchers interviewed the subjects and their teachers. Since the students are not fully apt in expression, they express their thoughts through nodding, shaking their heads, or facial expressions. Table 4 shows the summary of the interview records.

Table 4 Summary of interview records

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

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

The above results show that three students and the teachers expressed that they liked this type of game. Both teachers and students believe that it is a type of instruction and not just a game. All subjects expressed soreness in arm muscles, indicating that the muscles are being trained. Also, in the game process, the three students had certain level of physical training. During the interviews, the teachers also pointed out that there is low demand for hardware and equipment for this type of game and it should be widely used. To conclude, the combination of vision, hearing, and physical movement in sensory integration is effectives and receives affirmation.

5. CONCLUSION AND SUGGESTIONS

The results of this study show that in terms of sensory integration training, the training of student sensory connections, including vision, hearing, motor senses, and overall coordination of limbs all show some positive changes in the observation process. In terms of physical ability training, including changes in heartbeat, blood pressure, and body temperature, as well as upper arm soreness of the students shows an effect on extending muscles, major muscle training and muscle endurance. The results are supported by Huang et al. (2009) findings in multimedia motion sensor game applications. On the whole, the teachers and the students possess positive attitude toward applying webcam motion sensor game for training autistic students' sensory integration and found it interesting. Additionally, the findings of the study show that GBL has a significant effect on learner motivation in instruction (Papastergiou, 2009; Rosas et al., 2003; Virvou, Katsionis, & Manos, 2005). Also, webcam motion sensor game can connect their physical actions to the virtual world, blurring the boundaries between the physical and the virtual, which can lower their need for abstract thinking ability, and in turn increase their level of participation. Studies related to the enhancement of learning motivation also show that different degrees of learning motivation would elicit learning effects (Mizelle, Hart, & Carr, 1993; Small & Gluck, 1994). As a result, the effect of applying webcam motion sensor game to and game-based learning for training autistic students' sensory integration is significant and effective.

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