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Message from the Editor-in-Chief

Dear Readers,

I am happy to inform you that the Turkish Online Journal of Educational Technology (TOJET) has been published fourth issue in 2011. This issue has covered the selected papers from IETC-2011 (International Educational Technology Conference) and normal review papers.

The Turkish Online Journal of Educational Technology is an international journal in the field of educational technology. TOJET is an online and peer-reviewed journal that accepts papers on all aspects of educational technology. Research papers could be about, but are not limited to: using educational technology in classroom, new developments in educational technology, instructional design, distance education, computer and internet applications in education, educational simulations, educational gaming, and other aspects of the use of educational technology in the learning and teaching activities.

The aim of TOJET is to diffuse new developments in educational technology. The mission of TOJET is to provide educators, teachers, administrators, parents and faculties with knowledge about the very best research in educational technology. TOJET's acceptance rate is 20%. TOJET is now a major resource for knowledge about educational technology.

TOJET publishes research and scholarly papers in the fields of educational technology. All papers are reviewed at least by two international members of the Editorial Board with expertise in the areas(s) represented by a paper, and/or invited reviewers with special competence in the area(s) covered. The Editors reserve the right to make minor alterations to all papers that are accepted for publication.

TOJET is interested in various researches in educational technology. These researches can help teachers to find out how educational technology can motivate and help students to put the knowledge to their long term memory. Therefore, I am pleased to publish this issue which different papers from various fields are shared with professionals.

We have four guest editors for this issue. These are Prof. Dr. Xibin Han - Tsinghua University, China (The guest editor of v.10 i.4), Prof. Dr. Rozhan M. Idrus - Universiti Sains Malaysia, Malaysia (IETC Conference Editor), Prof. Dr. Toshiyuki Yamamoto, Japan (IETC Conference Editor), and Assoc. Prof. Dr. Cengiz Hakan Aydin, Turkey (IETC Conference Editor).

TOJET thanks and appreciate guest editors and the editorial board who have acted as reviewers for one or more submissions of this issue for their valuable contributions.

As always, issue v.20 i.4 features contributions from many countries. TOJET is confident that readers will learn and get different aspects on how to use educational technology in learning and teaching environments. Any views expressed in this publication are the views of the authors and are not the views of the Editor and TOJET.

TOJET will organize IETC-2012. IETC series is an international educational activity for academics, teachers and educators. This conference is now a well known educational technology event. It promotes the development and dissemination of theoretical knowledge, conceptual research, and professional knowledge through conference activities. Its focus is to create and disseminate knowledge about the use of instructional technology for learning and teaching in education.

Call for Papers
TOJET invites article contributions. Submitted articles should be about all aspects of educational technology. The articles should be original, unpublished, and not in consideration for publication elsewhere at the time of submission to TOJET. Manuscripts must be submitted in English.

TOJET is guided by it's editors, guest editors and advisory boards. If you are interested in contributing to TOJET as an author, guest editor or reviewer, please send your cv to tojet.editor@gmail.com.

October 01, 2011

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

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A BLENDED LEARNING STUDY ON IMPLEMENTING VIDEO RECORDED SPEAKING TASKS IN TASK-BASED CLASSROOM INSTRUCTION

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ABSTRACT
This study investigates designing and implementing a speaking course in which face-to-face instruction informed by the principles of Task-Based Learning is blended with the use of technology, the video, for the first-year student teachers of English in Turkish higher education. The study consisted of three hours of task-based classroom instruction, complemented with one hour of additional class time, which was devoted to viewing and evaluating students' video recorded speaking tasks, assigned as homework. A mixed research method was used to collect data from multiple sources: recordings of a pre-and post-course speaking task, analysis of the video-recordings of students' speaking tasks, informal interviews with the students, and a written end-of-year course evaluation survey. Analysis of quantitative and qualitative data revealed that students made noticeable improvement in their oral communication skills, and they were positive in their perceptions of integrating technology in the lesson. The study also indicated that the use of video camera, as a technological tool, had a positive impact on students' viewing and critically evaluating their speaking tasks. Attention is drawn to a number of potential advantages of integrating technology into face-to-face instruction, and it is suggested that video cameras represent a language learning resource worthy of further investigation.
Keywords: blended learning, speaking skills, student teachers of English, mixed research method, task-based speaking course (TBSC), video camera

INTRODUCTION

In the last decade, second language (L2) courses that combine face-to-face learning and applications of technology, in particular computer assisted language learning (CALL), have been the subject of numerous studies (Bonk & Graham, 2006; Dewar & Whittington, 2004; MacDonald, 2006; Neumeier, 2005; Stracke, 2007). These courses usually require students to attend traditional face-to-face classes and to work independently with a synchronous and/or asynchronous communication tool. As existing studies have shown, this blended approach has become the most popular model of CALL use in L2 learning, particularly in language programmes where CALL components can provide face-to-face instruction with an "efficient use of human and material resources" (Salaberry, 2001, p. 51).

L2 courses that incorporate technology in combination with face-to-face instruction have been found to promote L2 learning effectively as they can give students the flexibility to work independently, at their own pace, promoting language acquisition (Felix, 2003; Collentine, 2000; Singh, 2003). In a study, Ayres (2002) reported that a vast majority of the L2 English and Japanese learners felt that computer enhanced instruction was motivating and appropriate to students' learning needs. In addition, those participants believed that online activities promoted learning, and they expressed the need for the inclusion of more web-based activities in their instruction (see also Beauvois, 1994, 1998; Warschauer, 1996). In a similar study, Felix (2003) found that the incorporation of technology into face-to-face instruction helped L2 learners of Italian, Japanese and English feel more comfortable with technology and the learning of L2. About two thirds of participants in Felix's study believed that web-based activities facilitated learning. The students with more positive attitudes were those who had been exposed to activities with clear goals, organized tasks, and immediate feedback.

As a growing number of L2 learners now experience technology in combination with face-to-face instruction, it is important to examine the value of this technology integrated learning on L2 learners' speaking and their perceptions of technological tools to ensure their success in the learning process. This study seeks to broaden the existing body of research by examining L2 Turkish learners' perceptions towards the use of video cameras as a supplement to face-to-face task-based learning environment, and the effect of using this blended approach on improving students' speaking proficiency.

CONCEPTUAL FRAMEWORK AND RELATED LITERATURE

The use of technology: Video cameras

The availability of a variety of media technologies allow users to record audio and video files in a reasonably short amount of time leading to the increased use of video cameras in lecture halls and other learning environments (Odhabi & Nicks-McCaleb, 2009). Increasingly, researchers have begun to explore the benefits of recording lectures as well as student speaking to make them available for students to access in many different formats including streaming video, Postcast/Videocast and interactive flash presentation (Chandra, 2007; Christel & Frisch, 2008). Hence, the use of a video is increasingly finding its way into CALL contexts.

The literature on integrating video-recording of student speaking in language learning offers several advantages: First, students can watch and see themselves and their fellow friends' performances. Similarly, teachers can use video to help students become better speakers in English (Lonergan, 1984; Tomalin & Stempleski, 1990). In addition, students have the opportunity to view the recording on video more than once. Thus, recordings allow students to replay the video as many times as they need; so, they can make self-evaluation of themselves as well as their fellow friends. As a consequence, students become self-critical, because they can see their problems and trace their improvements.

Task-based learning

A review of the literature on task-based learning (TBL) reveals several different definitions of the term 'task'. Viewing tasks from a classroom interaction, Willis (1996) defines a task as "a goal-oriented activity in which learners use language to achieve a real outcome" (p. 53). Foster and Skehan (1996) view tasks as activities that are meaning-focused and outcome-evaluated and have some real-world relationship. Long and Crookes (1993) note that as well as being meaning-oriented, classroom tasks must have a clear relationship with real-world contexts of language use and language need.

Pedagogic tasks

Long (1989) distinguishes between target and pedagogic tasks in which target tasks are viewed as "what the learner will eventually do in English" whereas "pedagogic tasks" are considered as "activities worked on in the classroom to approximate the target tasks" (p. 6). Willis and Willis (2007, p. 12-14), highlight several characteristics of a 'task': it should engage learners' interest; primary focus should be on meaning; there should be a clear outcome; the task should relate to real world activities, and it should be encouraging.

Classroom implementation of task-based language teaching

Task-based language teaching (TBLT) proposes that "the primary unit for designing a language programme and for planning individual lessons should be a 'task' because task promotes L2 learning. An important phase in the TBL framework is the task cycle (Willis, 2009). Willis describes three components of the task cycle - task, planning and report- and highlights that the teacher has a crucial role in each component. She also remarks that the task cycle can be adapted to different teaching situations. Nunan (2004) raises several principles to be considered in a task-based curriculum. Through *scaffolding,* learners should be provided with a supporting framework to facilitate learning. *Task dependency* refers to one task growing out of, and building upon the previous one. The concept of *recycling* enables learners to maximize opportunities for learning. In TBL, active learning is expected so that learners acquire the language by *actively* using it. Nunan also notes that *integration of form and function* is needed to make the relationships between grammatical form and communicative function clear.

Task-based instruction is considered to be potentially suitable for learners of all ages. It is agreed to be particularly effective when the learners are engaged in relatively similar real-life tasks. As such, task-based language instruction has been employed by many researchers, and it has proved to be highly effective in enhancing the learning of a second or foreign language. Loumpourdi (2005) reports making a transition from a prescriptive 'Presentation-Practice-Production' (PPP) approach, normally used by teachers in Greece through TBL in teaching grammar for intermediate-level students. After realizing that the grammar course, previously based on PPP approach, focusing on the presentation and practice of grammatical features, not only confused and bored students but also failed to achieve the desired results, she decided to change it gradually by introducing grammar tasks that were meaningful to learners. Loumpourdi (2005) reports that TBL offered several benefits to teaching grammar: tasks kept students interested and provided more natural learning opportunities, and the students were able to grasp the meaning and the functional use of the grammar better besides acquiring accuracy of forms.

In another study, Stark (2005) adopted TBLT into a business English syllabus for advanced students in Switzerland by incorporating project type task sequences to promote effective communication. Using websites, e.g., *Henry Ford's early mass production of cars*, and supporting materials, e.g., business press covers on current issues related to the company as authentic input, she set up similar pedagogic tasks and simulations such as giving a businesslike meeting, team work and presentation on a real well-known company, e.g., *Nike* to replicate real world activities. Stark found that setting up similar tasks to *achieve task repetition* helped bring the functions of language and communication to the forefront, and contributed to achieving grater accuracy and complexity in students' task performance.

Kiernan (2005) developed a project in which he used traditional narrative tasks to low-level adult learners at a Japanese university to build up learners' general conversational narrative skills and to prepare them for conversational situations outside the classroom. Kiernan demonstrates how these low-level Japanese students, who at the beginning did not understand English, despite several years of English at school, "moved from stunned silence to a babble of chatter" (p. 59) and were able to amuse each other with personal anecdotes told in English. In another study in Japan, Muller (2005) introduced TBL to very low level Japanese students by adapting a vocabulary-focused lesson from the PPP-based textbook to TBL. He reported that implementing TBL proved a challenge with beginners, as the students, who initially, had very little spoken ability in English, were able to develop their spoken English.

THE STUDY

In the context of learning English as a second or a foreign language (ESL/EFL), in addition to gaining basic communication skills, speaking with a greater degree of proficiency is of great significance, particularly for students who are to accomplish various academic tasks in English. Despite this, many students fail to achieve the desired level of proficiency in the target language due to several reasons. These may include establishing speaking courses on traditional views with an exclusive focus on linguistic features to the neglect of meaning, and not creating opportunities for the students to speak on topics that would be relevant to their present and future needs. As a result, students may experience problems in oral communication and become hesitant in speaking English. Since speaking is required in academic and professional performances, the lack of oral production skills becomes a serious disadvantage.

This study aims to design a speaking course in which face-to-face instruction, based on the principles of TBL is blended with the use of video for the first-year student teachers of English in Turkish higher education.

The study addresses the following research questions:

1. What are the student teachers' perceptions on the effectiveness of video-recorded TBSC as a blended learning environment?
2. What is the contribution of the blended approach to the improvement of student teachers' speaking skills?

METHODS

Primarily a qualitative research, the study incorporates mixed research methods, i.e., the use of different instruments and procedures to examine the impact of blended approach on promoting a group of Turkish student teachers' speaking proficiency. Mixed research methods have frequently been implemented by CALL researchers "to strengthen and cross-check the data before conclusions are made" (Levy, 2000, p. 173).

Data collection tools

Data were collected from multiple sources: recordings of a pre-post-course speaking task, students' video-recordings of speaking tasks on a weekly basis, informal weekly interviews administered with the students, and a written end-of-year course evaluation survey to analyze learners' experiences. The employment of mixed methods provided opportunities for triangulation, allowing the results to be cross-validated, thus enhance validity and increase the depth and breadth of the understanding of the study (Burns, 2000; Motteram, 1999).

Participants

The participants of the study were 28 first-year student teachers of English; seven male and 21 female, aged between 21 -22, attending to a state university in Turkey. The students had similar backgrounds concerning the amount and type of language instruction they had previously received. On entry to the course, their knowledge of grammar and reading comprehension was at the lower-intermediate level, but, they were quite inadequate in speaking skills. None of the students had any prior experience in using video for language learning purposes.

Course setting

Speaking is one of the fundamental courses that student teachers of English are required to take in their first-year of teacher education programme. However, from the author's observation, many student teachers, despite having received a speaking course, do not display an acceptable level of competency in speaking English nor are they always engaged in meaningful spoken interaction needed to carry out various academic tasks.

The first reason for this could be attributed to the fact that the use of prescriptive PPP tends to be a well-established approach in many speaking courses in Turkey, as in some other countries, e.g., Greece (see Loumpourdi, 2005 for details). However, as contended by Willis and Willis (2007), such courses offer a very simplified approach to language learning, and are unlikely to develop students' speaking skill, adequately. Additionally, some courses follow a structured-based approach focusing on form and accuracy to the neglect of meaning and communication. As a result, students fail to attain a usable level of fluency and proficiency in L2 even after years of instruction (Skehan, 1996).

In view of the numerous benefits afforded by TBL and the use of technology, discussed earlier, the present Task-based speaking course (TBSC) has been founded on the premises that task-based instruction blended with the use of technology, would be more conducive to developing student teachers' ability to communicate as fluent speakers of English. While stressing a focus on meaning and communication as its priority, the present course also considers form and accuracy mainly in the context of meaningful classroom interaction. In other words, as supported by SLA research, students' attention to the formal features of L2 is considered important for language learning, but only if it is done while maintaining emphasis on meaning and communication (Long & Robinson, 1998).

TBSC was based on the principles suggested by Willis (1996); Willis and Willis (2001) in combination with other frameworks, notably Skehan (1996; 2003) and Nunan (2004) to meet the speaking needs of the students in this specific context. The course was scheduled as three lessons of face-to-face teaching, each lesson lasting 45 minutes, and it lasted one semester (14 weeks). An additional one-hour classroom time was added to the weekly schedule which was devoted to viewing and evaluating students' speaking tasks, which the students video-recorded independently working mainly in groups, each consisting of three or more students.

The following steps were followed in developing the framework of the blended TBSC.

Needs assessment

Initially, needs assessment was conducted to identify student teachers' speaking difficulties, their perceived needs and expectations from the speaking course and the kind of topics they wished to be included in the course. To ascertain students' initial language learning needs in speaking, students were invited to speak on one of the argumentative topics below, as a pre-course speaking task:

- Most university degrees are theoretical and do not prepare students for the real world. They are therefore of very little value.
- In the words of the old song "Money is the root of all evil".

Each student was asked to speak into a microphone attached to a PC and their talk was recorded using Goldwave as a record device for further data analysis.

The next stage involved analyzing students' initial speaking using an oral test rating scale, specifically developed for this study. The rating scale featured five categories: fluency, pronunciation, vocabulary, accuracy and task accomplishment, and a clear definition of five descriptors in each category were provided. A score is awarded for each category to a maximum of 20, the whole oral test rating scale totaling 100 points. The global speaking score for each student is calculated by summing up the scores that a student receives for each category.

Each student's recorded speech was listened to several times by the researcher, and was scored using the oral test rating scale discussed above. Another researcher, also familiar with the scale, scored students' speaking independently using the same rating scale. Consistency of raters and agreement among them was high; 92.6%. Any disagreement among the raters (researcher and the second rater) was resolved through discussion (see discussion section for findings).

Needs analysis served as a diagnostic tool in helping the researcher to identify problems that student teachers experienced in expressing themselves orally. It also helped to identify students' specific language needs to be integrated in TBSC. Common problems students experienced ranged from lack of vocabulary and fluency, weak pronunciation, frequent occurrence of language errors.

Furthermore, students were interviewed using a semi-structured interview, which lasted between 15-20 minutes. The purpose of the interviews was to evaluate students' present level speaking ability, to elicit their perceived difficulties in speaking, and their expectations from the speaking course. Interviews, which were conducted in English, were audio-recorded and later transcribed for analyses.

Students (*N=28)* unanimously agreed that they expected to improve their pronunciation, fluency and accuracy. They stated that they felt anxious and shy about speaking in the presence of others, and their knowledge of vocabulary was restricted. In fact, these problems were already evident in their initial speaking performances. While the initial pre-course speaking task served to identify students' language needs, the same speaking task was given at the end of the study, serving as a post-course speaking task to determine the effect of technology-based TBSC on learning outcomes as will be discussed in the data analysis section.

The next stage in the study involved designing the course that would address those identified student problems, their specific needs and expectations.

Determining the tasks

Target tasks were determined in accordance with the findings of needs assessment. The guiding principles in determining the themes and content for tasks included the students' interests, familiarity, and their relevance to students' needs. Students' preferred topics, e.g., money, education, language, fashion, tourism were integrated into the course. Thus, tasks focusing on a variety of actual topics were generated to cater for the present and future speaking needs of student teachers of English.

Sequencing the tasks

Sequencing was done according to the complexity and the cognitive demands of the tasks (Robinson, 2001). For example, earlier tasks in the present course were cognitively less demanding than those in later units, as illustrated below:

Sample task 1: You are working as a tourist guide, taking a group of tourists around one of the wonders of the world. Give as much information as possible on your chosen wonder answering each tourist's question.
Sample task 2: Conduct a research to find out which words have entered into Turkish language. Discuss benefits and its dangers. How would you solve this invasion?

Each task illustrated above was designed to be performed as a group work. While Task 1, which was *a narrative task,* was studied during the second week in the course, Task 2, *a problem solving task,* was the last task scheduled in the course, as it was thought to be cognitively more demanding.

In the present TBSC, also corresponding to each task was a particular rhetorical function, e.g., narration, description, problem-solution, argumentation. In this way, the relationship between communicative function and grammatical form was made clear (Nunan, 1993; 2004). By providing a range of tasks, and taking into account functional and communicative features of the tasks, the course aimed to provide students with speaking skills and experiences transferable beyond the classroom and meet student teachers' academic requirements.

COMPONENTS OF THE BLENDED TBSC

The course required students to attend three hours of face-to-face classes, and then work independently planning and video-recording their assigned speaking tasks in groups. Following this, one-hour of classroom time was added to the weekly schedule to view and evaluate students' video-recorded tasks. Face-to-face classroom instruction component of the TBSC consisted of the following three components:

Pre-task

This stage was intended to clarify the objectives of the task and do task briefing (Willis, 1996). In this initial phase, task planning activities were done to provide learners with a repertoire of topic-specific vocabulary, some potential language, and general information students could draw on during the task (Skehan & Foster, 2001). According to Nunan (2004), an exposure to input is needed in interactive and communicative tasks. Input was obtained from multiple sources to create a context for learners. Students read texts or dialogues drawn from a textbook, newspaper articles or other written sources on the theme. Through consciousness raising activities, students' attention was drawn to some key language features and vocabulary in these texts.

An alternative source of input for the students was to listen to recordings of a similar task being carried out by a native-speaker. The aim of this was to provide students with a model for task performance, create a stimulating communicative context, and raise their awareness of how native speakers naturally use various devices, e.g., repetition and clarification requests (Willis, 1996). Other sources of input were obtained from student searches of websites, and watching a movie on a related theme.

Task cycle
The crucial role of planning time in the success of task performance is highlighted (Willis, 2009). Thus, during the task cycle, students prepared for the tasks for 10-15 minutes by planning an outline of their talk in writing, or in note form. Students, working in pairs or in groups depending on the nature of the task, made a list of key points covering what they considered to be crucial in performing that particular speaking task.

After the students had planned for their specific task, they then rehearsed it before reporting on it orally. During this stage, the researcher who was also the teacher provided students with the necessary scaffolding encouraging them to produce ideas, monitoring their progress, and giving individual coaching where necessary. Students were encouraged to integrate the new lexis and language they had acquired from their readings into their speaking as part of active learning (Nunan, 2004). They were also instructed to focus on appropriate strategies to enable them to become effective speakers of English.

Report
At the report stage, students presented results of their task orally in groups or in pairs with a focus on meaning and effective communication to convey information appropriately and fluently. Since each group or pair's talks were different, they listened to compare versions, and commented on each other's talks.

BLENDING CLASSROOM LEARNING WITH VIDEO-RECORDED TASKS
This stage involved assigning students a speaking task similar to the one studied during that particular week, as an extension to the face-to-face learning carried out in the classroom. Students were required to prepare for the task collaboratively outside the class hour. Following Willis (2009) who advises task recordings, using a digital video camera, students video-recorded themselves doing the speaking task, an example of which is given below:

The theme covered in the face-to-face learning is *English as a global language.* The classroom teaching is mainly devoted to discussing the reasons for English being a global language. Students' assigned task is related to the *influence of English on the Turkish language,* as stated below:

Conduct a research to find out which words have entered in Turkish language. Discuss benefits and its dangers. How would you solve this invasion?

During the next class hour, students' digitally video-recorded speaking tasks were viewed. While viewing the tasks, each student's task performance was evaluated using the oral test rating scale, discussed earlier in terms of fluency, pronunciation, vocabulary, accuracy and task accomplishment. Additionally, students were given feedback on various aspects of their talk, and they were provided with focus-on-form through consciousness-raising by drawing their attention to relationships of form, meaning and function.

Brindley (2009) suggests that adopting task-based assessment requires that teachers and learners become accustomed to considering language tasks as indicators of progress and achievement, and learners need to understand the criteria for evaluation of performance. Thus, students were informed of the criteria for assessment of each task based on the oral test rating scale to assess their task performance, and they were suggested to critique on any aspect of the task.

In addition to video-recording of their speaking, the students listened to their own speech and transcribed sections themselves. Using task transcripts, students were asked to *notice* and highlight interesting features and the language that they used in their talk. These proved to be very useful in increasing students' awareness of their strengths and weaknesses.

DATA ANALYSIS
Student scores from the pre-and post-speaking tasks were systematically entered into a computer for quantitative analyses, which was later analyzed using the Statistical Package for the Social Science (SPSS), version 11.5. Paired Samples T-test was administered to find out if there existed any significant difference between the pre- and post-speaking scores of the students.

Data from the interviews and end-of-course evaluation were analyzed qualitatively through content analysis to identify emerging themes and trends. Following the strategy of analytic induction (Goetz & LeCompte, 1984), the researcher read through the interview transcripts several times to have a holistic nature of the data. Tally charts were used to produce a list of responses to each question to find recurrent themes. Based on the qualitative analysis of the responses given to each question, information was organized and categorized to achieve data reduction to approximate towards "an accurate description and interpretation of the phenomenon'' Wiersma and

Jurs (2005, p. 206). Salient comments regarding students' responses to each interview question were identified and noted. A similar procedure was adopted in analyzing students' written responses to the end-of-course survey evaluation.

FINDINGS

The two research questions will be examined based on the empirical evidence gathered from different research instruments.

Student teachers' perceptions on the effectiveness of video-recorded TBSC

Students responded positively on integrating videos into speaking classes. They appreciated particularly intrinsic features of the use of video-enhanced tasks, and the opportunities for interaction and collaboration with other students, which they perceived as facilitating learning, adding innovation to the traditional face-to-face classroom teaching, expressed below:

> *We haven't used video for recording our speaking and evaluating ourselves before so it was the first experience to study speaking this way. The use of video made the lessons more enjoyable and close to real life situation.*

From the observation of the researcher, the students seemed to prepare better when they knew that they would be recorded. Generally, students reported that they liked seeing their recorded speeches because they could identify their problems and see their improvements. According to them, this process enabled them to keep their own record of progress. The following extract from a student reflects the opinion of the whole class:

> *We have become aware of our strengths and weaknesses. Comparing my first and the last speaking task, I can see great improvements in my pronunciation, vocabulary and grammar. I definitely see a great progress in my speaking skills.*

In addition, students appreciated the supportive atmosphere created and the benefits of *scaffolding*, particularly during evaluating their video-recorded speaking tasks. They stated that the feedback they received helped them develop useful strategies:

> *This video integrated speaking course has really been very productive in many ways: First, our instructor's supportive behavior made us feel relaxed. She clarified the points we did not understand. Also we were able to develop various strategies. We are now progressing step by step in the way of speaking like a native speaker. This is not a dream but it is just only up to use; focusing on the speaking strategies.*

The impact of the blended TBSC, particularly students' video recording of their speaking tasks independently working at their own pace, has been significant in helping students to overcome their anxiety. The following extract illustrates leaving behind their fear of making mistakes and perceiving speaking as a process of continuous practice.

> *At first, we had some anxiety, which comes from our previous education system which taught us to be silent. However, the present speaking course encouraged us to speak English. In a short time we were able to overcome the silence syndrome. Although we had some anxiety at the beginning of this course, after a while we felt more comfortable and self-confident. This was because of our new methods which we have learned. Through this method, first we gathered some information about the topic, such as learning some new words, then discussed about the subject using the new words. This method enhanced our vocabulary. By performing the tasks we learned how to use new expressions in context. All these helped us gain a production-based skill and develop our fluency in English.*

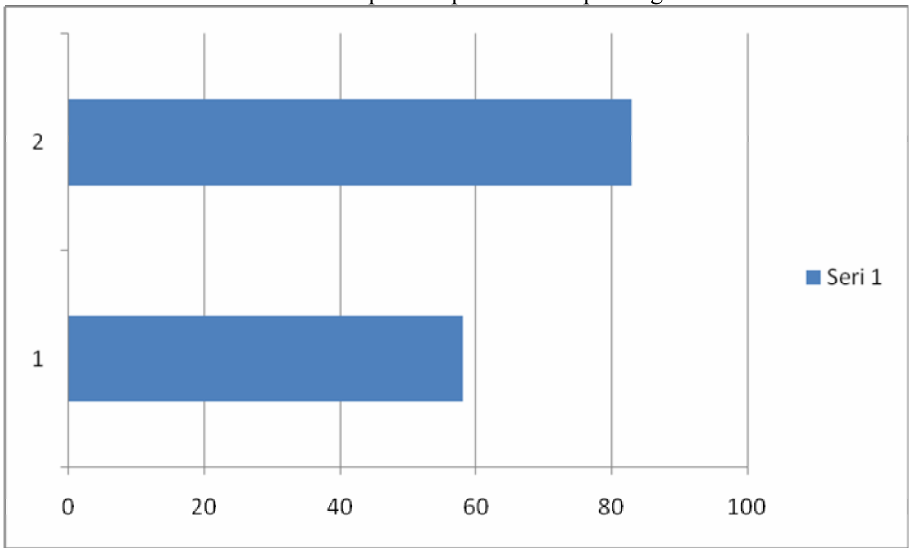
Contribution of the Blended Approach to the Improvement of Students' Speaking Skills

This research question will be addressed in relation to data obtained from pre-and post-speaking tasks and an end-of-course evaluation.

Findings from pre-and post-course speaking tasks

In order to determine the extent to which these student teachers benefited from the blended TBSC, they were asked to speak on the same topic, as they did at the beginning of the course as a post-course speaking task. Each student's talk was recorded and rated using the same oral test rating scale, discussed earlier. Descriptive statistics were employed in analyzing the data. The findings are reported below:

Table 1: Students' pre-and post-course speaking scores



As indicated in Table 1, students' mean speaking score, which was measured as 58.0 before they took the course, which increased to 82.86, as measured at the post-course speaking task, indicating 43.3% of overall average increase in fluency, pronunciation, vocabulary, accuracy and task accomplishment as assessed according to the oral test rating scale.

Table 2: Results of paired samples T-test regarding pre-and post-course students' speaking

Score	N	$\overline{X}$	sd	df	t	P
Pre-course speaking	28	58	5.35	27	-26.575	.000
Post-course speaking	30	82.86	4.75			

In accordance with the results of the Paired Samples T-test, as indicated in Table 2, a significant difference ($p < .001$) has been recorded between the pre-course and post-course mean speaking scores of students, suggesting that the blended TBSC has had a considerable influence on each student's speaking performance.

When students' initial talks were compared with the final talk, considerable progress was found to have been made. Initially, students' oral production was inadequate; their knowledge of the topic was superficial; they produced some disconnected ideas and many language mistakes; they were unable to support their ideas; their use of vocabulary was limited, and they did not have much confidence in speaking.

This is illustrated below by the transcript of one student's pre-course speaking on the topic: "Most university degrees are theoretical and do not prepare students for the real world. They are therefore of very little value".

> *In the university we're supposed to work lessons. we don't do anything other than lesson and uumm, so we're fall uummm falling behind with the other activities and real world. We have to umm…work hard every time and ... we're given a lot of homework. I think…homework is unnecessary. .sometimes it's necessary umm.. but if it's given very... too much the students tend to…not to do homework and give up working.. sometimes in university we're given lessons about uhhmm.. parent, child and culture.. how to gain money..*

The following transcript of the same student at the post-course speaking reveals that the same student used a richer range of vocabulary related to the topic, disconnected sentences turned into meaningful and coherent spoken discourse. He was better aware of stress and intonation (not indicated in transcript).

> *As every… every body knows the university education is the last and at the same time is the best education that one can get before getting his or her job. Therefore it must be of great value ummm to prepare individuals for their future careers. ummm By so doing they will have less difficulty in performing their jobs.. So.. it must be practical rather than theoretical. Ummm. Think of a doctor who hasn't done any practice ummm during his ummm university education. You know.. doctors are*

> *doing practices on dead bodies so they can ummm get their education practical.. but.. instead of doing so if they do studies only on papers, ummm I think they can't be good doctors in the future.. and and how can we trust such a doctor? ummm or.. think of an engineer who is building structures and so on.. if they don't go and see how the buildings are build they can't learn it well.. so I strongly agree with the idea that individuals should get practical education rather than theoretical during their university education to ummm get well prepared for careers and for their future years…*

Evaluation of end-of-course survey

As stated earlier, at the outset of the course, students *(N=28)* unanimously stated that they expected to improve their pronunciation, vocabulary, fluency, and accuracy; they felt anxious and shy about speaking; their knowledge of vocabulary was restricted, and they remained unable to speak fluently.

Findings indicated that students made considerable improvements in all areas in which they felt inadequate in at the beginning of the course. The analysis demonstrated the emergence of several categories: (a) students expanded their knowledge of *vocabulary* and made significant improvements in their *speaking skills*; (b) the interactive nature of pair and group work promoted *collaborative learning* and *incidental learning*, and (c) they appreciated *scaffolding.*

The students overwhelmingly indicated that TBSC met their initial expectations, as clear from the following extract:

> *The speaking course has been very useful for me. At the beginning, I hoped that I would improve my pronunciation, fluency and accuracy in speaking English. Now that we are about to complete the course, I can say that my expectations have been met. My pronunciation is much better compared with what it was at the beginning of the course. I have also improved my knowledge of vocabulary. I have learned different idioms and new academic words about different topics.*

Many students (*N=28*) stated that they had previously been exposed to form-focused instruction. The following extracts illustrate how transition from a conventional grammar-based instruction to TBSC helped students develop their fluency and confidence to speak in English:

> *At the first speaking lesson, I had almost an empty mind about speaking, for I previously did not have such a course in high school. The curriculum had focused entirely on grammar and a little writing. Therefore, I had some fears about having a speaking course at the university. I thought what a hard course it is going to be. On the contrary, it was not that much difficult as I thought. Since the very beginning, our speaking lessons have proved to be very fruitful. When I look back into the past term, I can clearly see that I am miles away from where I was at the beginning. I extended my vocabulary. Also, my grammar skills improved. I now realize how important it is to make grammatically correct speeches. Most importantly, speaking course has helped me gain an intellectual maturity and thinking critically because I talked on a variety of topics, and I now have some ideas to speak about.*

Working in pairs and groups created opportunities for *collaborative learning*, also enabling *incidental learning,* as clear from the following extracts:

- *Each group talked about different topics so we could learn different ideas from our friends. This helped us to digest new expressions and strengthen our pronunciation.*
- *My friends have contributed a lot to my speaking. I, myself, picked up many words and phrases from them. To sum up this speaking course helped me improve my speaking skills.*
- *Students stated that while performing the tasks, they acquired both vocabulary and grammar knowledge to enable them to express themselves fluently.*
- *Not only did I learn new vocabularies, but also I improved my grammar. At the beginning of this course I could not speak so good as to express my opinions clearly and effectively. As time went by I improved my speaking.*

Undoubtedly, the most important benefit of the TBSC was that students, through cognitively engaging tasks that reflect authentic and purposeful use of language, were able to communicate meaningfully and effectively. This is illustrated by the following sample task:

> Imagine that you are an English teacher. Your students are having difficulties in learning English. What language learning strategies would you advise them?

As seen in the following video-recorded transcript, the task is performed as a group work and group members acting as a *teacher and students:*

Sample task:

S1: I have short memory to remember names. Sometimes I can easily forget the name of my neighbors; friends please tell me…. some of the tricks to develop a filing system in my mind.
T: You… you cannot remember the names then… try to picture people's faces in your mind, or if there are similar names in your relatives… your family…try to think of an example .. and you'll remember them
S2: My problem is far more different…. My problem is that ….not remembering things… I've got lots of things in my mind … exams, lessons, etc. These things always slip my mind .. and .. I'm very absent minded. What can I do?
T: You should write things down on a piece of paper and stick them on your wardrobe but be careful about it. Because it should be somewhere you always look at.
S3: I have a problem too. I can't remember new words in the new language ….. I memorize them but I can't keep them in my mind for a long time. What can I do?
T: Always repeat repeat… The more you write words down in the new language the more you remember them. Or you can make a sentence with the word.. When you forget a word's meaning remember the sentence and you'll recall it.

The main reason for students to speak fluently, as evidenced from the above-illustrated tasks could be attributed to the empowering potential of the blended TBSC, which helped student teachers to be aware of the amount of theme-related knowledge, language and vocabulary. In addition, the fact that students performed two similar tasks under each theme, one during the face-to-face learning and the other outside the lesson, helped to achieve task continuity; thus, leading to greater accuracy and complexity in performance.

DISCUSSION
The first research question asked what the student teachers' perceptions on the effectiveness of video-recorded TBSC as a blended learning environment was. In general, video-recordings proved to be a very useful learning tool in recording and evaluating the speaking tasks with the learners involved in this study. Asking student teachers to record their speaking tasks independently has given students an important benefit in that they were able to communicate in English, do some additional research on the task, and relate what they had learned in the face-to-face classroom learning environment to the speaking task. The results of the survey on student perceptions indicated that most students acknowledged that recording their speaking was a real challenge for them, and that watching and evaluating their recordings increased their awareness of their own mistakes, as well as enabling them to trace their own progress.

The second research question asked what the contribution of the blended approach to the improvement of students' speaking skills was. As is evidenced from the findings obtained from this study, the speaking course that incorporated technology in combination with face-to-face instruction has been highly effective in promoting student teachers' speaking proficiency.

First, when the scores from the students' pre-course and post-course speaking task are compared, it can be seen that a considerable progress has been noted for each student. These same students also used a wider range of vocabulary, notably extending their theme-related vocabulary. Additionally, a noticeable improvement in the language used was present.

Next, the impact of integrating video into the course has been very significant in helping students overcome their anxiety, gain fluency and useful communication strategies. Students' end-of-year course evaluation reveals that this is due to the empowering potential of the blended TBSC.

As has been shown from several comments made by the students and based on informal interviews held with them, students are now more aware of the amount of theme-related knowledge they need to acquire. They have started to accept grammar and vocabulary not as discrete elements of language but as powerful means for putting their ideas into communication. While students' primary attention was directed to the meaningful communication, TBSC proved to be beneficial in achieving a balance between accuracy, fluency and gaining a higher level of complexity. This confirms Willis and Willis's (2007) argument that taking the task as a starting point, learners are encouraged to deploy whatever language they already possess, build upon it, improve and expand their capabilities. The findings obtained from this study also confirm remarks made by Foster's (1999) arguments that "…giving learners tasks to transact, rather than items to learn, provides an environment which best promotes the natural learning of languages". (p. 69)

Another outcome from this study is that collaborative interaction provided a context conducive to negotiation of meaning, thus confirming Skehan and Foster's (2001) argument. Students acknowledged that through collaboration, they gained useful insights from their fellow friends.

Finally, the present study is consistent with studies conducted by several other researchers who found TBL to be particularly useful in developing students' language skills. The findings of the present study confirms Loumpourdi's (2005) study which revealed that using tasks into a grammar syllabus increased students' self-esteem and boosted their confidence, and those previously felt intimidated by rules were able to express themselves more willingly. In addition, students subconsciously became familiar with L2 grammatical features as the researcher raised their awareness through drawing their attention to such features.

The study also confirms that of Stark (2005), who designed a task-based specialist business English course, in several aspects. First, working in pairs/groups created opportunities for collaborative learning, enabling students to benefit from each other. Next, as in the present study, while the major aim was to promote students' communication skills, Stark notes that students developed various other skills, e.g., writing. Students found the tasks relevant, motivating and most importantly, they felt that they had improved their language skills, presentation skills, and vocabulary. Finally, as in the present study, setting up similar tasks contributed towards achieving greater accuracy and complexity in students' task performance.

The present study also parallels that of Kiernan's (2005) study, which involved using narratives with to low-level adult Japanese adult learners to develop general conversational skills. As in the present study, whilst those Japanese learners had previously studied English at school, they had little experience of having to speak English. However, implementing TBL to these students increased their confidence in conversational skills. Finally, the results of the present study is consistent with Muller (2005) in that implementing TBL proved a challenge with beginners, as the students, who initially, had very little spoken ability in English were able to develop their spoken English through the use of TBL.

These findings are also in agreement with other studies reporting the positive impact of integrating technology on L2 learning (e.g., Ayres, 2002; Beauvois, 1994, 1998; Felix, 2003).

CONCLUSIONS AND FUTURE DIRECTIONS

This study reported on the design and implementation of a blended TBSC that combined face-to-face classroom instruction with video-recorded speaking tasks, for the first-year student teachers of English in Turkish higher education. This implementation was found to be helpful in enhancing students' speaking skills by offering an innovative learning experience to students who were able to engage in meaningful interaction, and improve in the areas where they saw an obvious need for improvement.

Findings of this study are significant in contributing to the related literature as the results indicate that in an EFL/ESL context, a speaking course based on the principles of TBL can be conducive to promoting students' speaking proficiency along with developing their knowledge of language. The findings of this study also advance our understanding of the contribution the use of video-recordings of students' speaking tasks makes to foreign language learning, and offer useful insights to teachers and course designers in designing a speaking course.

While the present course has been designed to develop mainly the speaking skills of a group of students in Turkey, its implications extend this particular context. It is hoped that the framework discussed here will provide guidelines to researchers and teachers in other contexts to develop not only the speaking skills but also other skills for their students.

Finally, given that the research is small-scale conducted with only 28 student teachers of English, and that the context is unique, what is documented here is not generalizable. Therefore, further research into TBL incorporating the video-recordings of students' speaking, needs to be conducted with a larger number of students, to prove the effectiveness of this approach, and to further explore its full potential in teaching and learning EFL/ESL.

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A COMPARATIVE STUDY OF PROBLEMATIC INTERNET USE AND LONELINESS AMONG TURKISH AND KOREAN PROSPECTIVE TEACHERS

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ABSTRACT
The main aim of this study is to compare the problematic internet use and its relation to loneliness among two nations' prospective teachers, Turkey and South Korea. Five hundred and ninety five prospective teachers from three universities, two from Turkey and one from South Korea participated in the study. Generalized Problematic Internet Use Scale 2 and UCLA Loneliness Scale were used to collect data. Some of the major findings are as follows: a) No differences were found between the problematic Internet use of Turkish and Korean prospective teachers; b) Male Turkish prospective teachers found to have more problematic use of internet than female counterparts on the other hand no differences were found among South Korean prospective teachers by means of sex; c) Positive but low correlations between problematic Internet use and loneliness levels of prospective teachers of both nations; d) There is a significant difference between Turkish and Korean prospective teachers. South Korean prospective teachers were found to be in higher levels of loneliness than Turkish counterparts.
Keywords: Problematic internet use, internet addiction, prospective teachers, comparative study

INTRODUCTION

In today's world technology has been prevalently used in almost all spheres of life and as a consequence the personal ownership ratio of computer and internet is rapidly increasing each year. According to a research on Information Technologies Use employed by Turkish Institute of Statistics, the ratio of computer use and internet access in enterprises was 88,7% and 85,4% in January 2007 whereas in January 2008 these rates respectively increased to 90,6% and 89,2%. In January 2010, the ratio of internet access was 90,9% (Turkish Institute of Statistics, 2011).

Meanwhile, statistics (2011) from the Korea Communications Commission, which is a Korean government organization, show household's computer possession ratio was 80.4% and Internet access ratio was 79.8% except enterprises in 2007, and it was 93.2%, 83.4% in 2010, which was increased 12.8%, 3.8%, respectively. In addition, the subscription ratio of broadband Internet access system has been rapidly increased since 2005. As of 2010, the number of broadband Internet access system's subscribers is estimated that about 37% of the nation's population is exploiting the broadband Internet access system, and the ratio has been sharply increased.

The reason accounting for this quick rise in internet use is certainly related to the services it provides and its easy access. Internet has been widely used for a variety of purposes in several domains. As stated by Deniz and Coşkun (2004) as an educational tool internet lets access to inexpensive, global, interactive and intensive computer communication and it also enables the student to improve his/her learning experience. Online users can easily access internet from a bunch of locations including their homes, workplaces, houses, school, internet cafes etc. The researches also put forth that (Ceyhan, Ceyhan and Gürcan, 2007; Deniz, 2001, 2007; Deniz and Coşkun, 2004; Tutgun, 2009; Tutgun and Deniz, 2010) most of the students reported to have easy access to computers and internet.

The principal functions of internet are increasing the means of researchers, facilitating the communication and enabling data share however the uncalculated rise of internet use started to introduce several problems as well.

Some individuals manage to limit their internet use within the required time whereas certain people face problems at school, work or social life since they fail to draw the boundaries and excessively use the internet. The term internet addiction was introduced for the first time by Goldberg (1996) in a forum website and a list of symptoms was defined. Right after that, incredible numbers of people from the whole world sent their complaints to this forum site regarding internet use. Hence a global research domain emerged and a good number of researchers and clinicians started to conduct studies on internet addiction. The earliest indicators of internet addiction were developed by Goldberg (1996), DSM-IV (Diagnostic and Statistical Manual of Mental Disorders) parallel to the diagnosis measurements of alcohol addiction, subsequently, for internet addiction and internet misuse Young (1996b) developed certain criteria in line with diagnosis measurements of Pathologic gambling presented in DSM-IV (American Psychiatric Association, 1995). Following the cases exemplified by clinicians, a new dispute emerged; whether the internet caused addiction or excessive usage of internet was simply a behavioral indicator of already- existing psychological problems that were manifested through internet (Keser Özcan and Buzlu, 2005; King and Barak, 1999). Further studies employed several new concepts like internet addiction, internet dependency, problematic internet usage, pathologic internet usage, internet behavior addiction and cyber addiction.

Young (1996b) favored the term internet addiction and drew a parallel between internet addiction and drug or alcohol addiction since they all brought about academic, social and professional losses. In subsequent researches, Young (1996b) described “Problematic internet usage” based on “Pathological gambling” criteria (Young and Rogers, 1998; Young, 1996b). According to Young (1996a) problematic internet users who spare little time for real people in life prefer to spend time alone on computer and the same finding is demonstrated in several other researches as well (Deniz and Tutgun, 2010; Kraut, Kiesler et al., 2002). Kandell (1998) defined internet addiction as a psychological addiction which particularly affected teenagers and he emphasized that excessive usage of internet was likely to introduce problems related to health, social relations and time management. The researches covering young population, university students in particular, have manifested rather critical findings and revealed that university students formed the most risky group (Ceyhan, Ceyhan and Gürcan, 2007; Deniz and Tutgun, 2010; Kandell, 1998; Lavin, Marvin et al., 1999; Morahan-Martin and Schumacher, 2000; Tutgun and Deniz, 2010; Young, 2006).

As put forth by Caplan (2005) Problematic internet usage is a multi-dimensional syndrome composed of cognitive and behavioral symptoms causing negative social, academic/professional outcomes. According to this perspective, the term internet addiction on its own is not encompassing enough hence the terms pathologic or problematic have also found place in literature. Afterwards based on the generalized problematic internet usage developed by Davis (2001), Caplan (2010) developed a multi dimensional measurement tool named as Generalized Problematic Internet Use Scale 2 (GPIUS2) according to cognitive-behaviorist model and indicated that people’s self expression habit on internet which is connected to their lack of self trust brought about significant numbers of negative consequences on their lives. In present study too, the measurement tool developed by Caplan (2010) has been used after adapting into Turkey and Korea.

LITERATURE REVIEW

Studies of Problematic Internet Usage in Turkey fall short in describing pathological dimensions of internet addiction and researchers relate its causes to several different reasons. Gönül (2002) puts forth that addiction is not to internet but its context and the means it provides. On the other hand the clinicians studying this field in Turkey note that internet addictive users have additional clinical findings (Köroğlu, Öztürk et al., 2006; Odabaşıoğlu, Öztürk et al., 2007; Öztürk, Odabaşıoğlu et al., 2007).

While investigating the causes of problematic internet use, the researchers also attempted to develop measurements tools to determine the problematic internet usage. In Turkey since the measurement tools detecting problematic internet use in particular are limited, these researches have been given priority.

In Keser Özcan and Buzlu’s (2005) research, the validity and reliability of Online Cognition Scale developed in 2002 by Davis to detect problematic internet usage amongst the sampling of university students has been examined and adapted into Turkish. The research has been carried out among 148 university students who spent at least two hours online in a week. At the end of this research, parallel to the original scale an Online Cognition Scale with 36-item four-factored (loneliness-depression, lessened motivation control, social support and distraction) has emerged. On the other hand, Ceyhan, Ceyhan and Gürcan (2007) in their research have developed a measurement tool to detect problematic internet usage amongst university students. The researchers detected that 5 Likert type scale consisted of total 33 items and in the development stage of scale they manifested that according to the data gathered from 1658 university students, the scale was composed of three factors(negative consequences of internet, social benefit/ social comfort, excessive usage). The specific scale has no objective of diagnosing people with internet addiction by measuring problematic internet usage but aims to exhibit the healthy and unhealthy usage levels of internet. Kayri and Günüç (2009) conducted a study to detect structural validity and internal consistency coefficient of the Turkish adaptation of Internet Addiction Scale originally developed by Nichols and Nicki (2004). Turkish adapted scale consisted of 30 items which were all positive and was scaled with 5 Likert type grading. Certain gaps and Internet addiction levels have been determined according to the scores obtained from scale. Accordingly the ones receiving above 90 scores were categorized as internet addicts. In the same research, 31 university students were grouped as internet addict.

As reported by Öztürk, Odabaşıoğlu et al. (2007) this addiction type comes to surface when the person fails to limit internet usage, keeps staying online despite the social or academic losses or feels deep anxiety when faced with a restriction on internet usage. This addiction type, diagnosed with above-mentioned symptoms, has been extensively analyzed in psychiatry literature since the mids of 1990s. The clinical pictures of excessive internet usage put forth that a typical internet addict spend 40-80 hours a week online and can stay online 20 hours straight. Those patients whose sleep routine is diverted may start to use stimulants, drink excessive amounts of coffee or Coke and as a consequence of lessened physical activity they may face obesity, carpal tunnel syndrome, backache and posture disorders.

In Odabaşıoğlu, Öztürk et al.'s (2007) research case studies have been presented and student groups with different complaints have been examined. The research findings demonstrate that internet addiction that is widely common among teenagers in particular spoils the mental and physical development of patients, adversely affects social relations and academic success as well. According to the research, there is a 1,5 year period of time changing between 6 months to 3 years prior to misuse or addiction of internet. As the time spent online a week is examined it is found that there is an average of 7-8 hours changing between 4 to 20 hours.

Tutgun and Deniz (2010) have examined problematic internet usage of prospective teachers in Education Faculties with respect to certain variables (gender, department, university, daily use etc.). It has been detected in the research that problematic internet usage of prospective teachers was in medium level. The rest of the findings revealed that with respect to gender, male and female prospective teachers differed in terms of problematic internet usage level. As the level of daily internet usage rose so did problematic internet usage level and prospective teachers describing themselves fully competent computer users were, compared to the ones feeling less competent, more oriented towards problematic internet usage. Another research finding showed that freshmen students were, compared to senior students, more oriented towards problematic internet usage. The comparison with respect to department indicated that prospective teachers in the Department of Computer and Teaching Instructional Technologies were more inclined to problematic internet usage than the prospective teachers in other departments (Science-Mathematics, Fine Arts, and Social Sciences).

In a different study Deniz and Tutgun (2010) analyzed the relation between loneliness levels and problematic internet usage of prospective teachers. The research finding demonstrated that there is a correlation between loneliness levels and problematic internet usage of prospective teachers studying at education faculties. Taking into account the fact that if a prospective teacher who is expected to be a professional role model in many aspects for students is trapped in problematic internet usage and faces academic, social and familial losses, present research signals even more significance to take necessary precautions with no delay. Another study, in which the university students have been examined in terms of gender and loneliness, supports these findings (Odaci and Kalkan, 2010).

In the same way, similar researches were conducted in South Korea. In particular, led by the government, the Internet addiction level of the nation for general people and youths has been analyzed to make public the result every year since 2002. Most of the university hospitals have run rehabilitation programs related to Internet addiction based on the result since 2010. Furthermore, this study found that legislation is recently promoted at the national assembly regarding treatment and improvement for various digital addiction including game addiction as well as Internet addiction.

According to 'Actual condition survey on Internet addiction of Korean in 2010' that is conducted through door-to-door interview method for the entire people by the Korean government and released in March, 2011, the Internet addiction levels (IALs) of age 9 ~ 39 among the Korean, who use Internet more than once within recent a month, is represented as 8.0% (Ministry of Public Administration and Security, 2010). In the survey for each age group, the numbers of Internet addicted elementary, middle, high school students are 13.7%, 12.2%, 10.0%, respectively, and adult's IALs is estimated 8.0% for 20s, 4.0% for 40s.

Furthermore, the IALs survey conducted according to the home environment for reflecting in the welfare policy shows the IALs is also different depending on income. Regardless of age groups, the IALs survey for each household's income shows the IALs of households below the middle class is the highest of 11.9%, and the case of above the middle class is only 6.6%.

On the other hand, the IALs of the poor reaches 11.1%, in particular, a high-risk group[1] for Internet addiction in this class is as many as 3.7%. Moreover, the high-risk group of one-parent families (7.3%) is more than 2 times than both-parent families (3.0%), and the IALs of multicultural families (37.6%) is high more than 3 times than the average families (12.3%). This result shows the social low-income and neglected groups are likely to be exposed to the risk of Internet addiction more than the above middle class.

Especially, a serious problem is that the entire IALs of youth groups is decreased, however, the number of high-risk youths with a high immersion level of Internet is 3.1%, which shows 3.1% of increase comparing to 2009. In addition, the mobile phone's IALs conducted first in this survey is 11.1%. Therefore, the need of diversified studies is presented according to a qualitative problem of Internet addiction and an introduction of new platforms.

A positive aspect obtained from this result is that the IALs of the entire people has been gradually decreasing from 2004 when the survey was begun. The IALs of the entire people is indicated as the decrease from 8.5% in 2009 to 8.0% in 2010. The IALs of youths is also lowered from 14.4% in 2007 to 12.8% in 2009 (National Information Society Agency, 2009), 12.4% in 2010. The report says that this is a result from systematic and scientific actions of Korean government and schoolteachers. Therefore, considering the importance that students of their adolescence are in self-formation ages related to a collective-efficacy and self-efficacy for their studies and society, it could be said that a systematic study is very important for PIU dependencies of school teachers including would-be teachers.

However, it is indicated that the high-risk group concentrated in the low-income class is increased from 2.6% in 2009 to 3.1% in 2010. The IALs of elementary school students rises by 2.9% over last year, so it is analyzed that the addiction age group is tend to be lowered. Accordingly, this report suggests an active interest of parents and a necessity of systematic education from kindergarten stage.

Improvements presented in this report by Korean government are active curative measures such as connected implementation of counseling-treatment for high-risk people, training experts for counseling-treatment, expansion of professional counseling organizations for Internet addiction, opening of 'Internet shelter school' using vacation-weekend, provision of mobile counseling services for a neglected class etc., and a necessity of systematic researches and development of a scale according to new technologies such as mobile phones.

Suggestions of active solutions to the problem by Korean government originate from studies' results provided by numerous scholars in the meantime. Studies of scholars performed from 2004 to 2010 in Korea are divided into studies on addiction related to platforms such as Internet, mobile phones, digital games, portable game players etc. and mixed studies associated with various fields of study such as counseling, legislation etc. Especially, it have been provided the results of studies related to platforms such as mobile phones, portable game players, PMP, MP3 etc. as well as Internet addiction and systematic studies such as rehabilitation treatment program etc. from 2005.

As a result of analyzing top 10 papers with a high quotation index selected from Internet addiction related studies published from 2007 to March, 2011 in Korea through an academic database, most studies for age groups of middle, high school students are represented more than 90%. Recently, the direction of studies also tends to expand into a field of professionals.

Studies could be divided into comparison of Internet symptoms (Lee & Lee, 2004a), pattern analysis of excessive Internet users (Lee & Lee, 2004b), recognitive characteristics according to recognition levels (Chung & Kim,2008), analysis of addiction tendencies related to stress and depression (Park & Park, 2009), development of diagnostic criteria. Generally, it is used the similar measurement scales as cases of general international studies as well as Turkey. However, what's remarkable is that the government and scholars have jointly developed to use independent diagnostic sheets suitable to the Korean sentiment from 2002 (National Information Society Agency, 2002). Arguably, Even though a platform is the same, there is a slight difference in

[1] The meaning of the high-risk group noted in this study is a case that the Internet addiction level is at a serious condition requiring counseling treatment based on the scale presented by the medical profession in Korea.

the use form etc. depending on the racial sentiment (Teo et al., 2008). Accordingly, a supplemented sheet was also developed to release in 2010 (National Information Society Agency, 2010).

RATIONALE OF THE STUDY

Internet is commonly used by young population for a variety of purposes. Particularly at universities easy access to internet, the need to study courses or contact with course instructor, desire to contact freely with the opposite sex etc. make the internet use a favorite activity amongst university students.

As relevant literature also puts forward, comprehensive research on the problematic internet usage among university students, points to the gravity of situation. Furthermore university students are more inclined towards developing excessive internet usage-related problems on accounts of various factors containing developmental problems (Ceyhan, Ceyhan and Gürcan, 2007). The tendency of college students to establish close relations with the opposite sex makes the internet usage attractive in their eyes. Besides psychological and environmental factors in university students' lives may drive them to experience internet addiction. It is inevitable that college students with low social skills end up being socially isolated. Internet is a favorite social communication tool for those students feeling lonely; however it is even harder for such students to provide control on the internet. According to Erikson (1998) the principal developmental task of college students is to establish close relations with peers in the same or opposite sex. It is only natural that college youngsters failing to develop social skills in natural social environment end up with familial and business problems in particular as they grow up. The social and academic failures individuals experience due to problematic internet usage that comes to surface during university life may constitute the base for the future loneliness and social isolation and losses in business and family relations. Certain professions, particularly teaching, require social communication skills. A teacher is a role model for students at all times. A teacher who goes through professional and social problems due to uncontrolled internet usage cannot be expected to provide a healthy data transfer to students or be a good role model. Hence further analyses are required to discuss problematic internet usage of prospective teachers studying at faculties of teaching. In that way the problems shall be detected and comprehensive studies to take relevant measurements be conducted.

Due to the restrictions on the researches about problematic internet usage and measurement tools present study employed Turkish and Korean adaptation of the Generalized Problematic Internet Use Scale 2 (GPIUS2) developed by Caplan (2010) and enabled the use of this scale for both countries. Furthermore this study bears additional significance since it analyzes the topic from a cross-cultural perspective by determining internet usage characteristics of the two different countries. As indicated by Caplan (2005) Problematic Internet Usage is a multi-dimensional syndrome. Knowing no bounds in internet usage and consequent problems may vary with respect to age groups, different professional groups, psychological state of individuals, internet usage characteristics etc. Hence it is possible to come across a variety of problematic internet usages with respect to different demographic structures in different countries and also there may be a relation between different characteristics of internet usage and problematic internet usage. Problematic Internet Usage is a prevalent problem all throughout the world. From this point of view it is a must to conduct comprehensive studies covering different cultures and detect whether the responsible causes vary with respect to cross-cultural characteristics. Such researches shall be beneficial in clarifying the factors related to problematic internet usage and also enable to detect characteristics of internet users from different countries and their cross-cultural diversities.

In the present study, Turkey and South Korea have been focused in terms of the problematic internet use and its relation to loneliness. Turkey and South Korea are two different countries in many ways, such as economic, cultural, demographic, and geographic and so on. For example in Turkey there are approximately 32,187,000 internet users which consist of 44% of the population while the number and the percentage are remarkably higher in South Korea, respectively 41,363,000 and 84%. This remarkable gap shows itself in the world ranking of these two countries in percentage of internet users in respect to population (Euromonitor International, 2011a, 2011b). South Korea is in the ninth place whereas the Turkey is the fortieth (Internet World Stats, 2011). Network Readiness Index shows that South Korea is one of the best countries (tenth rank) to use ICT effectively as a tool for the structural transformation of South Korean economy and society (World Economic Forum, 2011). Turkey is in the seventy first rank in this index among one hundred and thirty eight countries. In short, although Turkey is supposed to be an emerging market with power of its young and dynamic population it seems to have a digital gap between two countries. Based on these facts a comparative study between Turkey and South Korea about the problematic internet use would help to understand the structure of the topic deeply.

PURPOSE OF THE STUDY

The present study mainly attempts to compare the problematic internet use and its relation to loneliness among two nations' prospective teachers, Turkey and South Korea. Three major research questions were examined to realize the main goal:

1. What are the main characteristics of prospective teachers of both nations in relation to having computer facilities and purpose of using Internet?
2. Are there differences in problematic internet use by prospective teacher characteristics (such as sex, age etc.) within and between the nations?
3. Is there any relationship between problematic internet use and loneliness levels of prospective teachers of the both nations?
4.

METHOD

Participants

Participants were 595 prospective teachers from three universities, two from Turkey and one from South Korea. Marmara University Atatürk Faculty of Education is one of the well known teacher training faculties in Turkey, which is located in Istanbul. The faculty has twenty departments and its prospective teacher (student) population is over seven thousand. Maltepe University is a foundation (private) university located in Istanbul too. The third university from South Korea is Chung Ang University. The ages of the participants ranged from 17 to 37 (M: 21.07; SD: 2.16); and % 68.2 were females in total.

Table 1: Distributions of participants by universities and departments

Departments	Name of Universities			TOTAL
	Maltepe University	Marmara University	Chung Ang University	
English Language Teaching	35 (18.0)	74 (38.1)	85 (43.8)	194 (100)
Early Childhood Education	14 (50.0)	-	14 (50.0)	28 (100)
Educational Sciences	62 (42.5)	48 (32.9)	36 (24.7)	146 (100)
Home Education	-	-	28 (100)	28 (100)
Special Education	19 (100)	-	-	19 (100)
Physical Education	-	-	44 (100)	44 (100)
Primary Mathematics Education	22 (31.9)	47 (68.1)	-	69 (100)
Music Education	-	24 (100)	-	24 (100)
Turkish Language Teaching	-	43 (100)		43 (100)
TOTAL	152 (25.5)	236 (39.7)	207 (34.8)	595 (100)

Data Collection Instruments

Demographic form. A demographic form of 16 questions was used to get data about the some individual characteristics of the sample (sex, age etc.) and some preferences and states in relations to computers (having a computer, time spend using internet etc.)

Generalized Problematic Internet Use Scale 2 (GPIUS2). GPIUS2 developed by Caplan (2010) was used to collect data about the problematic aspects of Internet use of prospective teachers. GPIUS2 has five sub scales, preference for online social interaction (POSI), mood regulation, cognitive preoccupation, compulsive internet use, negative outcomes. GPIUS2 has 15 items and all the items are on a scale ranging from 1 (definitely disagree) to 8 (definitely agree). The higher points show more problematic use. As Caplan indicates (2010, p.1093) GPIUS2 scale can be used in two different ways, as a set of separate sub-scales or as an overall composite index of GPIUS. In the present study the use of composite index of the scale was preferred. The scale's internal consistency reliability was found $\alpha= .91$ by Caplan. In the present study internal consistency reliability was found $\alpha= .89$ ($\alpha= .89$ for Turkish and $\alpha= .90$ for South Korean participants) which is as high as the original value.

GPIUS2 was translated English to Turkish and Korean in both countries by the experts of language and the field who has studies in computer/internet attitudes. After the translation, the scales were applied to the bilingual (Turkish/English and Korean/English) prospective teachers for test re-tests in three weeks intervals. High correlations and no differences were found ($r: .75$, $p<.001$; [paired group] $t: .34$, $df: 25$, $p>0.05$ for the Turkish sample and $r: .98$, $p<.001$; [paired group] $t: .15$, $df: 26$, $p>0.05$ for the Korean sample) between both applications of the Turkish and Korean prospective teachers. The results showed that the language equivalence and internal consistency reliability of the scale was approved for Turkish and Korean versions of GPIUS2.

UCLA Loneliness Scale. The scale developed by Russell, Peplau, & Cutrona (1980) has 20 items on 4 point scale ranging 1 (never) to 4 (often). The reliability and validity of the scale was done by (Demir, 1989) for the Turkish sample. In the present study the internal consistency of the scale was found α= .86 (α= .84 for Turkish and South Korean participants separately).

FINDINGS

The first main research question is to investigate the main characteristics of prospective teachers of both nations in relation to having computer facilities and purpose of Internet use.

Table 2: Having own computer by nation

	Turkey	South Korea	TOTAL
	f (%)	f (%)	f (%)
Yes, I have	323 (83.2)	183 (88.4)	506 (85.0)
No, I don't have	65 (16.8)	24 (11.6)	89 (15.0)
TOTAL	388 (100)	207 (100)	595 (100)

Table 2 shows that higher percentages of the prospective teacher have computers of their own in both nations.

Table 3: Time spend for chatting in a day by nation

	Turkey	South Korea	TOTAL
	f (%)	f (%)	f (%)
Never	36 (9.3)	95 (45.9)	131 (22.0)
Less than 1 hour	217 (55.9)	70 (33.8)	287 (48.2)
1-3 hours	114 (29.4)	33 (15.9)	147 (24.7)
4-5 hours	15 (3.9)	7 (3.4)	22 (3.7)
6-8 hours	6 (1.5)	1 (0.5)	7 (1.2)
More than 8 hours	-	1 (0.5)	1 (0.2)
TOTAL	388 (100)	207 (100)	595 (100)

Table 3 shows that 45.9% of South Korean prospective teachers reported that they never used Internet for chatting with someone else while the proportion is 9.3% for Turkish prospective teachers. It is clearly seen that the proportion of Turkish prospective teachers using internet for chatting are remarkably higher than South Korean prospective teachers.

Table 4: Time spend for meeting with new people in a day by nation

	Turkey	South Korea	TOTAL
	f (%)	f (%)	f (%)
Never	241 (62.1)	158 (76.3)	399 (67.1)
Less than 1 hour	119 (30.7)	40 (19.3)	159 (26.7)
1-3 hours	23 (5.9)	6 (2.9)	29 (4.9)
4-5 hours	4 (1.0)	2 (1.0)	6 (1.0)
6-8 hours	-	1 (0.5)	1 (0.2)
More than 8 hours	1 (0.3)	-	1 (0.2)
TOTAL	388 (100)	207 (100)	595 (100)

Table 4 shows that, parallel to the results of Table 3, higher percentage of prospective teachers (Turkey 62.1% and South Korea 76.3%) from both nations reported that they have never used internet for the purpose of meeting new people. But the distribution among both nations shows that Turkish prospective teachers tend to use internet more hours to meet with new people than South Korean prospective teachers.

Table 5: Time spend for searching for homework in a day by nation

	Turkey	South Korea	TOTAL
	f (%)	f (%)	f (%)
Never	22 (5.7)	2 (1.0)	24 (4.0)
Less than 1 hour	180 (46.4)	31 (15.0)	211 (35.5)
1-3 hours	171 (44.1)	115 (55.6)	286 (48.1)
4-5 hours	14 (3.6)	40 (19.3)	54 (9.1)
6-8 hours	1 (0.3)	9 (4.3)	10 (1.7)

More than 8 hours	-	10 (4.8)	10 (1.7)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 5, majority of Turkish prospective teachers spend less than one hour for searching for their homework while majority of South Korean prospective teachers spend 1-3 hours period. Based on the distribution of the data it is clearly said that South Korean prospective teachers seem to spend more time for searching for their homework than Turkish prospective teachers.

Table 6: Time spend for surfing the Internet for new information in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	18 (4.6)	2 (1.0)	20 (3.4)
Less than 1 hour	193 (49.7)	89 (43.0)	282 (47.4)
1-3 hours	154 (39.7)	87 (42.0)	241 (40.5)
4-5 hours	19 (4.9)	16 (7.7)	35 (5.9)
6-8 hours	4 (1.0)	7 (3.4)	11 (1.8)
More than 8 hours	-	6 (2.9)	6 (1.0)
TOTAL	388 (100)	207 (100)	595 (100)

Table 6 shows that very few number of prospective teachers do not use internet for searching new information. The majority of the prospective teachers of both nations spend up to three hours of time for seeking for new information.

Table 7: Time spend for surfing the Internet for reading news in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	58 (14.9)	13 (6.3)	71 (11.9)
Less than 1 hour	232 (59.8)	102 (49.3)	334 (56.1)
1-3 hours	85 (21.9)	72 (34.8)	157 (26.4)
4-5 hours	12 (3.1)	11 (5.3)	23 (3.9)
6-8 hours	1 (0.3)	6 (2.9)	7 (1.2)
More than 8 hours	-	3 (1.4)	3 (0.5)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 7, majority of students in each nation spend less than one hour to read news.

Table 8: Time spend for playing gamble in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	340 (87.6)	199 (96.1)	539 (90.6)
Less than 1 hour	29 (7.5)	5 (2.4)	34 (5.7)
1-3 hours	15 (3.9)	2 (1.0)	17 (2.9)
4-5 hours	3 (0.8)	-	3 (0.5)
6-8 hours	1 (0.3)	-	1 (0.2)
More than 8 hours	-	1 (0.5)	1 (0.2)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 8, playing gamble is not the focus of interest for the majority of prospective teachers of both nations. On the other hand Turkish prospective teachers seem to spend slightly more time playing gamble compare to South Korean prospective teachers.

Table 9: Time spend for searching porno sites in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	344 (88.7)	190 (91.8)	534 (89.7)
Less than 1 hour	36 (9.3)	13 (6.3)	49 (8.2)
1-3 hours	3 (0.8)	4 (1.9)	7 (1.2)
4-5 hours	-	-	-

6-8 hours	1 (0.3)	-	1 (0.2)
More than 8 hours	4 (1.0)	-	4 (0.7)
TOTAL	388 (100)	207 (100)	595 (100)

Table 9 shows that, as in Table 8 for gambling, searching porno sites reported no focus of interest majority of prospective teachers. The rest of the distributions seem to be in balance for both nations.

Table 10: Time spend for playing interaction games in a day by nation

CHATTING	**Turkey**	**South Korea**	**TOTAL**
Never	274 (70.6)	149 (72.0)	423 (71.1)
Less than 1 hour	83 (21.4)	35 (16.9)	118 (19.8)
1-3 hours	24 (6.2)	18 (8.7)	42 (7.1)
4-5 hours	5 (1.3)	2 (1.0)	7 (1.2)
6-8 hours	-	2 (1.0)	2 (0.3)
More than 8 hours	2 (0.5)	1 (0.5)	3 (0.5)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 10, approximately 30% of prospective teachers in each nation spend an amount of time to play interaction games. The majority of the student teachers among the players reported that they spend less than one hour for playing interaction games.

Table 11: Time spend for downloading music in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	101 (26.0)	67 (32.4)	168 (28.2)
Less than 1 hour	183 (47.2)	107 (51.7)	290 (48.7)
1-3 hours	89 (22.9)	24 (11.6)	113 (19.0)
4-5 hours	11 (2.8)	4 (1.9)	15 (2.5)
6-8 hours	2 (0.5)	-	2 (0.3)
More than 8 hours	2 (0.5)	5 (2.4)	7 (1.2)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 11, half of the prospective teachers of each nation spend less than one hour on internet for downloading music. Turkish prospective teachers reported that they slightly more time for downloading music than South Korean counterparts.

Table 12: Time spend for downloading photos in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	121 (31.2)	61 (29.5)	182 (30.6)
Less than 1 hour	207 (53.4)	114 (55.1)	321 (53.9)
1-3 hours	54 (13.9)	20 (9.7)	74 (12.4)
4-5 hours	3 (0.8)	7 (3.4)	10 (1.7)
6-8 hours	2 (0.5)	1 (0.5)	3 (0.5)
More than 8 hours	1 (0.3)	4 (1.9)	5 (0.8)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 12, majority of prospective teachers of both nations reported that they spend less than one hour for downloading photos. The rest of the distribution seems to be balanced for Turkish and South Korean prospective teachers.

Table 13: Time spend for using e-mail in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	24 (6.2)	16 (7.7)	40 (6.7)
Less than 1 hour	259 (66.8)	148 (71.5)	407 (68.4)
1-3 hours	86 (22.2)	23 (11.1)	109 (18.3)
4-5 hours	14 (3.6)	13 (6.3)	27 (4.5)
6-8 hours	3 (0.8)	4 (1.9)	7 (1.2)

More than 8 hours	2 (0.5)	3 (1.4)	5 (0.8)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 13, very low percentages of prospective teachers in each nation seem not to spend time using e-mail correspondence. Majority of prospective teachers reported that they spend e-mail less than one hour a day.

Table 14: Time spend for downloading films in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	174 (44.8)	42 (20.3)	216 (36.3)
Less than 1 hour	118 (30.4)	91 (44.0)	209 (35.1)
1-3 hours	66 (17.0)	61 (29.5)	127 (21.3)
4-5 hours	22 (5.7)	9 (4.3)	31 (5.2)
6-8 hours	3 (0.8)	3 (1.4)	6 (1.0)
More than 8 hours	5 (1.3)	1 (0.5)	6 (1.0)
TOTAL	388 (100)	207 (100)	595 (100)

Table 14 shows that 44.8% of Turkish prospective teachers reported that they have never spent time for downloading films compare to 20.3% of South Korean prospective teachers. South Korean prospective teachers seem to spend more time in internet to download films than Turkish prospective teachers.

Table 15: Time spend for producing/developing web sites/blogs in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	334 (86.1)	90 (43.5)	424 (71.3)
Less than 1 hour	38 (9.8)	87 (42.0)	125 (21.0)
1-3 hours	10 (2.6)	22 (10.6)	32 (5.4)
4-5 hours	6 (1.5)	5 (2.4)	11 (1.8)
6-8 hours	-	-	-
More than 8 hours	-	3 (1.4)	3 (0.5)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 15, majority of Turkish prospective teachers (86.1%) are not interested in spending time for producing/developing web sites or blogs. On the other hand more than half of the South Korean participants reported that they spend some amount of time, mostly less than one hour, for web site or blog production/development.

Table 16: Time spend for shopping on line in a day by nation

	Turkey	**South Korea**	**TOTAL**
	f (%)	f (%)	f (%)
Never	286 (73.7)	32 (15.5)	318 (53.4)
Less than 1 hour	82 (21.1)	119 (57.5)	201 (33.8)
1-3 hours	16 (4.1)	41 (19.8)	57 (9.6)
4-5 hours	4 (1.0)	9 (4.3)	13 (2.2)
6-8 hours	-	2 (1.0)	2 (0.3)
More than 8 hours	-	4 (1.9)	4 (0.7)
TOTAL	388 (100)	207 (100)	595 (100)

As seen in Table 16, 73.7% of Turkish prospective teachers reported that they don't spend anytime for shopping online while only 15.5% of South Korean prospective teachers reported in the same way. The data clearly shows that South Korean prospective teachers spend more time than Turkish prospective teachers.

Second main research question is to find out the differences of problematic internet use of prospective teachers by their demographic characteristics. First of all, the data obtained from two main scales of the research, GPIUS2 and UCLA, were analyzed.

Table 17: Problematic Internet Use By Nations

	n	**Mean**	**sd**	**df**	**t**	**p**

Turkey	388	39.56	19.36	593	0.33	n.s.
South Korea	207	40.08	16.09			

As seen in Table 17, no differences were found between the problematic Internet use of Turkish and Korean prospective teachers. The means also shows that problematic internet use of the participants is below average which means the Internet is not a problematic medium for both nations' prospective teachers.

Table 18: Loneliness by Nations

	n	Mean	sd	df	t	p
Turkey	388	31.76	9.33	593	11.80	0.000
South Korea	207	40.66	7.55			

Although loneliness, alone, is not the major investigation of this study, results of the Table 19 shows us that there is a significant difference between Turkish and Korean prospective teachers. South Korean prospective teachers were found to be in higher levels of loneliness than Turkish counterparts.

Table 19: Correlation between problematic internet use and age

Problematic Internet Use vs. age	n	r	p
Turkey	388	- 0.12	0.02
South Korea	207	- 0.09	n.s.

As seen in Table 19 the results indicate a negative and low correlation between problematic Internet use and age only in Turkish prospective teachers. The result means that as the age grows up the level of problematic Internet use drops down. It can be explained by being mature as the years pass in relation to proper use of Internet. But on the other side no relationship found for the South Korean prospective teachers. This can be, probably, explained by the age difference of both groups. South Korean participants' age has been found statistically higher (Mean age/Turkish: 20.51, Mean age/S. Korean: 22.13, t: 9.28, p<0.001) than Turkish prospective teachers. The way of this difference would be an explanation of the contradictory result.

Table 20: Problematic Internet Use By Sex

	Sex	n	Mean	sd	df	t	p
Turkey	Male	120	43.70	20.31	386	2.84	0.005
	Female	268	37.72	18.67			
South Korea	Male	69	41.75	17.53	205	1.05	n.s.
	Female	138	39.25	15.33			

Table 20 shows that there is a significant difference between male and females in relation to problematic internet use only among Turkish prospective teachers. Male Turkish prospective teachers found to have more problematic use of internet than female counterparts.

Table 21: Problematic Internet Use by Computer Sufficiency

	Sufficiency	n	Mean	sd	F	p
Turkey	Never	8	40.38	24.89	2.09	n.s
	Few	159	36.70	17.72		
	Quite	196	41.35	19.79		
	Completely	25	43.56	22.84		
	TOTAL	388	39.57	19.37		
South Korea	Never	4	36.50	4.65	0.21	n.s
	Few	58	39.40	16.10		
	Quite	121	40.17	15.99		
	Completely	25	41.96	18.30		
	TOTAL	207	40.09	16.10		

Table 21 shows that there is no difference between problematic internet use in relation to computer sufficiency levels of prospective teachers in both nations.

Table 22: Problematic Internet Use by Internet Using Place

	Place	n	Mean	sd	F	p	Difference
Turkey	Home	280	41.03	19.89	3.23	0.02	Home> Internet café Home> Library
	Internet cafe	23	31.74	14.53			
	Library	20	30.85	14.24			
	Other	65	38.72	18.86			
	TOTAL	388	39.57	19.37			
South Korea	Home	157	38.65	15.96	1.96	n.s	
	Internet cafe	3	37.67	19.66			
	Library	27	45.37	17.64			
	Other	20	44.60	12.98			
	TOTAL	207	40.09	16.10			

As seen in Table 22, ANOVA results put differences between problematic internet uses in relation to mostly preferred internet using place among Turkish prospective teachers. The post-hoc LSD analysis revealed that home users seem to have higher problematic levels compared to internet café and library users in Turkey. No differences have been found in South Korean participants.

Table 23: Problematic Internet Use by Time Spend on Internet in a Day

	Time	n	Mean	sd	F	p	Difference
Turkey	Less than 1 hour	141	30.46	13.21	26.56	0.000	Less than 1 hour<1-4 hours Less than 1 hour<5-8 hours Less than 1 hour<+8 hours 1-4 hours<5-8 hours 1-4 hours<+8 hours
	1-4 hours	213	42.70	18.58			
	5-8 hours	26	57.96	24.95			
	+ 8 hours	8	56.75	31.73			
	TOTAL	388	39.56	19.37			
South Korea	Less than 1 hour	23	26.78	11.73	7.16	0.000	Less than 1 hour<1-4 hours Less than 1 hour<5-8 hours Less than 1 hour<+8 hours
	1-4 hours	134	40.82	15.35			
	5-8 hours	36	43.36	15.35			
	+ 8 hours	14	46.50	20.86			
	TOTAL	207	40.09	16.10			

As seen in Table 23 significant differences found between problematic internet uses of prospective teachers in relation to time they spend on Internet in a day. The results show that heavy users have more problematic in Internet use in both Turkish and South Korean prospective teachers. If the analyses have been investigated in details, South Korean prospective teachers who spend less than one hour on Internet in a day have less problematic in internet use than the other heavy users. On the other hand, in Turkish prospective teachers the differences were found between not only among less than one hour and the other heavy users but also 1-4 hours users and the others.

Table 24: Problematic Internet Use By Number of Years Using Internet

	Time	n	Mean	sd	F	p
Turkey	Less than 1 year	9	28.67	10.94	0.92	n.s.
	1-3 years	53	39.26	20.43		
	4-5 years	124	38.98	17.83		
	6-8 years	132	40.98	20.49		
	+8 years	70	39.59	19.78		
	TOTAL	388	39.56	19.37		
South Korea	Less than 1 year	2	25.00	2.83	0.89	n.s.
	1-3 years	6	33.33	14.51		
	4-5 years	17	42.94	20.39		
	6-8 years	39	41.28	13.51		
	+8 years	143	39.92	16.32		
	TOTAL	207	40.09	16.10		

As seen in Table 24 no significant differences found between problematic internet use in relation to the number of years using Internet of prospective teachers in both nations.

Third main research question is to investigate the relationship between problematic internet use and loneliness levels of prospective teachers.

Table 25: Correlation between problematic internet use and loneliness levels of prospective teachers by nations

Problematic Internet Use vs. loneliness	n	r	p
Turkey	388	0.11	0.02
South Korea	207	0.29	0.00

Table 25 shows that there are positive but low correlations ($p<0.05$) between problematic Internet use and loneliness levels of prospective teachers of both nations.

RESULTS AND DISCUSSION

First, prospective teachers were examined by computer ownership and the purpose of Internet use. The findings show that South Korean prospective teachers have slightly higher percentages (88.4% - 83.2%) of having their own computers. Although this slight difference in favor of South Korean prospective teachers it can easily seen that majority of prospective teachers have computer in both nations.

The purpose of Internet use of Turkish and South Korean prospective teachers shows some differences in many cases. The most remarkable cases are the ones which are related with social interactions. Turkish prospective teachers reported that they spend more time for chatting and meeting with new people than South Korean counterparts. The result shows that 45.9% of South Korean prospective teachers reported that they never used Internet for chatting with someone else while the proportion is 9.3% for Turkish prospective teachers. It is clearly seen that the proportion of Turkish prospective teachers using internet for chatting are remarkably higher than South Korean prospective teachers. Another difference can be caught in online shopping. Higher percentages of Turkish prospective teachers (73.7%) reported that they have never used internet as an online shopping medium while 84.5% of Korean prospective teachers use some amount of time. Playing gambling and searching porno sites have been reported very low in percentages for both nations' prospective teachers.

The second main research question is to investigate the possible differences on problematic internet use of Turkish and South Korean prospective teachers. No significant differences were found between the problematic internet use of Turkish and South Korean prospective teachers. The level of problematic internet use was also found below average. Studies conducted in order to examine problematic usage of the internet do not diagnose addiction, but only focus on whether an internet usage level, which can cause problems, exist or not. Therefore, the fact that the level of problematic internet use was found below average indicates that there is no tendency, in any of the countries, towards a level of internet use that can cause problem. Also in another study where the problematic internet usage levels of the prospective teachers in Turkey were examined, this tendency has been found out to be below average (Tutgun and Deniz, 2010). According to 'Actual condition survey on Internet addiction of Korean in 2010', the internet addiction levels (IALs) of the entire people has been gradually decreasing from 2004 when the survey was begun. The IALs of the entire people is indicated as the decrease from 8.5% in 2009 to 8.0% in 2010. The IALs of youths is also lowered from 14.4% in 2007 to 12.8% in 2009, 12.4% in 2010. The report says that this is a result from systematic and scientific actions of Korean government and schoolteachers (Ministry of Public Administration and Security,2010).

Problematic internet use was positively and significantly ($p<0.05$) related to loneliness. But the levels of the correlations were low. Although it is not the main concern of the present research the loneliness levels of both nations' prospective teachers have been found statistically different. South Korean prospective teachers' loneliness levels were found higher than the Turkish counterparts. It is hard to guess the reasons of this difference but the low percentages of using internet for chatting and meeting new people by South Korean prospective teachers compare to Turkish counterpart should be taken into consideration to make an evaluation of this case.

Male Turkish prospective teachers have significantly higher scores than females while there is no difference in South Korean side by sex. This finding supports other studies made on the differentiation by gender of the problematic internet use in Turkey (Odaci and Kalkan, 2010; Tutgun, 2009; Tutgun and Deniz, 2010). In their studies Tutgun and Deniz (2010) have suggested that male and female students to be provided with the same internet usage facilities in various environments where internet is used. On the other hand, it can be considered that in internet usage environments in Korea, internet usage facilities are positively provided for the both genders. There are studies that emphasize on the problematic internet uses of the males also in other countries than Turkey (Anderson, 2001; Kubey, Lavin and Barrows, 2001; Morahan-Martin and Schumacher, 2000). In Morahan-Martin and Schumacher (2000)'s research as well, similar findings have been obtained. Here too the individuals diagnosed with pathologic internet use are mostly composed of men and these people use internet to make new friends, receive emotional support, play interactive games and find social comfort. This deduction is also a one-to-one reference to the finding of present research for Turkish side. Turkish prospective teachers reported that they spend more time for chatting and meeting with new people than South Korean counterparts. The fact that male prospective teachers in Turkey tend more to use internet at problematic levels in comparison with females may result due to the excessive times they spent in internet with the purposes of chatting and meeting with new people.

There is a significant difference ($p<0.000$) between hours spend online in a day and problematic internet use in both nations. Due to the excessive time spent by prospective teachers in both nations on the net, we can reasonably assume that the daily time spent on the net is one of the greatest risk factors in this group and this deduction is parallel to other researches that analyzed the relation between internet use lengths and negative results associated with excessive internet use (Anderson, 2001; Caplan, 2005; Davis, 2001; Griffiths , 2000; Rotunda, Kass et al., 2003; Young, 1999).

According to the statistics from the Korea Communications Commission (2011), the ratio using Internet within recent a month was the average 1.9 hours a day in 2007's statistics and 2.3 hours in 2010, which is analyzed as an increase of 0.4 hour. Especially, as of 2010, average Internet use period of Internet users over age 3 of the Korean is 85.2 months, and the case using Internet for more than 7 years is also founded as 55.1%. Examining the changes of average usage for each year, the case using 'more than once a day' was 77.2%, 'more than once a week' was 21.0% in 2007. Average weekly Internet usage was 13.7 hours, and the case using for more than average 14 hours a week (average 2 hours a day) was also founded as 50.2%. In the 2010's survey, the case using Internet 'more than once a day' is 78.4%, 'more than once a week' is 21.8%, and the average weekly Internet usage is founded as 13.9 hours, which shows it gradually increases.

As stated by Caplan (2005) individuals who lack skills to show themselves prefer online communication instead of face-to-face interaction and consequently online social interaction drives these individuals to spend longer periods of time on internet. On the other hand the social environment established on internet may drive people to use internet continuously and this situation can go so far as to cause some psychological disorders. In Griffiths' (2000) research, it has been underlined that excessive internet users do so in order to overcome or inactivate their insufficiencies (social defencelessness in real life, low self-esteem, physical incompetence). Accordingly these particular individuals go through serious problems due to excessive usage of internet.
On the other hand, in this study it has been found out that, unlike South Korean prospective teachers, the prospective teachers in Turkey tend to use the internet for the purpose of establishing social interaction and meeting and chatting with new people. This may cause the Turkish prospective teachers to spend more time on a daily basis in the internet and consequently use internet in a problematic way. As for the prospective teachers of South Korea, in comparison with their Turkish counterparts, spend more time for researching and shopping on the internet and spend lesser time for chatting and meeting with new people.

Yet, the finding indicating that the level of loneliness of the Korean prospective teachers differentiate in comparison with the Turkish prospective teachers suggest that they may be spending more time on the internet with the purpose of social interaction, in other words developing websites and blogs. Internet usage for producing and developing websites and blogs has been found out to be higher in South Korea in comparison with the Turkish prospective teachers. According to this result, majority of Turkish prospective teachers (86.1%) are not interested in spending time for producing/developing web sites or blogs. On the other hand more than half of the South Korean participants reported that they spend some amount of time, mostly less than one hour, for web site or blog production/development. This finding suggests that South Korean prospective teachers may have social interactions through blogging. This point should be assessed with an in-depth research to be conducted in South Korea, through personal interviews.
Other findings show that no differences were found between number of years using internet; computer sufficiency and problematic internet use.

As the last word, when all the findings evaluated altogether, it would be clearly said that the problematic internet use of Turkish and South Korean prospective teachers seem alike in terms of level and related factors although two countries have been reported (World Economic Forum, 2011) in different technological (network) readiness levels.

CONCLUSIONS AND RECOMMENDATIONS

As indicated by present research, problematic internet usage tendency of prospective teachers is clearly a warning for the potential negativities they can go through in future. As a conclusion it is urgent that in Education Faculties where prospective teachers are trained, immediate precautions be taken. Driven by this deduction, in this research several suggestions are stated.

It is inevitable for the university students, who cannot develop their social skills in their natural social environment, to face serious problems in their future family and business environments. Particularly in the occupational groups where the effective utilization of social interaction skills is required, such as teaching, social interaction has a vital importance. This is because of the fact that, a teacher who experiences problems with its social and occupational environment due to its excessive internet use, will not be able to transfer knowledge to its students in a healthy way and will not present a good model. In present research, it is clear that the tendency of prospective teachers to problematic internet usage because of their loneliness is an indicator of possible problems they may experience in the future. Therefore, studies can be conducted to measure the level of problematic internet usage by prospective teachers periodically.

Besides, studies on how to control problematic internet usage by prospective teachers can also be conducted. In order to prevent excessive internet usage by university students due to the lack of the ability to adapt to new social environments and establishing new friendships, the academic staff can support especially freshmen with group projects and cooperative study techniques which provide them new opportunities to socialize.

It is natural to have some limitations of conducting and interpreting this research as it is the first comparative study in its field between Turkey and South Korea. Further researches should be done to understand the state and effects of information communication technologies on different samples and by using different research methodologies, such as qualitative ones.

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A CROSS-CULTURAL STUDY OF ICT COMPETENCY, ATTITUDE AND SATISFACTION OF TURKISH, POLISH AND CZECH UNIVERSITY STUDENTS

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ABSTRACT
Due to various factors, countries begin to have different levels of information and communication technologies (ICT) and they have their own unique culture of ICT usage. This case appears interesting especially when we consider university students' proficiency, attitudes and satisfaction in use of ICT.

The purpose of this study is to examine the similarities and differences of university students in Turkey, EU candidate, and in Poland and Czech Republic, new members of EU, in terms of their proficiency, attitudes and satisfaction in use of ICT.

The data of this study, composed of open-and closed-ended questions, were collected from students studying at departments of social and computational sciences. Statistical analyses of data collected were performed by SPSS 17, statistical package program.

Results showed that a) despite the fact that Turkish students use computer for a shorter time than Polish and Czech students, there is no statistically significant difference between them, b) in terms of attitudes toward computer and their satisfaction, there is no difference between students studying at social departments whereas there is a statistically significant difference between students studying at departments of computational sciences.
Keywords: ICT competency, ICT attitudes, ICT satisfaction, ICT literacy

INTRODUCTION
One of the basic roles of education is to prepare students to information society. This preparation is the most important source of future economic and social development (Hakkarainen et al., 2000). Some instructors argue that learning can be developed and students can be effectively prepared to business areas by integrating technologies and learning processes (Butzin, 2000; Reiser, 2001, Hopson, Simms, & Knezek, 2002).

Nowadays, rapidly increased information has created some important cultural riches in society. Learning and the way how to learn information literacy take an important place in the realization of this richness (Durmus & Kaya, 2010). Reaching information and increasing information literacy are directly related to ICT use, in other words, ICT literacy (ICTL). Although not theoretically clear, researchers and instructors have different descriptions of ICTL and competency which are considered by governments in recent years as an important factor in economic growth and development (Ololube, 2006; Luu & Freeman, 2011). Educational Testing Service (2002) defines ICTL as the ability to use digital technology, communication tools and also the ability to use technology as a tool to research, organize, evaluate, and communicate information. For Katz et al. (2004), ICTL is the ability to use technology as a tool to research, organize, and communicate. Drenoyianni (2004) argue that ICTL is more than the ability to operate a computer system and that ICT literate has to reach, organize and evaluate information.

Despite ICT is considered nowadays as consisting of computer and internet use, ICTL and computer literacy (CL) are two different concepts. Because CL measures skills of computer use whereas ICTL deals with the way how individual reaches information using tools such as computer and internet.

In early years, CL was specifically defined as programming or reprogramming but with newly developed technologies. This definition has to be revised. Even though CL is briefly described as the ability to use computer (Korkmaz & Mahiroğlu, 2009), other definitions exist as well in literature such as "the ability to control computer and programs in order to attain some goals"; "the ability to use computer for information retrieval, communication and problem solving" (Akkoyunlu, 1996). A good computer literate is expected to turn on computer, to know logic of computer work, its components and how to effectively use computer programs in order to reach information (Walsh, 2007). CL is not considered as a unique domain but divided into sub-domains such as basic computer literacy, programming literacy. Taking into account these definitions, CL can be defined as the ability to do operations relevant to his/her purpose.

In literature, there are several studies researching ICTL and CL. One of these most important and detailed studies is PISA studies, a set of research by OECD (2005, 2006, 2007, 2009). In these studies whose data were collected from developed and developing countries, both national and transnational ICT use was examined, but these studies do not seem to have data regarding students' self-efficacy, attitudes or satisfaction in ICT and computer.

Germany, Poland, Netherlands and Czech Republic are countries having most student exchange programs with Turkey. Among these countries, Poland and Czech Republic, two developing countries like Turkey, are more relevant to conduct a comparative study concerning ICT. Below are presented ICT situations in two countries.

With the reform of the Polish national education system in the school year 1999-2000, ICT has been integrated into almost all school subjects and students began to be prepared to use computers and software in other subjects during separate ICT lessons. Thanks to this reform, ICTL and CL have increased compared to the year 2000 (Gurbiel, Hardt-Olejniczak, Kolczyk, Krupicka, & Syslo, 2005).

As in Poland, some arrangements have also been realized in Czech educational system to become an EU member, special importance has been given to ICT lessons at schools. But ICTL and CL levels did not differ from the previous level as did in Poland.

In Turkey, studies concerning the integration of computer courses in the curriculum began on 1984 but the integration of computer courses in the curriculum from primary school could not be possible until the year 2000 (Er & Güven, 2008). Many studies conducted in Turkey indicated that students had medium or low levels of ICTL and CL (Korkmaz & Mahiroğlu, 2009; Dinçer, 2011). Results also showed that students had low levels of CL due to their lack of personal computers and dissatisfaction about their courses (Dinçer, 2011).

Finally, as a research question, we wished to examine similarities and differences between students in EU candidate Turkey and new EU members Poland and Czech Republic in terms of ICT competency, attitude and satisfaction.

2. METHOD

2.1. Participants

440 students studying at universities in Turkey, Poland and Czech Republic participated in this study. Students continuing their education at departments of computational sciences in Turkey were compared with students at same departments in Czech Republic; students studying at departments of social sciences in Turkey were compared with students at same departments in Poland. Descriptive statistics related to participating students were given in Table 1.

Table 1 Descriptive statistics of students

	Turkey's Social Students	Poland's Social Students	Turkey's Science Students	Czech's Science Students
Male	32 (7.27%)	30 (6.82 %)	46 (10.45 %)	43 (9.77 %)
Female	113 (25.69 %)	115 (26.14%)	29 (6.59 %)	32 (7.27 %)
Total	145 (32.96 %)	145(32.96 %)	75 (17.04 %)	75 (17.04 %)

2.2. Data Collection and Analysis Procedures

The data of this study were collected from a survey which consists of four parts with open-and closed-ended questions. The first part elicits demographic data; the second part concerns computer and Internet use; the third part examines attitudes toward computers and the final part concerns computer competency.

The survey was administered to volunteer students in Turkey, Poland and Czech Republic during spring semester of the academic year 2010-2011. It was carried out in participants' native language and then was translated into English by translators. Independent-samples t-test and Pearson product-moment correlations were performed using SPSS 17 software, statistical package program.

The computer and Internet use variables were chosen from students survey which encompassed satisfaction (1 = satisfaction, 2 = dissatisfaction); computer ownership (1 = yes, 2 = no); students' experiences with computer and Internet (ranging from 1= "less than one year" to 4= "five years or more") and students frequency of computer and Internet use (ranging from 1 = "almost never" to 5 = "four or more hours a day"). Data concerning students' attitudes toward computers were acquired from attitudes toward computers section in the survey (ranging from 1= "strongly disagree" to 4= "strongly agree"). Computer competency data were gathered from the section "computer competency" in the survey (1= "I don't know what this means"; 2= "I know what this means but I cannot do it"; 3=" I can do this with help from someone"; 4=" I can do this very well by myself"). Other data were collected by open-ended questions.

3. RESULTS

Findings of this study showed that all students studying at departments of social sciences both in Turkey and Poland had informatics courses containing only basic computer topics while a great majority of students studying at departments of computational sciences in Turkey and Czech Republic, besides informatics courses, had other courses such as database, computer hardware, programming, operating system and graphic design.

Students were asked if they have a personal computer and if they are satisfied with computer-related course(s) taken in the university, if not, for what reasons they are dissatisfied. They were also asked how long they have been using computer and Internet, how much time they spend using computer and Internet and for what purposes they use computer and Internet. They were asked about their attitudes toward computers and their computer competency too. An independent-samples t-test was performed to determine if there were statistically significant differences between students. Results are given in Table 2 below.

Table 2 Differences in students' ICT use, competency, attitude and satisfaction

	Social Students								Science Students							
	TURKEY			POLAND			Difference		TURKEY			CZECH			Difference	
	N	M	SD	N	M	SD	t	p	N	M	SD	N	M	SD	t	p
Lesson Satisfied	129	1.29	0.46	111	1.16	0.37	2.43	0.16	74	1.35	0.48	68	1.07	0.26	4.22	0.00
Reason of Dissatisfied	32	4.93	1.52	17	2.18	1.01	6.71	0.00	22	3.27	1.03	3	4	1.73	-1.06	0.30
Computer Ownership	145	0.77	0.43	145	0.99	0.08	-6.32	0.00	75	0.99	1.12	75	0.96	1.97	1.01	0.31
Computer Experience Period (year)	145	3.03	1.05	145	3.85	0.57	-8.29	0.00	75	3.49	0.70	75	3.84	0.55	-3.37	0.00
Internet Experience Period (year)	145	2.88	0.99	145	3.86	0.57	-5.98	0.00	75	3.35	0.72	75	3.84	0.53	-4.78	0.00
Computer & Internet Use (hours/week)	145	10.75	5.79	145	14.74	5.62	-5.95	0.00	75	19.01	8.08	75	26.68	7.45	-6.04	0.00
Purpose of Computer & Internet	145	5.78	1.71	145	6.53	1.43	-4.06	0.00	75	6.45	1.73	75	6.31	1.95	0.49	0.63
Computer Attitude	145	2.23	0.62	145	2.13	0.60	1.34	0.18	75	2.60	0.57	75	2.39	0.54	2.35	0.02
Computer Competency	145	3.33	0.39	145	3.42	0.49	-1.69	0.09	75	3.67	0.29	75	3.59	4.43	1.49	0.14

As we see in the table, Turkish (M=1.29, SD=0.46) and Polish (M=1.16, SD=0.37) students studying at departments of social sciences were satisfied with computer-related courses and there was no statistically significant difference between them regarding satisfaction (t (238) = 2.43, p = 0.16). Turkish (M=1.35, SD=0.48) and Czech (M=1.07, SD=0.26) students studying at departments of computational sciences were satisfied with computer-related courses but there was statistically significant difference between them concerning satisfaction (t (140) = 4.22, p = 0.00, p < 0.05).

When students dissatisfied with computer-related courses were asked for what reasons they are not satisfied, a statistically significant difference was found in Turkish and Polish students' reasons for their dissatisfaction (t (47) = 6.71, p = 0.00, p <0.05). However, no statistically significant difference was observed in Turkish and Czech students' reasons for their dissatisfaction (t (23) = -1.06, p = 0.30). While 52.60 % of Turkish students studying at departments of social sciences and being dissatisfied with computer-related courses, told as reasons of their dissatisfaction some hardware problems they confronted in laboratories (computers not working, old hardware, etc.), 38.88 % of Polish students said that they were not satisfied with computer-related courses due to little information. Of all Turkish students studying at departments of computational sciences and being dissatisfied with computer-related courses, 34.63 % showed teachers as reason of this dissatisfaction while little information and newer use are two other factors of dissatisfaction (23.08 % for each). As to Czech students, % 40 of them thinks that little information is the main reason of their dissatisfaction.

When we look at the fact that students participating in this study have or not have personal computers, a statistically significant difference was found between Turkish and Polish students studying at departments of social sciences (t (288) = -6.32, p = 0.00, $p < 0.05$), but no significant difference was observed between students studying at departments of computational sciences (t (148) = 1.01, p = 0.31). Almost all Polish students (M=0.99, SD=0.08) have a personal computer whereas only three fourths of Turkish students (M=0.77, SD=0.43) have personal computers, which may explain the reason of this difference. Almost all Turkish (M=0.99, SD=1.12) and Czech (M=0.96, SD=1.97) students studying at departments of computational sciences have at least one personal computer.

Findings related to computer experience period showed that there were statistically significant differences both between Turkish and Polish students studying at departments of social sciences (t (288) = -8.29, p = 0.00, $p <$ 0.05) and Turkish and Czech students studying at departments of computational sciences (t (148) = -3.37, p = 0.00, $p < 0.05$). When we think about the reasons of these differences, we found that Polish students studying at departments of social sciences (M=3.85, SD=0.57) use computers for a longer time than Turkish students (M=3.03, SD=1.05); Czech students (M=3.84, SD=0.55) studying at departments of computational sciences use computers for a longer time than Turkish students (M=3.49, SD=0.70).

Findings regarding Internet experience period indicated statistically significant differences both between Turkish and Polish students studying at departments of social sciences (t (288) = -5.98, p = 0.00, $p < 0.05$) and Turkish and Czech students studying at departments of computational sciences (t (148) = -4.78, p = 0.00, $p <$ 0.05). When we reflect on the reasons of these differences, we see that Polish students studying at departments of social sciences (M=3.86, SD=0.57) use Internet for a longer time than Turkish students (M=2.88, SD=0.99); Czech students (M=3.84, SD=0.53) studying at departments of computational sciences use Internet for a longer time than Turkish students (M=3.35, SD=0.72).

Findings with respect to weekly computer and Internet use also revealed statistically significant differences both between Turkish and Polish students studying at departments of social sciences (t (288) = -5.95, p = 0.00, $p <$ 0.05) and Turkish and Czech students studying at departments of computational sciences (t (148) = -6.04, p = 0.00, $p < 0.05$). When we consider the reasons of these differences, we observe that Polish students studying at departments of social sciences (M=14.74, SD=5.62) use computer and Internet for a longer time than Turkish students (M=10.75, SD=5.79); Czech students (M=26.68, SD=7.45) studying at departments of computational sciences use computer and Internet for a longer time than Turkish students (M=19.01, SD=8.08).

Concerning for what purposes students participating in this study use computer and Internet, a statistically significant difference was noted between Turkish and Polish students studying at departments of social sciences (t (288) = -4.06, p = 0.00, $p < 0.05$) but no significant difference was observed between students studying at departments of computational sciences (t (148) = 0.49, p = 0.63). 36.60 % of Turkish students stated that they use computer and Internet for academic purposes and 27.60 % for social websites. 36.60 % of Polish students explained that they use computer and Internet for social websites and 27.60 % for surfing on diverse websites. A clear majority of Turkish and Czech students studying at departments of computational sciences (about % 58) use computer and Internet for surfing social and diverse websites.

Findings about students' attitudes toward computers showed that no statistically significant difference was found between Turkish and Polish students studying at departments of social sciences (t (288) = 1.34, p = 0.18) but a significant difference was detected between students studying at departments of computational sciences (t (148) = 2.35, p = 0.02). Results also indicated that Turkish students (M=2.60, SD=0.57) at departments of computational sciences had higher attitudes toward computer than Czech students (M=2.39, SD=0.54). Concerning Turkish (M=2.23, SD=0.62) and Polish (M=2.13, SD=0.60) students studying at departments of social sciences, we found that they have computer attitudes at medium level.

When we analyze CL of students participating in this study, we found no statistically significant differences between students studying at departments of both social (t (288) = -1.69, p = 0.09) and computational (t (148) =

1.49, p = 0.14) sciences. This may be explained by the fact that a great majority of students (% 89.01) had high level of CL.

The Pearson product-moment correlations test was performed to determine if there was a connection between CL levels and personal computer ownership. Results indicated that there was a positive but low relation between CL levels and personal computer ownership (r (438) =0.26, p < 0.01).

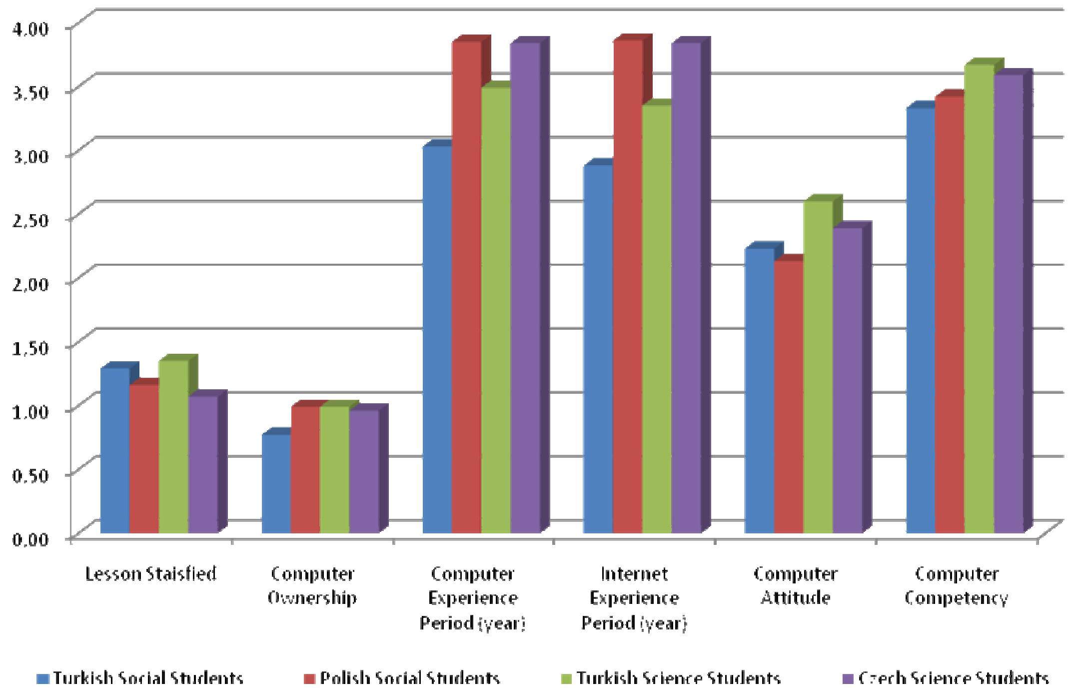

Figure 1 Status in students' ICT use, competency, attitude and satisfaction

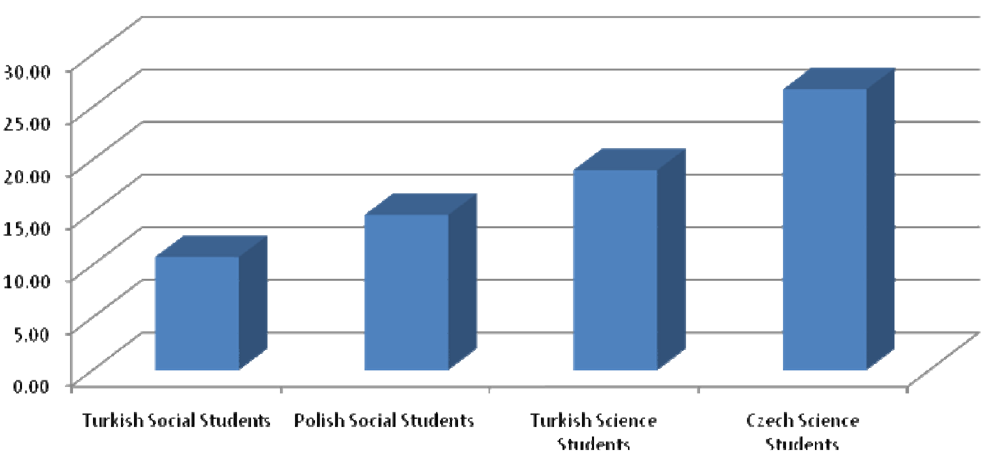

Figure 2 Status in students' Computer & Internet Use (hours/week)

4. DISCUSSION AND CONCLUSION

CL levels have increased in parallel with rapidly developing technology (Varol, 2002; Geçer & Dağ, 2010). Correspondingly, societies with high information literacy levels become stronger than other countries in economic, political and scientific fields (Kaya, 1995; Çakmak, 2008). In developed and developing countries, we observe many studies being carried out to enhance information literacy. Generally, the most of these studies aim at increasing ICTL with basic computer courses at educational institutions.

Today, because accessing to electronic information became widespread and local libraries have been replaced by Internet, ICT use was identified with computer and Internet use; ICTL and CL have a linear relationship (Zhang & Espinoza, 1998; Gross & Latham, 2007). Therefore, to comment ICT use competency, attitudes and satisfaction regarding computers, we think it is a good starting point to study computer competency, attitudes and satisfaction about computers.

Although a great majority of students participating in this study indicated that they were satisfied with computer-related courses taken in the university, 16.82 % of them expressed their dissatisfaction. As reasons of their dissatisfaction, Turkish students highlighted computers not working in laboratories, unskilled teachers and some programs they have to take in the curriculum and they will never need in real life while Polish and Czech students said that they were not satisfied with computer courses due to insufficiency of information about computer subjects. As we examined dissatisfaction reasons in Turkish students within hardware problems, we observed computer maintenance problems at universities and increased number of students per computer. We also found out that in basic computer courses, they received standard course content and that, in addition to basic computer courses, they asked for a computer course with contents peculiar to their professional fields (Dinçer, 2011).

Since the cost of information and communication technology has declined, computer and Internet access has become common. It is not wrong to say that students using ICT at home have more ICT experiences (Luu & Freeman, 2011). We believe that this affirmation is verified by the fact that a great majority of students participating in this study had personal computers and that they had a high level of computer competency, and that there was a positive but low relation between computer competency and personal computer ownership. Previous studies also indicated that, for students, being deprived of using computer at home posed a more serious obstacle than being deprived of using computer at school (Moos & Azevedo, 2009), which strengthens this affirmation.

Although Turkish students began to use computer and Internet later than Polish and Czech students, no difference was seen between them regarding their computer competency. It is pleasing to see that Turkish students were as competent as Polish and Czech students despite their late use of computer and Internet.

When we look at findings with respect to weekly computer and Internet use, we observe that Turkish students use computer and Internet for a shorter time than Polish students but for a longer time than Czech students. We note that these differences are associated to fields rather than to countries because Turkish students studying at departments of social sciences use computer and Internet for academic purposes while Polish students use computer and Internet for social websites and for surfing on diverse websites. Reasons of computer and Internet use in computational fields vary. Turkish students, like Polish ones, use computer and Internet for surfing on diverse websites and for social websites. We think it should be useful to associate these differences to social structure and to study students 'social life in accordance with their countries and departments.

Finally, no difference was detected between students regarding their attitudes toward computers. However, we should note that, compared with Polish and Czech students, Turkish students have high attitudes toward computers. But, reasons of theses higher attitudes could not be explained.

As students participating in this study could not easily understand open-ended questions, we suggest, for further studies, collecting data by these questions rather quantitatively. We suggest especially reconsidering reasons of computer and Internet use in connection with countries' socio-economic structures.

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A FUZZY LOGIC-BASED QUALITY FUNCTION DEPLOYMENT FOR SELECTION OF E-LEARNING PROVIDER

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ABSTRACT
According to the Internet World Stats (2010), the growth rate of internet usage in the world is 444.8 % from 2000 to 2010. Since the number of internet users is rapidly increasing with each passed year, e-learning is often identified with web-based learning. The institutions, which deliver e-learning service via the use of computer and internet, are responsible to choose the most suitable e-learning service provider for effective distance education. The purpose of this research is to identify the e-learning design requirements and to select the most suitable e-learning service provider. In this research, fuzzy logic – based Quality Function Deployment (QFD) was employed. A questionnaire was conducted in order to collect the data from a group of experts who were selected on the basis of their knowledge and expertise in related industry. By using the Converting Fuzzy data into Crisp Scores (CFCS) technique, the collected data was defuzzified. Then, the critical success factors of e-learning service providers were identified. As a result, fuzzy logic-based QFD was utilized for the selection of the e-learning service providers.
Keywords: E-learning Design, Provider Selection, Fuzzy Logic, Fuzzy - Quality Function Deployment, House of Quality, Lifelong Learning.

1. INTRODUCTION

The rapid changes and growth in information and communication technologies (ICT) provide significant opportunity to share information resources and knowledge. These developments in the last couple of decades have also led to a valuable contribution for a wide range of learning applications. E-learning has become an acceptable and modern way of distance education that is delivered via the use of computers, internet and multimedia presentation (Lau, 2000). Moreover, distance education is preferred as a valuable way of learning for lifelong learning. At this point, e-learning design is an important issue for better education service.

E-learning also moves the traditional instruction paradigm to a learning paradigm (Jönsson, 2005). The most significant difference that distinguishes traditional learning and e-learning is physical distance among participants (Robinson & Bawden, 2002). Its applications can appear with different types of designations such as web-based learning, virtual classrooms, and digital collaboration (Khalifa & Kwok, 1999; Kaplan & Leiserson, 2000). Some researchers proposed different types of e-learning (Raymond, 2000; Bose, 2003). These types are web supported – blended or mixed mode, and fully online e-learning format (Robinson & Bawden, 2002; Roffe, 2002; Bose, 2003). Khan (2001) proposed a framework that offers a list of considerable factors which would be needed for the creation of a successful experience for diverse learners. Sun et al. (2006) studied the critical factors for a successful e-learning.

The QFD process requires various inputs which are also in the form of linguistic data (human perception, judgment, and evaluation on importance of customer requirements or strengths of relationship between customer requirements and technical attributes) that is quite vague and subjective (Chen et al., 2006). Although it is really important to overcome the vagueness and imprecision in human thought for operative judgment and decision making, most of the input variables in traditional QFD are represented with crisp numerical values that also cause precise judgments. To address the ambiguity in QFD process, Khoo and Ho (1996) proposed an approach that centered on the application of fuzzy arithmetic and possibility theory. Teng and Tzeng (1996) used fuzzy multi-criteria ranking for evaluating transportation investment alternatives. Sohn and Choi (2001) proposed a fuzzy-QFD model that conveys fuzzy relationship between CAs and TRs for reliability in the context of supply chain management. In order to develop a fuzzy QFD model, another research was conducted by Yang et al. (2003) to adapt HOQ to meet the needs of buildable designs in the construction industry. A fuzzy optimization model for QFD planning process was proposed by Kahraman et al. (2004). The linguistic variables were applied in the relationship matrix to weight of CAs (Karsak, 2004). In order to aggregate the information from the group decision QFD model on the application of software design, Büyüközkan and Feyzioğlu (2005) conducted the ordered weighted geometric operator.

In this study, in order to deal with the ambiguity in QFD process, fuzzy logic is used to gather the data from each decision maker. The CFCS (Converting Fuzzy data into Crisp Scores) technique is employed to defuzzify the variables. As a result, fuzzy logic-based QFD is utilized to select the e-learning service provider.

2. THE CONCEPT OF ONLINE EDUCATION FOR LIFELONG LEARNING

As an education expert in lifelong learning, John Field defined lifelong learning as a "relative new concept" although it has traditionally been known as adult education (Field, 2003). Lifelong learning is also meant to symbolize a second chance for individuals to update their skills and qualifications. Higher education institutions have an important role to develop and provide learning opportunities for individuals. E-learning indicates a radical change in learning paradigm (Lee et al., 2007). Furthermore, in comparison to traditional learning process in e-learning process participants need to have several characteristics, such as self-motivation and self-discipline that contribute to success in e-learning process (Bose, 2003). These features make e-learning a viable learning option for lifelong learning.

3. METHODOLOGY

3.1. Fuzzy Set and Linguistic Variables

In order to deal with the vagueness of human thought, Zadeh (1965) first introduced the fuzzy set theory, which was oriented to the rationality of uncertainty due to imprecision or vagueness. Especially in group decision-making process, there is also an internal uncertainty based on distinctive characteristics of the all individual decision makers. A major contribution of fuzzy set theory is its capability of representing vague data. In fact, the fuzzy set theory is a generalized form of the classical set theory that has membership functions with values in [0, 1]. A fuzzy set is a class of objects with a continuum of grades of membership. Such a set is characterized by a membership (characteristic) function, which assigns to each object a grade of membership ranging between zero and one. A triangular fuzzy number is denoted simply as $(\frac{\alpha}{\beta}, \frac{\beta}{\gamma})$ or (α, β, ɣ). The parameters α, β and, ɣ respectively denote the smallest possible value, the most promising value, and the largest possible value that describe a fuzzy event (Kahraman et al., 2003). To aggregate all individual decision makers' opinions, a common measure is needed. Therefore, the fuzzy linguistic variables are used to represent the different aspects of human language. It also allows us to use the fuzzy linguistic variables for human words and sentences with numerous linguistic criteria, such as very low, low, medium, high, very high. The linguistic terms and corresponding fuzzy numbers are shown in Table 1.

Table 1. Linguistic Term and Corresponding Fuzzy Numbers

	Linguistic Term	Fuzzy Number
(VH)	Very High	(8,9,10)
(H)	High	(6,7,8)
(M)	Medium	(4,5,6)
(L)	Low	(2,3,4)
(VL)	Very Low	(0,1,2)

3.2. Defuzzification Method

Defuzzification is a process which needs to evaluate that a fuzzy number is characterized by its shape, spread, height, and relative location on the x-axis (Opricovic & Tzeng, 2003). In this study, the CFCS (Converting Fuzzy data into Crisp Scores) defuzzification method is executed through fuzzy aggregation procedure. The CFCS defuzzification method was first proposed by Opricovic and Tzeng (2003). By determining the left and right scores, the CFCS method provides fuzzy max and fuzzy min of fuzzy numbers. According to the membership functions of the fuzzy numbers, the total score is computed with a weighted average. A tilde "~"is placed above a symbol (*Z*) where the symbol represents a fuzzy set. If $\tilde{z}_{ij}^{d} = (\alpha_{ij}^{d}, \beta_{ij}^{d}, \gamma_{ij}^{d})$ is given for the fuzzy evaluation of decision maker d (d = 1,2,…,n) about the degree to which the criterion *i* affects the criterion *j*. The CFCS defuzzification method includes five-step algorithms described as follows:

(1) Normalization:

$$x\alpha_{ij}^{k} = (\alpha_{ij}^{k} - \min \alpha_{ij}^{k}) / \Delta_{\min}^{\max}, \tag{1}$$

$$x\beta_{ij}^{k} = (\beta_{ij}^{k} - \min\alpha_{ij}^{k}) / \Delta_{\min}^{\max}, \quad (2)$$

$$x\gamma_{ij}^{k} = (\gamma_{ij}^{k} - \min\alpha_{ij}^{k}) / \Delta_{\min}^{\max}, \quad (3)$$

where $\Delta_{\min}^{\max} = \max\gamma_{ij}^{k} - \min\alpha_{ij}^{k}$.

(2) Compute left (ls) and right (rs) normalized value:

$$x\alpha s_{ij}^{k} = x\beta_{ij}^{k} / (1 + x\beta_{ij}^{k} - x\alpha_{ij}^{k}), \quad (4)$$

$$x\gamma s_{ij}^{k} = x\gamma_{ij}^{k} / (1 + x\gamma_{ij}^{k} - x\beta_{ij}^{k}). \quad (5)$$

(3) Compute total normalized crisp value:

$$x_{ij}^{k} = \left[x\alpha s_{ij}^{k}(1 - x\alpha s_{ij}^{k}) + x\gamma s_{ij}^{k} x\gamma s_{ij}^{k}\right] / \left[1 - x\alpha s_{ij}^{k} + x\gamma s_{ij}^{k}\right]. \quad (6)$$

(4) Compute crisp values:

$$z_{ij}^{k} = \min\alpha_{ij}^{k} + x_{ij}^{k}\Delta_{\min}^{\max}. \quad (7)$$

(5) Integrate crisp values:

$$z_{ij}^{k} = \frac{1}{p}(z_{ij}^{1} + z_{ij}^{2} + \Lambda + z_{ij}^{p}). \quad (8)$$

3.3. Fuzzy - Quality Function Deployment

Quality Function Deployment is a useful tool for total quality management to develop new products and services. Furthermore QFD helps to improve the features of existing products and services. It was developed in late 1960s in Japan, by Yoji Akao (Akao, 1972). QFD charts are filled through various inputs such as questionnaires, interviews and focus groups. This increases the uncertainty in the quantification of the information. The linguistic variable is useful in dealing with situations that are identified in quantitative expressions (Wang and Chuu, 2004). In order to decrease the uncertainty in the data collected, fuzzy logic can be used (Bouchereau and Rowlands, 2000). To address the ambiguity in QFD, there are some researches are conducted Temponi et al. (1999) Bevilacqua et al. (2006), and Wang (2010). The QFD process contains four phases. The house of quality matrix is usually called as the phase one matrix, or the planning matrix (Hauser and Clausing, 1988) that is shown in Fig. 1. The HOQ is described and its process following approaches suggested by Brown (1991), and Griffin and Hauser (1992).

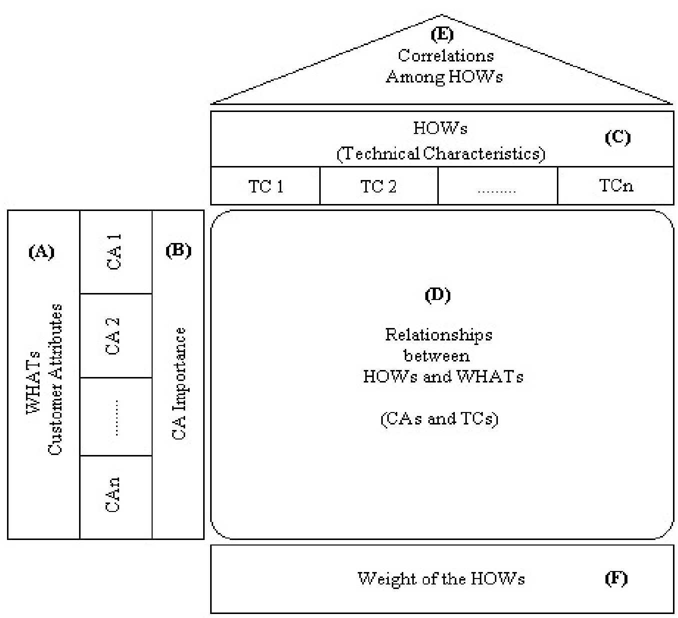


Figure 1. House of Quality

***Step 1**-Identifying process of the WHATs:* In this step, the process includes the determination of customer needs, the assignment of priorities to customer attributes (CAs), and the evaluation of the customer's perception are needed (Temponi et al., 1999). The wanted benefits in a product or service in the customer's own words are customer needs and often called (CAs) or "WHATs" area (A) in Fig. 1. This step depends on expertise of the team members (Griffin and Hauser, 1992).
***Step 2**-Determination process of the HOWs:* Technical characteristics (TCs), which are also called measurable requirements, are stated as the "HOWs" of the HOQ. TCs are determined by a multidisciplinary team and located on the area marked as (C) in Fig. 1.
***Step 3**-Preparation of the relationship matrix:* TCs, which impact on which CAs, are judged by a team. Likewise, it is really important to identify the influence degree of TCs. This relationship between TCs and CAs is shown in the area identified as (D) in Fig. 1.
***Step 4:** Elaboration process of the correlation matrix:* The physical relationships among the technical requirements are specified on an array known as "the roof matrix" and identified as (E) in Fig. 1.
***Step 5:** Action plan:* The weights of the TCs, identified as area (F), are placed at the base of the quality matrix. The weights are one of the main outputs of the HOQ, and are determined by:

$$Weight(\mathrm{TC})_i = V(\mathrm{TC})_{i1} \times Im(\mathrm{CA}_1) + \ldots + V(\mathrm{TC})_{in} \times Im(\mathrm{CA}_n), \quad (9)$$

where $V(TC)_{in}$ is the correlation value of TC_i with CA_n, and $Im(CA_n)$ represents the importance or priority of CA_n.

4. APPLICATION – CASE STUDY

In this study, an illustrative case is presented. An educational institution, which aims to provide online education for lifelong learning program, is described figuratively. As e-learning service providers, 5 firms (A, B, C, D, and E), which have operations in the e-learning service industry, are selected. The e-learning provider selection model is identified by the following steps:

4.1. Selection of the Decision Makers

In this study, decision makers are selected for data collection according to their expertise in related industry. Most of the decision makers are managers/executives of e-learning users at the institutional level. 10 potential decision makers were selected and sent the invitations for this research. Moreover, in order to help the identification process of HOWs and WHATs, a broad literature research is served (Bevan, 1999; Brajnik, 2001; Signore, 2005; Li et al., 2009).

4.2. Determining the Linguistic Terms and Corresponding Fuzzy Numbers

To aggregate the opinions of each decision maker, the linguistic variables in Table 1 are employed. These variables are Very High (8;9;10), High (6;7;8), Medium (4;5;6), Low (2;3;4) and Very Low (0;1;2).

4.3. Identifying WHATs

In this step, to identify WHATs, as mentioned above, a wide-range literature review is condensed and each decision maker is asked to identify which quality characteristics should be used in this research. After the evaluations of the decision makers, 10 attributes are identified and shown in Table 2a.

Table 2. Identified WHATs and HOWs

(a)

WHATs		
1	AE	Aesthetics
2	FC	Functionality
3	RL	Reliability
4	US	Usability
5	EF	Efficiency
6	MT	Maintainability
7	PR	Portability
8	RC	Rich Content
9	CS	Customer Support
10	CT	Cost Effectiveness

(b)

HOWs		
1	CE	Certificated Education
2	TC	Technical Capability
3	QC	Quality Certification
4	RP	Reputation
5	FS	Financial Stability
6	EI	Experience in the Industry
7	QDT	Qualified and/or Experienced Design Team
8	QSS	Qualified Support Service Staff

4.4. Identifying HOWs

In order to identify HOWs, each decision maker is asked to determine which factors are important to meet the CAs for evaluating e-learning service providers. Identified HOWs are shown in Table 2b.

4.5. Calculating the Importance Degrees of WHATs

In this step, the decision makers evaluate the importance degrees of WHATs. By using the arithmetic mean method, importance degrees of WHATs are calculated. The importance degrees of each WHAT are shown in Fig. 2.

4.6. Identifying the Correlation between HOWs and WHATs

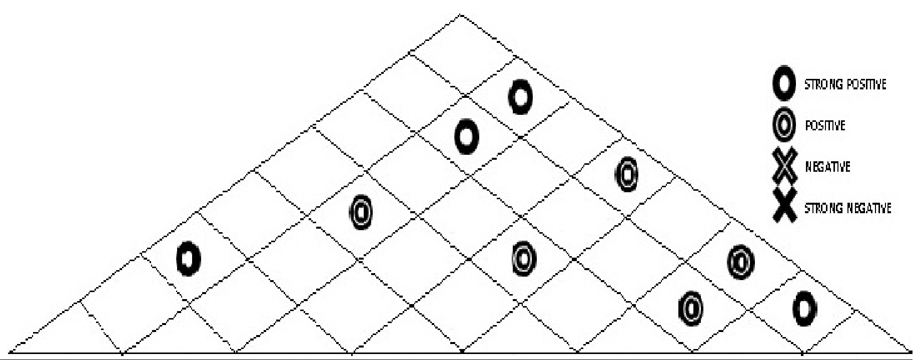
To identify the correlation between HOWs and WHATs, each decision maker is asked to evaluate the impact of each HOW on each WHAT. An evaluation example of a decision maker is shown in Table 3. Calculated correlation values are shown in Fig. 2.

Table 3. A Decision Maker's Evaluation of the Relationship between HOWs and WHATs

	UF	TC	QC	RP	FS	EI	QDT	QSS
AE	L	H	VH	H	VH	H	VH	H
FC	M	H	VL	M	H	VL	VL	VH
RL	L	VH	VH	L	VH	VH	L	M
US	VH	VH	VL	VH	VH	VL	H	L
EF	M	VL	L	M	VL	L	H	H
MT	VH	L	H	VH	L	H	VH	L
PR	VL	VH	VL	VL	VH	VL	L	L
RC	H	M	L	H	M	L	M	H
CS	H	L	H	M	VL	VL	L	VH
CT	H	M	H	L	H	L	H	VH

4.7. Computing the Weights of HOWs

By using Eq. (9), the weights of HOWs (W_i) are calculated. The calculated values are shown in Fig. 2.



				UF			TC			QC			RP			FS			EI			QDT			QSS		
	α	β	γ	α	β	γ	α	β	γ	α	β	γ	α	β	γ	α	β	γ	α	β	γ	α	β	γ	α	β	γ
AE	3,33	4,33	5,33	1,67	2,17	2,67	2,33	2,83	3,33	3,67	4,17	4,67	3,33	3,83	4,33	3,67	4,17	4,67	3,33	3,83	4,33	3,67	4,17	4,67	3,33	3,83	4,33
FC	4,33	5,33	6,33	2,33	2,83	3,33	3,00	3,50	4,00	1,33	1,83	2,33	2,33	2,83	3,33	3,00	3,50	4,00	1,33	1,83	2,33	1,33	1,83	2,33	2,67	3,17	3,67
RL	3,00	4,00	5,00	2,00	2,50	3,00	2,00	2,50	3,00	2,00	2,50	3,00	2,00	2,50	3,00	2,00	2,50	3,00	3,00	3,50	4,00	1,33	1,83	2,33	1,67	2,17	2,67
US	3,00	4,00	5,00	2,67	3,17	3,67	3,67	4,17	4,67	2,33	2,83	3,33	2,67	3,17	3,67	3,67	4,17	4,67	1,67	2,17	2,67	2,33	2,83	3,33	1,67	2,17	2,67
EF	5,33	6,33	7,33	1,67	2,17	2,67	2,33	2,83	3,33	2,67	3,17	3,67	1,67	2,17	2,67	2,33	2,83	3,33	1,67	2,17	2,67	3,33	3,83	4,33	2,67	3,17	3,67
MT	5,00	6,00	7,00	3,00	3,50	4,00	2,00	2,50	3,00	2,67	3,17	3,67	3,00	3,50	4,00	2,00	2,50	3,00	2,67	3,17	3,67	2,67	3,17	3,67	1,00	1,50	2,00
PR	4,00	5,00	6,00	1,33	1,83	2,33	2,67	3,17	3,67	1,33	1,83	2,33	1,33	1,83	2,33	2,67	3,17	3,67	2,67	3,17	3,67	0,67	1,17	1,67	2,00	2,50	3,00
RC	4,67	5,67	6,67	2,33	2,83	3,33	1,67	2,17	2,67	1,00	1,50	2,00	2,33	2,83	3,33	1,67	2,17	2,67	1,33	1,83	2,33	2,33	2,83	3,33	3,33	3,83	4,33
CS	4,67	5,67	6,67	2,33	2,83	3,33	1,67	2,17	2,67	1,67	2,17	2,67	1,67	2,17	2,67	1,00	1,50	2,00	1,67	2,17	2,67	2,00	2,50	3,00	2,67	3,17	3,67
CT	5,33	6,33	7,33	2,67	3,17	3,67	2,33	2,83	3,33	2,67	3,17	3,67	1,67	2,17	2,67	2,33	2,83	3,33	2,67	3,17	3,67	3,33	3,83	4,33	3,67	4,17	4,67
				W1			W2			W3			W4			W5			W6			W7			W8		
				9,49	14,32	20,16	9,89	14,89	20,89	9,06	13,82	19,59	9,20	14,03	19,87	10,02	15,09	21,16	9,20	14,03	19,87	10,08	15,01	20,94	10,74	15,84	21,94

Figure 2. The Fuzzy - House of Quality

4.8. Measuring the Correlation of HOWs

In this step, the decision makers are asked to evaluate the correlations of HOWs. The result is shown in the roof matrix in Fig. 2.

4.9. Determining of E-learning Providers' Influence on the TCs

To determine of e-learning providers' influence on the TCs, the decision makers' opinions are collected according to the relationship between TCs and e-learning service providers. Aggregated values for each provider are given in Table 4.

Table 4. E-learning Providers' Influence on Each Attribute

Firms	HOWs																							
	CE			TC			QC			RP			FS			EI			QDT			QSS		
	α	β	□	α	β	□	α	β	□	α	β	□	α	β	□	α	β	□	α	β	□	α	β	□
A	2,33	2,83	3,33	2,33	2,83	3,33	2,67	3,17	3,67	1,67	2,17	2,67	3,67	4,17	4,67	3,33	3,83	4,33	3,67	4,17	4,67	3,33	3,83	4,33
B	1,33	1,83	2,33	2,33	2,83	3,33	3,00	3,50	4,00	0,67	1,17	1,67	0,67	1,17	1,67	3,67	4,17	4,67	1,33	1,83	2,33	2,67	3,17	3,67
C	1,67	2,17	2,67	2,33	2,83	3,33	1,00	1,50	2,00	1,67	2,17	2,67	1,33	1,83	2,33	1,33	1,83	2,33	1,33	1,83	2,33	1,67	2,17	2,67
D	2,33	2,83	3,33	1,33	1,83	2,33	2,33	2,83	3,33	1,67	2,17	2,67	3,67	4,17	4,67	3,33	3,83	4,33	3,67	4,17	4,67	3,33	3,83	4,33
E	2,00	2,50	3,00	2,67	3,17	3,67	3,33	3,83	4,33	1,67	2,17	2,67	1,67	2,17	2,67	2,33	2,83	3,33	2,33	2,83	3,33	2,33	2,83	3,33

4.10. Converting Fuzzy Scores to Crisp Scores for Ranking Each E-learning Service Provider

In order to rank each e-learning provider (Pr), CFCS defuzzification method is employed as mentioned above. Then, the weights are calculated by using the following equation. The scores and rank of each e-learning provider are shown in Table 5.

$$Weight(\mathrm{P})_i = V(\mathrm{Pr})_{i1} \times Im(\mathrm{TC}_1) + \ldots + V(\mathrm{Pr})_{in} \times Im(\mathrm{TC}_n)/\mathrm{P}_n \qquad (10)$$

Table 5. Scores and Rank of E-learning Providers

Providers		
	SCORE	RANKING
A	50,714	1
B	38,251	4
C	32,537	5
D	48,581	2
E	42,827	3

5. DISCUSSIONS AND CONCLUSIONS

According to the final results, e-learning provider A is rated as the best choice, but the other provider C is the worst one for a good e-learning service. By using this proposed method, an alternative way of e-learning service provider selection is described. Moreover, by using this method, critical success factors for e-learning service providers can be identified. According to the evaluations of each decision maker, "Qualified Support Service Staff" has the highest score and identified as the most important factor, followed key is "Financial Stability", "Qualified and/or Experienced Design Team" and "Technical Capability", respectively. These four factors have relatively higher scores than the others including "Certificated Education", "Reputation", "Experience in the Industry", and "Quality Certification". It also indicates that human resources are among the most important features of the online education industry. A balanced combination of human resources and technological factors is needed for a successful e-learning design.

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A HO-IRT BASED DIAGNOSTIC ASSESSMENT SYSTEM WITH CONSTRUCTED RESPONSE ITEMS

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ABSTRACT
The aim of the present study was to develop an on-line assessment system with constructed response items in the context of elementary mathematics curriculum. The system recorded the problem solving process of constructed response items and transfered the process to response codes for further analyses. An inference mechanism based on artificial intelligence was implemented with the system to diagnose the bugs in the problem solving process automatically. To examine the performance of the system, a “Multiplication of Fraction” test was constructed and administered to 158 six graders in Taiwan. The results showed that the mean of classification accuracies of the bugs is above 97%, which implies that the proposed system identifies leaning bugs accurately and efficiently. In addition to bug identification, a high-order item response theory (HO-IRT) was applied to estimate the overall and domain abilities. The correlations between the abilities estimated with HO-IRT and the number of bugs were highly correlated, which suggests that the more learning bugs children possessed the lower his/her mathematic abilities would be.
Keywords: constructed response item, computerized test, automated scoring, high-order item response theory

INTRODUCTION

Constructed response (CR) items are open ended, short answer questions that elicit students’ higher-level cognitive abilities and are beneficial to evaluate complex concepts or skills such as problem solving (Martinez & Bennett, 1992; Zenisky & Sireci, 2002; Bacon, 2003; Williamson, Bejar, & Sax, 2004, Kuechler & Simkin, 2010). The solving process of CR items involves multiple steps, which explicitly demonstrates how the final answers are derived, and sometimes, students are required to provide explanation in writing to support his / her answers. The responses of CR items will later be classified into different response types, and the scores will be given according to the actual performance. Also, due to different steps are involved in every single CR item, a unique rubric for scoring is required for each item.

The constructed response items have been used by some large-scale assessments, such as NAEP, PISA and TIMSS (National Assessment Governing Board, 2005; Olson, Martin, & Mullis, 2008; OECD, 2005; Parshall, Davey, & Pashley, 2002). The NAEP example items can be found on the website. (http://nces.ed.gov/nationsreportcard/itmrlsx/search.aspx?subject=mathematics). Taking NAEP scorning method as an example, the answers were rated into five response levels based on the completeness of the answers, which are extended, satisfactory, partial, minimal, and incorrect, and the criteria for each level are clearly described. Traditionally, human scorers of CR items must be well-trained to strictly follow the criteria to make sure that the responses are scored consistently. However, the training process of human scorers is time-consuming and economically inefficient. Although constructed response items provide sufficient and crucial information of student’s learning process, the high cost of time and money involves in manual grading remained challenging to educators and researchers (Attali, & Burstein, 2006; Attali, Powers, Freedman, Harrison, & Obetz, 2008).

In Figure 1, two examples of one of the available computerized tests with automated scoring system are illustrated. In these two items, the input formats and variations of items are limited, and the system does not record the problem solving process. Therefore in the present study, an on-line assessment system was developed to compensate the current practice of CR items. The system allows the solving process of CR items to be recorded completely and learning bugs (error patterns) to be analyzed automatically and instantly. Moreover, the overall and domain abilities are estimated simultaneous by higher-order item response theory.

Figure 1 Computerized constructed response items
(Thatquiz, http://www.thatquiz.org/)

METHOD

Computerized Test Development

In figure 2 and figure 3 the test interfaces of multiple choice and constructed response items are shown. The responses, like the equations or the fractions, can be inputted by using the tool the system provided adaptively for each CR item. The inputted equations will be displayed in the response area and recorded by LaTeX format. Table 1 is an example of an inputted equation and the corresponding codes in the database.

Figure 2 Interface of multiple choice items

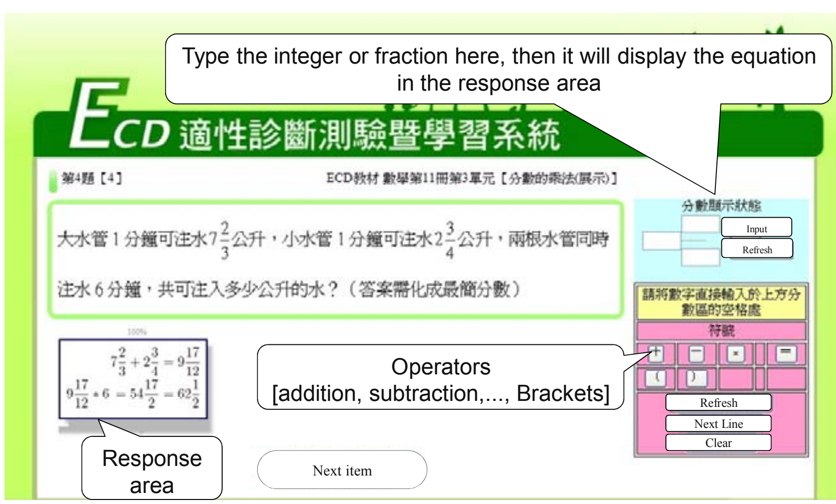

Figure 3 Interface of constructed response items

Table1 an example of the response format

Response pattern	$12\frac{8}{15}\times1\frac{1}{4}=\frac{180}{15}\times\frac{5}{4}=\frac{45}{3}=15$
Database	12\\frac{8}{15}* 1\\frac{1}{4} = \\frac{180}{15}* \\frac{5}{4} = \\frac{45}{3} = 15\\frac{}{}

The analysis of constructed response item

One of the purposes of this study was to develop an automated analysis process for CR items to diagnose error patterns. There were two parts in the analysis process; first, some rules were used to build a decision tree and to classify the responses into several categories. Second, the prototypes of error patterns were compared to responses of the participants by using the block-based matching analysis.

For example, in item 27, three rules are involved in the decision tree (see Figure 4)

Rule 1: check the status of the response area. If the response area is blank, then code 99 will be given; otherwise, rule 2 will be applied.

Rule 2: examine the correctness of the first equation in the participant's response by comparing with the correct equations preset in the system. If the first equation is correct, then apply to Rule 3a; otherwise apply to Rule 3b

Rule 3a: check the correctness of the final answer. If the student's final answer is correct, then the system will record that the student has answered this item correctly; otherwise the block-based matching analysis is applied to find the best fit error pattern from the prototypes of Bug1 to Bug9.

Rule 3b: if the error occurs due to fraction addition instead of fraction multiplication, then the block-based matching analysis will find the best fit error pattern from the prototypes of Bug10 and Bug11. Otherwise, the error pattern will refer to Bug 12, which implies that the student did not understand the problem.

The first step of block-based matching analysis is to decompose the student's response into blocks without operators, then compare these blocks with bugs' prototypes and find the best fit error patterns.

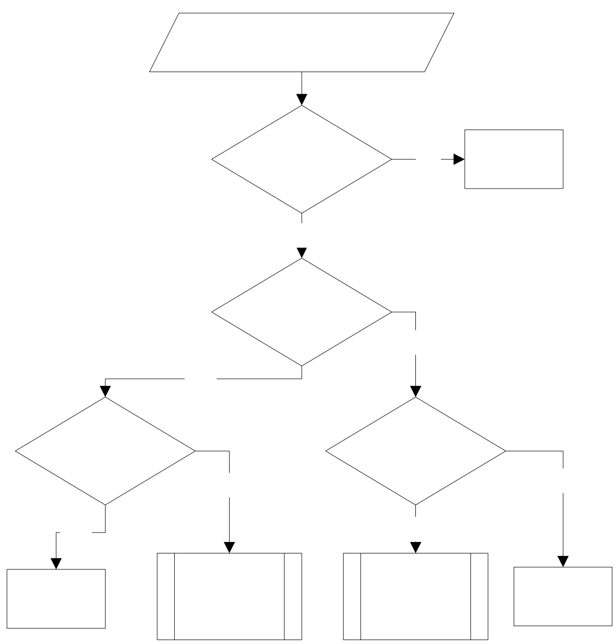

Figure 4 Analysis flow chart of item 27

Higher-Order Item Response Theory

A hierarchical structure of the higher-order item response theory (HO-IRT) framework involves the overall ability at the first layer and multiple domain abilities at the second layer. This framework has been well adopted at large-scale assessment settings. de la Torre and Song(2009) proposed a overall and multiple domain abilities simultaneously. de la Torre & Song(2009) and de la Torre & Hong(2010) show that parameter estimation by applying HO-IRT is more accurate and reliable than that by using traditional unidimensional IRT and multidimensional IRT separately. In this study, each domain of HO-IRT is considered to be unidimensional, and a domain-specific ability $\theta_i^{(D)}$ accounts for the performance of examinee i on domain d, where $d = 1, 2, ..., D$. The correlations between the different domain abilities are accounted for by positing a higher-order overall ability θ_i. Specifically, the domain abilities are linked to the overall ability via the linear function $\theta_i^{(d)} = \lambda^{(d)}\theta_i + \varepsilon_{id}$, where the $\lambda^{(d)}$ is the latent regression coefficient of the domain ability d on the overall ability, and ε_{id} is the error term which follows a standard normal distribution. Markov chain Monte Carlo (MCMC) method in the WinBUGS (Lunn, Thomas, Best, & Spiegelhalter, 2000) was used to estimate item and ability parameters simultaneously. In this framework, the response of examinee i to the jth item of the dth domain, $X_{ij}^{(d)}$, is a function of $\theta_i^{(d)}$ and the specific item characteristic via some IRT model. In this study, the multidimensional random coefficients multinomial logit (MRCML) (Adams, Wilson & Wang, 1997) model is employed, where the $\mathbf{b}_{ik}$, $\mathbf{a}_{ik}$ and $\boldsymbol{\xi}$ are the scoring matrix, design matrix and item parameter vector respectively. The probability of a response in category k of item j can be expressed as the following formulation.

$$\mathrm{P}(X_{jk} = 1; \mathbf{A}, \mathbf{B}, \boldsymbol{\xi} \mid \boldsymbol{\theta}) = \frac{\exp(\mathbf{b}_{jk}\boldsymbol{\theta} + \mathbf{a}'_{jk}\boldsymbol{\xi})}{\sum_{k=1}^{K_j} \exp(\mathbf{b}_{jk}\boldsymbol{\theta} + \mathbf{a}'_{jk}\boldsymbol{\xi})}$$

Test Description

A test of "Multiplication of Fraction" was developed based on the mathematics curriculum in Taiwan. One hundred and fifty-eight six graders were recruited from 4 elementary schools in Taiwan. There were 30 items in the test, including 26 multiple choice (MC) items and 4 constructed response (CR) items. In the present study (as shown in figure 5), the mathematical ability (overall ability) was assessed by the three domain abilities, in which conceptual knowledge was measured by MC item 1-4, procedural knowledge was measured by MC item 5-14, and problem solving was measured by MC 15-26 & CR 27-30.the test measured the mathematical ability and three domain abilities, conceptual knowledge, procedural knowledge and problem solving.

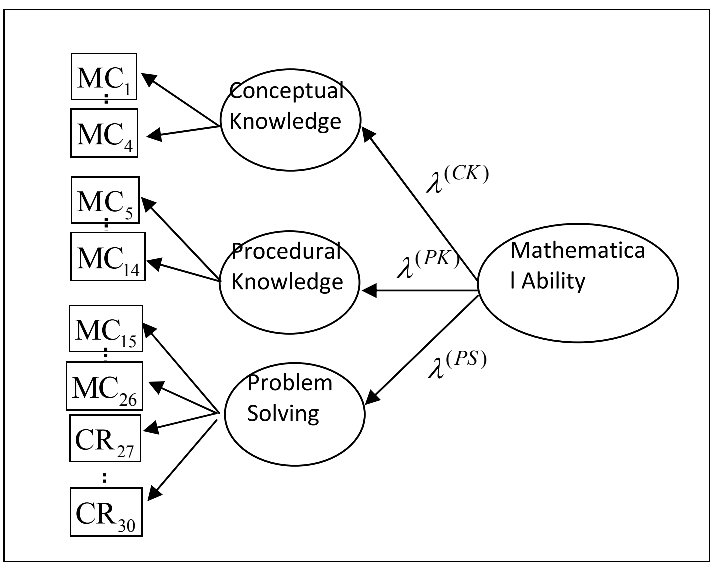

Figure 5 assessment framework of HO-IRT

RESULTS

The effectiveness of the error pattern diagnosis was examined by comparing the automated scoring results of the system to the human scoring results. In Table 2, the classification accuracy represents the percentage of the same diagnostic results by the system and human raters. The classification accuracies of constructed response items ranged from 94.94% to 99.37%, which means that the capability of the proposed system to diagnose student's learning bugs is close to that of human raters.

Table 2 Classification accuracies of the proposed method for learning bugs

CR items	Classification accuracies	# of learning bugs in this item
27	99.37%	12
28	98.73%	11
29	94.94%	10
30	95.57%	9

Table 3 shows the estimated regression coefficients by using the MCMC method under the HO-IRT model. This result showed that the three domain abilities and the overall mathematics abilities were highly correlated.

Table 3 The regression coefficient of the domain abilities

variable	$\lambda^{(CK)}$	$\lambda^{(PK)}$	$\lambda^{(PS)}$
Mean of posterior	0.947	0.948	0.979

Table 4 shows the correlations between students' abilities and the number of learning bugs. The number of error patters were highly correlated with the overall mathematics ability (r = -0.901), whereas the correlations between the number of error patterns ranged from r =-0.896 to -0.907. The results showed that the more error patterns the student possessed, the lower his/her mathematic ability was. Therefore, the results provide evidence that the proposed system successfully and effectively identify students' error patterns.

Table 4 Correlations between the abilities and the number of bugs

	Domain			
Variable	MA	CK	PK	PS
The number of Bugs	-0.901	-0.896	-0.907	-0.898

Note: MA= Mathematical Ability; CK= Conceptual Knowledge; PK=Procedural Knowledge; PS=Problem Solving.

CONCLUSION

The present study developed an on-line assessment system with constructed response items. The results showed that the current system effectively and efficiently identifies student's learning bugs. Moreover, the utility of the system in the real class settings was observed.

The diagnostic assessment system with constructed response item provides precise diagnostic information, which not only provides the process of problem solving, but also identifies the difficulties children encounter in learning mathematics. The overall ability estimated by HO-IRT provides crucial information for important decisions such as rank-ordering the students and the domain abilities, which were also estimated by HO-IRT, identify students' strengths and weaknesses in the process of learning. In a computer-based testing environment, speed and efficiency are gained through automated scoring (Zenisky & Sireci, 2002), thus, this on-line assessment system not only generates diagnostic feedbacks instantly that may potentially aid teachers to direct students to more remedial instruction, it will also promote the behavior of self-study among children.

The present study provides evidence that the assessment system is helpful for both teachers and students. However, for solving the constructed response items, it is time consuming for children to input the equations on the computer screen with the system. Therefore, even though instructions were clearly explained and practice items were provided before testing, children who were lack of computer skills or those who were unfamiliar with the system, experienced difficulties key in required information. For future studies, different types of constructed response item that provide easier access of tools or gadgets, such as geometric items using a variety of onscreen drawing tools (Bejar, 1991;Williamson, Bejar, & Hone, 1999;Williamson, Hone, Miller,&Bejar, 1998), should be developed and investigated.

ACKNOWLEDGEMENT

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AN AHP-BASED WEIGHTED ANALYSIS OF NETWORK KNOWLEDGE MANAGEMENT PLATFORMS FOR ELEMENTARY SCHOOL STUDENTS

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ABSTRACT
This study uses the analytical hierarchy process (AHP) to quantify important knowledge management behaviors and to analyze the weight scores of elementary school students' behaviors in knowledge transfer, sharing, and creation. Based on the analysis of Expert Choice and tests for validity and reliability, this study identified the weight scores of four important knowledge transfer behaviors, three knowledge sharing behaviors, and four knowledge creation behaviors. The behaviors "storing related articles," "providing reports," and "replying to others' articles" obtained the highest scores, which were used as the criteria to evaluate the knowledge management platform of the network.
Keywords: Knowledge Management, Analytical Hierarchy Process

INTRODUCTION
With the arrival of the digital era, people search for and use knowledge through the Internet. Friedman argued that this made the world flatter in the twenty-first century (Friedman, 2007). The application of information technology has improved knowledge management and the efficiency of applying knowledge in groups (Uzunboylu, Eriş, & Ozcinar, 2010). Today, organization members can easily locate, organize, store, transfer, share, apply, and create knowledge. These capabilities significantly increase learning organizations' use of knowledge (McAndrew, Clow, Taylor, & Aczel, 2004). Using network technology, organization members can transfer and share their collected knowledge through network platforms to further accumulate and innovate knowledge (Rampai, & Sopeerak, 2011), thereby maximizing knowledge diffusion and innovation in an atmosphere of sharing and cooperation.

This study created a model for elementary school students' uses of network knowledge management platforms based on the literature analyses (Nurluoz, & Birol, 2011; Lee, Lu, Yang, & Hou, 2010). Because it is hard to represent concepts related to knowledge management and even harder to quantify behavior models, we used scientific tools to perform our analysis. Therefore, the main purpose of this study was to use analytical hierarchy processes to quantify behaviors related to knowledge management and to analyze the weighted scores of behaviors relevant to elementary school students, including knowledge transfer, knowledge sharing, and knowledge creation. These scores would become the criteria for evaluating network knowledge management platforms and elementary school students' performance of knowledge management behaviors.

LITERATURE REVIEW
The American Productivity & Quality Center (APQC) suggested that "knowledge management is a strategy to enable the right people to obtain appropriate knowledge at the appropriate time, which also assists members in sharing information to put it into practice to increase organizational effectiveness. By sharing information and bringing collective intelligence into full play, an organization's coping and innovative abilities can be further increased." Therefore, knowledge management uses systematic approaches to collect, analyze, transfer, understand, and create new, more valuable knowledge. Knowledge management can be broadly divided into knowledge acquisition, accumulation, dissemination, sharing, transfer, and creation (Zhao, 2010). The most

important of these aspects are knowledge transfer, knowledge sharing, and knowledge creation. This study investigated the relevant literature and the key behaviors that are currently applied in elementary school students' knowledge management platforms

1. Knowledge transfer

Knowledge transfer is a communication procedure in which knowledge receivers gain knowledge from knowledge providers (Liao & Hu, 2007). Knowledge can only be transferred through specific contexts (Nunes, Santoro, & Borges, 2009). It can be integrated into organizational contexts and group interactions to maximize individuals' knowledge acquisition. In addition, group knowledge can be transferred to individuals through network tools and teaching. Furthermore, the providers' expertise in knowledge transfer and skills in knowledge coding should be equivalent to those of the receivers (Blumenberg, Wagner, & Beimborn, 2009).

2. Knowledge sharing

In knowledge sharing, an individual voluntarily shares the knowledge and experiences that one has learned with other members in an organization (Ipe, 2003). Knowledge sharing can be achieved through methods such as distributed learning, database creation, discussions of interaction mechanisms, and the sharing of practical experiences. Knowledge sharing has a significant positive influence on organizational performance (Law & Ngai, 2008). Furthermore, an organization's culture of knowledge sharing is also influenced by a fair and open atmosphere, the pleasure of helping others, and effective knowledge (Yu, Lu, & Liu, 2010). Furthermore, the application of a tag system creates more efficient knowledge sharing than does traditional keyword search techniques (Hsieh, Su, Chen, & Chou, 2009).

3. Knowledge creation

Knowledge creation is a process that unites individuals and organizations through environmental knowledge transformation and dynamic interaction (Nonaka & Toyama, 2007). Some scholars (Yanga, Fang, & Lin, 2010) have proposed strategies for organizational knowledge creation (including exploratory, entrepreneurial, consolidation, and development strategies) from the perspectives of the private and public domains to increase organizational private knowledge and to create organizational intellectual property. In addition, in terms of the relationship among individuals, groups, and organizations, knowledge tends to be lost or interrupted during knowledge creation. In a mechanism known as a "knowledge buckle," the end of one kind of knowledge stimulates the rapid rise of another, which enables knowledge flow to successfully produce knowledge sharing and creation among all the participants (Lin, Lin, & Huang, 2008). The knowledge buckle can successfully trigger knowledge creation and sharing across the phases of socialization, externalization, and combination.

Based on the relevant behaviors and mechanisms in knowledge transfer, network platforms make synchronous and asynchronous communication possible. Through knowledge transfer, elementary school students can easily and directly use and receive group knowledge, which reduces the barriers to knowledge transfer and promotes organizational knowledge transfer. Furthermore, network knowledge management platforms enable members to interact anytime and anywhere to learn and transfer implicit knowledge. Explicit behaviors use a network knowledge management platform to collect student-related articles, select articles, download documents and attachments, and select topic links to increase the transfer of explicit network knowledge and promote the assimilation of knowledge.

In addition, interactive knowledge sharing assists elementary school students in their growth and development as well as provides the foundation for the learning and communication skills necessary for knowledge construction. Highly educated persons lead those who demand knowledge and encourage them to pursue knowledge through sharing and instruction. The demonstration and sharing of new knowledge can be achieved by implementing the internalization of knowledge in a fair and open organizational atmosphere. Knowledge management platforms provide students with report articles, encourage them to recommend and share others' articles, and use tag definitions to classify articles. These tools make network knowledge sharing more convenient and increase its effect.

Socialized and implicit knowledge can gradually become explicit through the knowledge buckle of a knowledge management platform. The interaction in network knowledge management platforms and exchange with elementary school students further integrates this individual knowledge into organizational group knowledge. The dialogue-based and practice-based sites provided through knowledge management platforms (Nonaka, Toyoma, & Konno, 2000) enable students to create and publish knowledge. For example, they can create new articles, upload personal files, attach relevant information links, and respond to the articles published by others anytime and anywhere. Thus, the interaction of implicit knowledge and the acquisition of new knowledge increase the creative space of network knowledge and the effectiveness of knowledge creation.

METHODOLOGY

The analytical hierarchy process (AHP), a hierarchically layered structure, was developed for decision making (Saaty, 2003). This paper proposes a taxonomy model that applies AHP to a network knowledge management platform. We then explain how AHP can be utilized on a network knowledge management platform. We then present the results of a specially designed questionnaire that we administered to eight experts. Finally, we present the weights for the network knowledge management platform.

The AHP for the proposed model is as follows (Lee, Yoon, & Kim, 2007; Saaty, 2003):

Step 1: Define the problem and determine the goal

This study created a network knowledge management platform and, based on a literature analysis, identified the key behaviors (knowledge transfer, knowledge sharing, and knowledge creation) as the criteria for analyzing network knowledge management platforms. Based on our analysis of the Expert AHP questionnaires, we established the weights of each kind of knowledge application in a network knowledge management platform to understand elementary school students' application of knowledge.

Step 2: Select the factors for the model

Based on the relevant behaviors for knowledge management that many studies have investigated, this study used knowledge management behaviors for network knowledge management platforms as the criteria to evaluate elementary school students' knowledge application behaviors on network knowledge management platforms. The behaviors in the first hierarchy included knowledge transfer, knowledge sharing, and knowledge creation, and those in the second hierarchy included the sub-criteria for knowledge transfer (e.g., collecting others' articles, selecting and reading others' articles, downloading relevant information, and selecting links), the sub-criteria for knowledge sharing (e.g., providing information, recommending others' articles, and using tag definitions), and the sub-criteria for knowledge creation (e.g., publishing new materials, uploading files, and responding to others' articles).

Step 3: Design the questionnaire

We designed the questionnaire to facilitate all of the possible pair-wise comparisons among the factors. Table 1 shows a typical nine-point scale for an AHP questionnaire (Saaty, 1980). Our questionnaire was designed to measure all possible importance ratios among the factors. Table 2 shows a simple example of the questionnaire, in which three factors are selected: Factors A, B, and C (Lee, Lin, Fang, Lo, & Wu, 2009). According to Table 2, Factor A is twice as important as Factor B because the ratio of Factor A to Factor B is 2:1. Row 1 corresponds to the ratio of Factors A to B. Thus, in Row 1, we mark "v" in the cell associated with a value of 2 (closest to Factor A). Similarly, the importance ratio of Factor A to Factor C is 3:1. The importance ratio of Factor B to Factor C is 1:5. Both of these ratios are shown in Table 2 (Rows 2 and 3).

Table 1: The definition and explanation of the AHP 9-point scale

Intensity of Relative Importance	Definition
1	Equal importance
3	Moderate importance of one over another
5	Essential or strong importance
7	Demonstrated importance
9	Absolute importance
2, 4, 6, 8	Intermediate values between the two neighboring scales

Table 2: A simple example of a questionnaire

Factor	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Factor
A (Row 1)								﹀										B
A (Row 2)							﹀											C
B (Row 3)													﹀					C

Step 4: Use the questionnaire to collect experts' opinions

After we administered the questionnaires to the experts, we used a matrix of importance ratios to describe the results of the pair-wise comparisons. Equation 1 shows the matrix of importance ratios associated with Table 2.

The matrix is a symmetrical and reciprocal matrix for the pair-wise comparisons.

$$\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 1 & 2 & 3 \\ 1/2 & 1 & 1/5 \\ 1/3 & 5 & 1 \end{bmatrix} \end{array} \qquad (1)$$

Step 5: Test the consistency

We used the Consistency Index (CI) to express the results' degree of consistency. Saaty (1980) defined the consistency index (CI) as follows:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \qquad (2)$$

where $\lambda_{\max}$ is the maximum eigenvalue of the matrix of the importance ratios and n is the number of factors. Accordingly, Saaty (1980) defined the Constituency Ratio (CR) as follows:

$$CR = \frac{CI}{RI} \qquad (3)$$

where the Random Index (RI) is given by Table 3 (Saaty, 1980). If the value of the consistency ratio (CR) is less than or equal to 0.1, the questionnaire is considered acceptable. If the CR is greater than 0.1, the questionnaire is not acceptable.

Table 3: Random Index

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Remark: n is the number of factors

Experiment setup and results

We used AHP to evaluate the weights of network knowledge management platforms and applied procedures, such as defining problems, determining goals, choosing model factors, and designing and using a questionnaire, to collect the experts' opinions. To ensure the consistency of the pair-wise comparisons for the expert questionnaire, we performed a consistency test to eliminate unreasonable evaluation values and to avoid adverse decision-making quality.

We designed an AHP, nine-point scale, expert questionnaire based on the structure chart of the three aspects of the network knowledge management platform (i.e., knowledge transfer, sharing, and creation), the relevant behaviors for each aspect (see Figure 1), the pair-wise comparisons for each behavior's importance, and the intensity of each behavior's relative importance. We analyzed the AHP expert questionnaire with Expert Choice and calculated the weight values as the criteria for evaluating knowledge management behaviors for the platform.

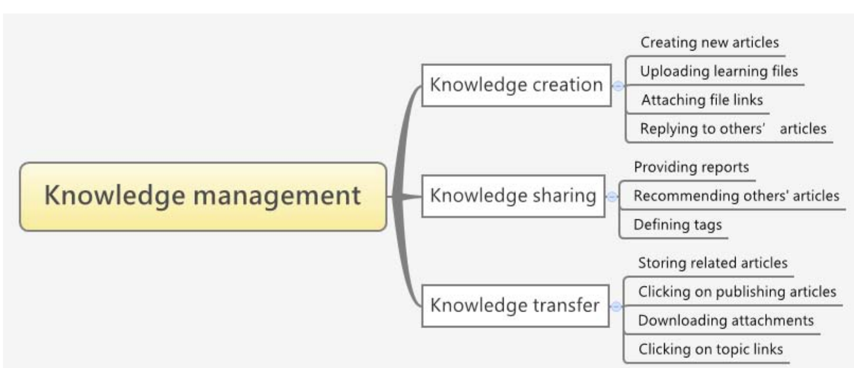

Figure 1: AHP Structure Chart of knowledge management -related behaviors

Consistency test

We selected the experts using three categories. The experts in the first category had expertise in education and teaching research (i.e., elementary school principals, directors, and teachers); the experts in the second category had expertise in technological network systems (i.e., college teachers and experts in educational technology); and the experts in the third category had expertise in human resources in knowledge management (i.e., college teachers and human resources managers). We selected eight experts and used Expert Choice to test the consistency of each questionnaire. In addition, we used the questionnaires that passed the consistency test to calculate weight values to obtain the weight of each behavior for network platform knowledge management.

Based on our analysis of the expert decision-making system in terms of knowledge transfer, six of the eight experts passed the consistency test (as shown in Table 4). In terms of knowledge sharing, five of the experts passed the consistency test (as shown in Table 5). In terms of knowledge creation, six of the experts passed the consistency test (as shown in Table 6).

Table 4: Maximum eigenvalue and the results of the consistency test for “knowledge transfer

Knowledge Transfer n=4				
Experts	λ_{max}	C.I.	R.I	CR
Expert A	4.027	0.009	0.9	0.01*
Expert B	4.837	0.279	0.9	0.31
Expert C	5.188	0.396	0.9	0.44
Expert D	4.216	0.072	0.9	0.08*
Expert E	4.270	0.090	0.9	0.10*
Expert F	4.135	0.045	0.9	0.05*
Expert G	4.027	0.009	0.9	0.01*
Expert H	4.000	0.000	0.9	0.00*

Note: * indicates CR ≦ 0.1, passing the consistency test

Table 5: Maximum eigenvalue and the results of the consistency test for “knowledge sharing”

Knowledge Sharing n=3				
Experts	λ_{max}	C.I.	R.I	CR
Expert A	3.499	0.249	0.58	0.43
Expert B	3.046	0.023	0.58	0.04*
Expert C	4.473	0.737	0.58	1.27
Expert D	3.070	0.035	0.58	0.06*
Expert E	3.035	0.017	0.58	0.03*
Expert F	3.000	0.000	0.58	0.00*
Expert G	3.406	0.203	0.58	0.35
Expert H	3.000	0.000	0.58	0.00*

Note: * indicates CR ≦ 0.1, passing the consistency test

Table 6: Maximum eigenvalue and the results of the consistency test for “knowledge creation”

Knowledge Creation n=4				
Experts	λ_{max}	C.I.	R.I	CR
Expert A	4.081	0.027	0.9	0.03*
Expert B	4.243	0.081	0.9	0.09*
Expert C	4.243	0.081	0.9	0.09*
Expert D	5.269	0.423	0.9	0.47*
Expert E	4.270	0.090	0.9	0
Expert F	4.261	0.072	0.9	0.08*
Expert G	4.351	0.117	0.9	0.13
Expert H	4.135	0.045	0.9	0.05*

Note: * indicates CR ≦ 0.1, passing the consistency test

Establishment of weight values

In this study, we used the expert questionnaires with values that passed the consistency test to ensure their reliability and validity. After excluding the questionnaires that did not pass the consistency test, we performed further calculations on the remaining questionnaires. We combined the index values with the weight values to obtain geometric means. We further calculated the means, based on the standard method, as the weights of network knowledge management behaviors and arranged them in the order of importance. To record elementary school students' knowledge application-related interactive behaviors for network knowledge management, we used AHP to input the factors and obtain their weights as the points to calculate knowledge application interactive behaviors for network knowledge management (see Table 7).

We applied the standardized weight values for knowledge application behaviors, which we obtained from the Expert AHP questionnaire analysis, to the established weight scores for the platform. These scores can be used as the basis to evaluate elementary school students' knowledge management behaviors for networks, as shown in Figure 2.

Table 7: Summary table combining expert questionnaire with weighted t-values

Knowledge management	Knowledge management behaviors	Original weight values	Standardized weight scores (points)
Knowledge transfer	Storing related articles	0.396	10
	Selecting published articles	0.199	5
	Selecting topic links	0.136	3
	Downloading attachments	0.269	7
Knowledge sharing	Providing reports	0.598	10
	Defining tags	0.247	4
	Recommending others' articles	0.155	3
Knowledge creation	Creating new articles	0.316	9
	Uploading learning files	0.210	6
	Attaching file links	0.110	3
	Replying to others' articles	0.364	10

Figure 2: Established weight scores for knowledge management platforms

CONCLUSIONS

Based on the literature review, this study summarized relevant behaviors, knowledge transfer, knowledge sharing, and knowledge creation as the design factors for a network knowledge management platform. According to our analysis of the AHP expert decision-making system, the following results of weight analysis was obtained for network knowledge application behaviors:

1. Among the relevant behaviors in "knowledge transfer," the most important was "storing related articles," followed by "downloading attachments," "selecting publishing articles," and "selecting topic links." Their weight values were 0.396, 0.269, 0.119, and 0.136, respectively, and the standardized weight scores were 10 points, 7 points, 5 points, and 3 points, respectively.

2. Among the relevant behaviors in "knowledge sharing behavior," the most important one was "providing reports," followed by "defining tags" and "recommending others' articles." Their weight values were 0.598, 0.247, and 0.155, respectively, and the standardized weight scores were 10 points, 4 points, and 3 points, respectively.

3. Among the relevant behaviors for "knowledge creation," the most important was "replying to others' articles," followed by "creating new articles," "uploading learning files," and "attaching file links." Their weight values were 0.364, 0.316, 0.210, and 0.110, respectively, and the standardized weight scores were 10 points, 9 points, 6 points, and 3 points, respectively.

To conclude, among the knowledge transfer behaviors for network knowledge management platforms, "storing related articles" can best transfer organizational knowledge from a platform to an individual network platform knowledge bank. This bank makes it easier for individuals to use knowledge and promotes efficient knowledge transfer. Therefore, the weight score of this behavior was high. In knowledge sharing, "providing reports" promotes the sharing of relevant topics and increases knowledge application resources in organizations. Therefore, the weight score of "knowledge sharing" was high. In knowledge creation, "replying to others' articles" was the major model for publishing creativity. Creative knowledge can only become explicit when organization members constantly interact with, respond to, and publish organizational knowledge, which increases group knowledge and is an important resource for knowledge creation. Therefore, the weight score of this behavior in "knowledge creation" was high. Furthermore, the unique interactive function of network knowledge management further increases the efficiency of knowledge transfer and sharing. For example, "downloading attachments" enables members to easily find the knowledge they need through the platform, which facilitates the transfer of organizational knowledge to individuals. The web articles and links necessary for "selecting topic links" help to transfer knowledge content and speed up the transfer of organizational knowledge to individuals. Using "defining tags" makes it easier for organizations to share knowledge, and the mechanism of "article recommendation" strengthens the sharing of team studies.

The limitations of the study are due to the AHP method assigns two factors with quantitative values for comparison, thus it was not easy to compare the attributes of tangible and intangible and some factors may be interdependent in some degree. Finally, the weight score model developed in this study can be used in future studies to evaluate the performance of elementary school students in network knowledge management behaviors.

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AN ANALYSIS OF INTERNET ADDICTION LEVELS OF INDIVIDUALS ACCORDING TO VARIOUS VARIABLES

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ABSTRACT
The concept of internet addiction refers to the excessive use of internet which in turn causes various problems in individual, social and professional aspects. The aim of this study was to determine internet addiction levels of internet users from all age groups. The study used survey model. Study group of the study consisted of a total of 596 people from all age groups. "Personal Information Form" and "Internet Addiction Scale" were used for data collection. Arithmetic mean, standard deviation, independent sampling and t test, ANOVA and LSD tests were performed on collected data. The findings of the study revealed that the individuals had low levels of internet addiction both in sub-scales and in the general of the scale according to age groups. It was found that there was a significant difference between internet addiction scores of the individuals who belonged to the age group of 19 and below and 30 and below. There was a significant difference between the internet addiction scores of students and other professional groups. It was found that internet addiction levels of males were higher than those of females. The results of the study were discussed together with the results of different studies and suggestions were made.
Keywords: Internet, Addiction, Individual

INTRODUCTION

During the years of Cold War, United States of America supported all kinds of inventions to fulfill their military objectives. To achieve this aim, Advanced Research Projects Agency (ARPA) was established in 1958. Today's internet was developed as a result of long studies carried out in ARPA (Musch, 2000). The World Wide Web (WWW) was developed and began to be widespread in 1991 (Hecht, 2001). While number of wide band internet users in Turkey was 18.604 in 2003, it reached 8.7 million by the end of 2010 (Information Technology and Communication Institution, 2011).

Rapid development of computer technology in information society and particularly the invention and advancement of internet led to major changes in human life. Today, thanks to internet, it is possible to shop from virtual stores, to meet new people and make new friends via social networks, to easily access information and sources required for any subject or to be informed about any event that takes place anywhere in the world (Çalık, Çınar, 2009). In addition to many positive effects, it is possible to discuss negative effects of computers, particularly of internet on individuals and society (Çalık, Çınar, 2009; Khasawneh, Al-Awidi, 2008; Kelleci, 2008: Weiner, 1996). Internet addiction might be listed among these negative effects (Chou, Condron, Belland, 2005).

The concept of internet addiction, which was first used by Goldberg in 1995, has recently turned out to be a phenomena, which is tried to be defined through various terms such as "net addiction", "internet addiction", "on-line addiction", "internet addiction disorder", pathologic internet use" and "cyber disorder" (Eichenberg & Ott, 1999). Although there is not a standard definition for internet addiction yet (Chou, Condron, Belland, 2005) the most basic symptoms can be listed as inability to restrict internet use, to continue internet use despite social or academic hazards and feeling a deep anxiety when access to internet is restricted (Öztürk et al, 2007).

Internet addiction is not still defined as a disorder in "Diagnostic and Statistical Manual of Mental Disorders" (also known as "DSM-IV-TR") published by the American Psychological Association in 2000. It was suggested that pathological gambling disorder was viewed as most akin to internet addiction (Köroğlu, 2001; Öztürk et al., 2007). Young, who first introduced the definition of internet addiction and determined the first diagnosis criteria concluded that "pathological gambling" under the title of impulse control disorders in DSM IV was viewed as most akin to internet addiction. Internet addiction does not involve misuse of any substances (Greenfield, 1999: Cited by. Arısoy, 2009).

The concept of internet addiction refers to the excessive use of internet which in turn causes various problems in individual, social and professional aspects. Internet addiction recently began to be analyzed as a psychological problem in association with various psychological problems in the academic world. Particularly educators, psychological counselors, psychologists and psychiatrists tended to carry out various researches on internet addiction (Zimmerl, 1998; Eichenberg and Ott, 1999; Morahan-Martin and Schumacher, 2000; Young, 2006; Ayaroğlu, 2002; Bölükbaş, 2003; Orhan and Akkoyunlu, 2004; Cengizhan, 2005; Esen 2007; Turnalar Kurtaran, 2008). These studies generally investigated the relationship between excessive use of internet and loneliness, depression, having antisocial values and low emotional intelligence, the relationships with the family, particularly with mother and friends, playing online games, searching and shopping, depressive symptoms, decreased social interaction, psychological well-being of the individual, social, verbal and academic functions.

The literature contains only a limited number of studies which investigated internet addiction levels of different age groups. For this reason, this study aimed to determine internet addiction of internet users from different age groups and thus to produce concrete and applicable solutions to overcome this problem. It is believed that this study differed from other studies in the literature from these aspects.

The main problem of this study was to determine the levels of internet addiction which cause excessive use of internet by the individuals from different age groups and in turn leads to experiencing various problems in individual, social and professional aspects.

Aim of the Study

The aim of this study was to determine internet addiction levels of individuals from all age groups in terms of various variables. To achieve the aim of the study, the following questions were tried to be answered:
1. What are the internet addiction levels of the individuals?
2. Do internet addiction levels of the individuals vary according to age group?
3. Do internet addiction levels of the individuals vary according professional group?
4. Do internet addiction levels of the individuals vary according to gender?

METHOD

Study Model

This is a descriptive study which used survey model. As it is known, survey models aim to indicate an existing situation as they are (Karasar, 1999). In this framework, we tried to determine internet addiction levels of the individuals from all age groups.

Study Group

Population of the study consisted of the individuals living in Kırşehir province of Turkey. Among random sampling methods, simple random sampling method was used to determine the study group. Study group of the study consisted of a total of 596 individuals from different age groups living in Kırşehir city center.
Of the individuals in the study group, 284 (47.7%) were male, 312 (52.3%) were female. As for the distribution of the study group according to age groups; a total of 109 (18.3%) belonged to the age group of 19 and below; 98 (16.4%) belonged to the age group of 20-29;155 (26.0%) belonged to the age group of 30-39; 141 (23.7%) belonged to the age group of 40-49; and 93 (15.6) belonged to the age group of 50 and above. As for the distribution of the participants according to professional status, it was found that 191 (32.0%) were students; 221 (37.1%) worked in various professions; 39 (6.5%) were unemployed; 119 (20.0%) were housewives and 26 (4.4%) were retired.

Study Instruments

"Personal Information Form" and "Internet Addiction Scale" were used for data collection.

Personal Information Form: This form consists of four questions on the data about the independent variables of the study.

Internet Addiction Scale (IAS): The scale, which was designed by Hahn and Jerusalem (2001), aims to determine internet addiction levels of the individuals. The original title of the scale is *"Skala zur Erfassung der Internetsucht".* The scale was adapted into Turkish by Şahin and Korkmaz (2011).

The scale contains 19 items and 3 factors. The first factor is "Loss of Control-LC"; the second factor is "Tolerance Development-TD" and the third factor is "Negative Consequences for Social Relationships-NCSR"

Kaiser-Meyer-Oklin (KMO) and Bartlett test analyses were performed to test structural validity of the scale. KMO= 0,919; Bartlett test value was x2= 6087,383; sd=171 (p=0,000). It was found that the items within the scale concentrated on three factors and explained 68.095% of total variance. Confirmatory factor analyses showed that the model had an acceptable adaptation. To calculate discriminative power of items, the correlations between the scores obtained from each item and the scores obtained from the factors were calculated and it was found that each item had a significant and positive relationship with factor score. Internal consistency analyses were conducted to calculate internal consistency of the scale. Analyses revealed that internal consistency coefficients of the factors varied between 0.887 and 0.926 and that internal consistency coefficient for the general of the scale was 0.858.

Data Analysis and Interpretation
Each of the items in internet addiction scale was scaled as Never (1), Rarely (2) Sometimes (3), Generally (4) and Always (5). In parallel with the structure of the scale, for three sub-factors, averages of the response of the individuals to five-item Likert type scale were calculated severally. High averages indicate high level of internet addiction while low averages indicate low addiction levels. The scores obtained from the responses of the individuals to five-item Likert type scale did not show a standard character due to the differences in number of items in the sub-factors. For this reason, obtained raw scores were converted into standard scores (minimum 20; maximum 100).

The levels corresponding to the scores obtained from sub-scales can be summarized as follows: low internet addiction (20-51), mean internet addiction (52-67), high internet addiction (68-100).
In this framework, internet addiction levels of the individuals were analyzed using arithmetic mean, standard deviation, t test, ANOVA and LSD analyses. $p<.05$ level was considered as adequate for the significance between the factors.

FINDINGS
In this section, the findings of the study were presented and evaluated in tables.

1. Internet Addiction Levels of the Individuals

Table 1. Internet Addiction Levels of the Individuals

Variable	N	M	SD	Min	Max	Levels **(f/%)**					
						Low		Medium		High	
Loss of Control-LC	596	32,61	17,67	17,14	100,00	510	85,6	38	6,4	48	8,1
Tolerance Development-TD		32,84	17,92	20,00	100,00	511	85,7	46	7,7	39	6,5
Negative Consequences for Social Relationships-NCSR		27,01	14,01	17,50	100,00	538	90,3	43	7,2	15	2,5
Internet addiction (Total)		30,30	10,37	18,95	71,58	570	95,6	24	4,0	2	0,3

Table 1 indicates that the individuals in different age groups had a low level of internet addiction in sub-scales and in the general of the scale.

2. Internet Addiction Levels of the Individuals according to Age Groups

Table 2. Means, Standard deviations and Variance Analysis Results of the Internet Addiction Levels of the Individuals according to Age Groups

Age Groups	**N**	Loss of Control-LC		Tolerance Development-TD		Negative Consequences for Social Relationships-NCSR		Internet addiction (Total)	
		M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
>19 age	109	47,31	22,85	31,74	17,46	26,67	14,48	35,35	10,26
20-29 age	98	33,24	17,27	34,69	18,91	29,26	14,78	31,87	10,10
30-39 age	155	28,02	12,70	31,45	17,38	25,32	11,59	27,61	9,33
40-49 age	141	29,99	15,53	34,36	18,67	26,33	13,64	29,37	10,35
50 < age	93	26,39	10,68	32,20	17,13	28,87	16,44	28,66	10,26
Genel Ortalama	596	32,62	17,67	32,84	17,92	27,01	14,01	30,30	10,36

Variable	**Source of Variance**	**Square Total**	**Degree of Freedom**	**Mean Square**	**F**	**p**	**Significant difference (LSD)**
Loss of Control-LC	Between groups	31436,163	4	7859,041	30,089	,000	the age group of 19 and below other
	Within	154366,3	591	261,195			

	groups	30					age groups
	Total	185802,493	595				
Tolerance Development-TD	Between groups	1130,806	4	282,702	,879	,476	--
	Within groups	189973,682	591	321,444			
	Total	191104,488	595				
Negative Consequences for Social Relationships-NCSR	Between groups	1337,159	4	334,290	1,710	,146	--
	Within groups	115538,040	591	195,496			
	Total	116875,199	595				
Internet addiction (Total)	Between groups	4513,296	4	1128,324	11,224	,000	the age group of 19 and below – other age groups
	Within groups	59410,652	591	100,526			
	Total	63923,947	595				

Data in Table 2 revealed that internet addiction levels of the individuals who belonged to the age group of 19 and below were higher than those of the individuals who belonged to the age group of 20 and over. An analysis was made to determine whether these differences were significant. The results showed that there was not a significant difference between TD (F(4-591)= .879, P>0.05) and NCSC (F(4-591)= 1.710, P>0.05) scores. It was found that there was a significant difference between LC (F(4-591)= 30.089, P<0.01) and IA general total scores (F(4-591)= 11.224, P<0.01). LSD test was performed to determine the groups which caused difference. LSD test results revealed that there was a significant difference between the internet addiction scores of 19 and below age group and other age groups.

3. Internet Addiction Levels of the Individuals according to Professional Groups

Table 3. Means, Standard deviations and Variance Analysis Results of the Internet Addiction Levels of the Individuals according to Professional Groups

Professional Groups	**N**	Loss of Control-LC		Tolerance Development-TD		Negative Consequences for Social Relationships-NCSR		Internet addiction (Total)	
		M	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Student	191	41,45	21,95	34,63	19,14	28,63	15,13	34,62	10,35
Worker	221	30,20	14,88	34,16	17,69	27,20	14,09	29,77	9,85
Unemployed	39	30,03	11,72	29,87	15,28	22,69	6,62	26,90	7,19
Housewife	119	25,06	10,65	29,62	17,49	25,88	13,99	26,36	10,15
Retired	26	26,70	10,34	27,69	13,13	25,00	11,61	26,19	8,31
Total	596	32,61	17,67	32,84	17,92	27,00	14,01	30,30	10,36

Variable	**Source of Variance**	**Square Total**	**Degree of Freedom**	**Mean Square**	**F**	**p**	**Significant difference (LSD)**
Loss of Control-LC	Between groups	24150,221	4	6037,555	22,073	,000	between the students and other professional groups
	Within groups	161652,272	591	273,523			
	Total	185802,493	595				
Tolerance Development-	Between groups	3266,126	4	816,532	2,569	,037	housewives, students and

TD	Within groups	187838,362	591	317,831			professional groups
	Total	191104,488	595				
Negative Consequences for Social Relationships-NCSR	Between groups	1498,583	4	374,646	1,919	,106	--
	Within groups	115376,616	591	195,223			
	Total	116875,199	595				
Internet addiction (Total)	Between groups	6353,119	4	1588,280	16,305	,000	between students and other professional groups
	Within groups	57570,829	591	97,413			
	Total	63923,947	595				

Table 3 indicated that internet addiction scores of the students were higher in terms of sub-scales and IA general when compared to other professional groups. An analysis was conducted to determine whether these observed differences were significant. Analysis results showed that the difference between NCSC(F(4-591)= 1.919; P>0.05) scores of the individuals according to professional groups was not significant; while the difference among LC (F(4-591)= 22.073; P<0.01) and TD (F(4-591)= 2.569; P<0.05) and IA (F(4-591)= 16.305; P<0.01) total scores was significant. LSD test was performed to determine the groups which caused difference. LSD test results showed that there was a significant difference between the students and other professional groups in LC sub-dimension; among housewives, students and the individuals who were working in TD sub dimension; between students and other professional groups in IA general total.

4. Internet Addiction Levels of the Individuals according to Gender

Table 4. t Test Results according to Gender of the Individuals

Variable		N	M	SD	DF	t	p
Loss of Control-LC	Male	312	31,98	17,97	594	-,913	,362
	Female	284	33,31	17,33			
Tolerance Development-TD	Male	312	29,15	16,15	594-	5,396	,000
	Female	284	36,90	18,88			
Negative Consequences for Social Relationships-NCSR	Male	312	24,76	12,15	594	-4,148	,000
	Female	284	29,47	15,46			
Internet addiction (Total)	Male	312	28,35	9,95	594	-4,916	,000
	Female	284	32,45	10,39			

It was understood from Table 4 that internet addiction scores of males were higher from those of females in sub-scales (LC, TD and NCSC) and in the general of the scale. An analysis was performed to determine whether these observed differences were significant. Analysis results showed that the difference between internet addiction scores of males and females according to LC subscale was not significant (t(594)=-.913; P>0.05); DFO (t(594)= -5.396),. However, it was found that the difference between internet addiction scores of males and females according to TD (t(594)= -5.396), NCSC (t(594)=-4.148) sub scales and IA general total (t(395)=-4,916) was significant

RESULT AND DISCUSSION

It was found that the individuals had low level of internet addiction in sub-scales and in general of the scale according to age groups. This finding is consistent with literature data. The literature contains various studies carried out in different societies which reported significantly low number of individuals with internet addiction

(Saville et al., 2010; Chaw, Black, 2008). Similar studies found that the majority of the individuals had a low level of internet addiction (Niesing, 2001; Hahn and Jerusalem, 2001).

It was found that internet addiction levels of 19 and below age group was high. It was observed that there was a significant difference between internet addiction scores of the individuals who belonged to the age group of 19 and below and 30 and below. Similarly, Choi et al., (2008) reported that internet addiction was more common among young people, and for this reason, young people should be permanently monitored. Öztürk et al., (2007) reported that internet addiction turned out to be a serious risk factor particularly for 12-18 age group. Hahn and Jerusalem (2001) reported that the individuals belonging to the age group of 20-29 used internet more, while internet addiction scores of the individuals belonging to the group of 19 and below was higher than other groups and that this situation varied according to gender.

It was found that there was a significant difference between internet addiction scores of the students and other professional groups. The study of Seville et al, (2010) conducted on high school students reported that internet addiction of the students who recently started high school was higher than that of other students. Chin-Chung and Sunny (2003) reported similar results.

Internet addiction levels of males were found to be higher than those of females. These findings are supported by the findings of various studies in the literature. In a study carried out by Choi et al., (2008) it was reported that the case of internet addiction was more common in male students when compared to female students. Karaman and Kurtoğlu (2009) found that male pre-service teachers were more addicted to internet than female pre-service teachers. Hahn and Jerusalem (2001) reported that males used internet more when compared to females; however internet use levels of females increased in years.

Internet addiction is described as the use of internet in increasing amounts of time in order to achieve satisfaction. Research shows that Internet addiction results in personal, family, academic, financial, and occupational problems. Because internet addicts by definition will have difficulty moderating their use on their own, therapy techniques can be employed to help them to become more motivated to reduce their use, and to become more conscious of how they get into trouble with the Internet. For this reason, in some countries, therapy centers are founded to identify and treat Internet addiction. Parents need to be aware of the signs of the internet addiction to help their children. For families, schools should organize such seminars as the symptoms of internet addiction, communication techniques, and how to take a proactive stance.

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AN EVALUATION OF STUDENT RESPONSE SYSTEMS FROM THE VIEWPOINT OF INSTRUCTORS AND STUDENTS

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ABSTRACT
Student response systems, often referred to as “clickers” are small hand-held devices which students may remotely respond to questions that are posed during lecture. In this research, the perspectives and lived experiences of both instructors and students who used clickers were examined. Also, the activities used by instructors were compared to Bloom’s taxonomy levels to provide a new component to our understanding of the impact of clickers. Instructors saw clickers as one tool in supporting student learning in their classrooms. The improved participation, immediate feedback, impact on attendance, and relatively easy formative assessment that result from the use of clickers provided the instructors a method of engaging students. The students requested the increase in use because they felt the use of clickers did supported or improved their classroom learning. They also enjoyed the peer discussions that instructors facilitated with regard to the use of clickers. Consequently, it was found that these systems were especially valuable tool for introductory courses and for monitoring peer learning methods in the large lecture classroom.

INTRODUCTION
Student Response Systems “SRSs” (Kaleta & Joosten, 2007) or “clicker” (Bergtrom, 2006), as they are commonly called, offer a management tool for engaging students in the classroom. Many instructors at both large and small educational institutions have begun to use classroom technology that allows students to respond and interact via small, hand-held, remote keypads (Caldwell, 2007).

In order to comprehend the pedagogic developments in this area, it is necessary to understand the practical process of using the SRSs. A typical pattern of use is presented in Figure 1. During the lecture, the instructor poses a question. Each student has a handset (clicker) that allows students to select the preferred option for the answer. The handsets transmit this information to a receiver, which in turn transmits it to the voting software on a computer in the class. The handsets transmit to the receiver using wireless technologies, depending on the particular system used. After the allotted time, the software produces a histogram or bar chart of the results, which is displayed to the students using a data projector to the computer. The instructor then chooses of action to respond to the results. The software also allows the data to be recorded so that results can be analyzed later.

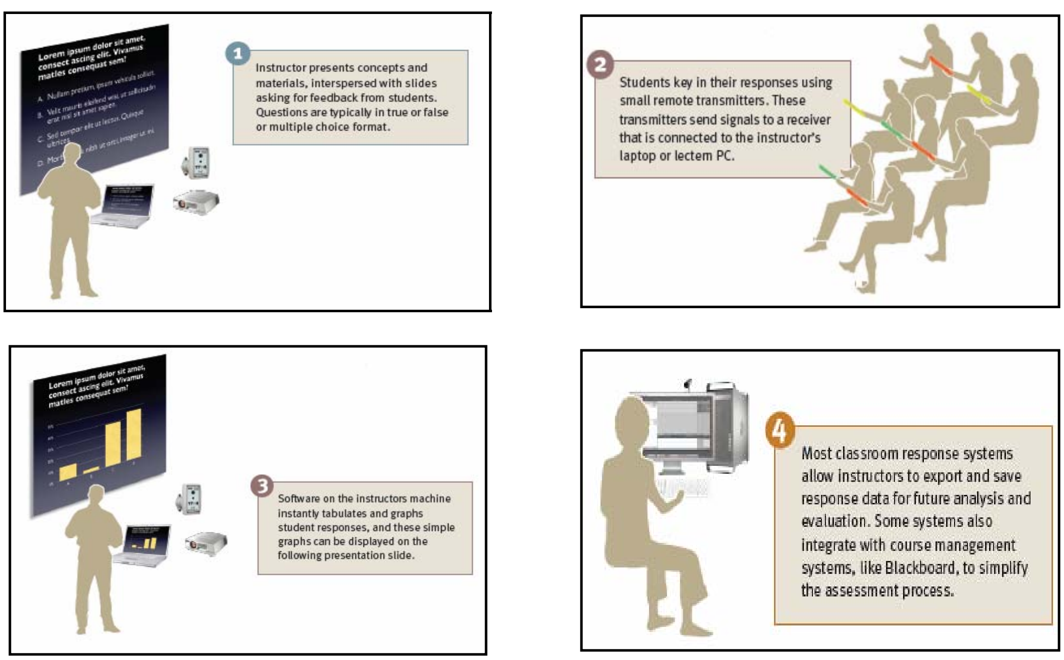

Figure 1. Schematic of the Student Response System

Most handsets allow multiple-choice responses, with up to ten answers available. The handsets can be used anonymously. However, the handsets can be mapped to a student's name. This allows the instructor to see individual's answer, either within the lecture or when reviewing responses at a later stage.

The key advantage of using the SRS (Student Response System) is that it can give feedback to both students and instructors on how well the entire class understands concepts presented. Once this feedback is obtained, an instructor can modify the course of instruction, or students can work out misconceptions by peer or classroom discussion (Kay, 2009). The SRSs have been used to improve student interaction, engagement, and attention (Draper & Brown, 2004; Hinde & Hunt, 2006), increase attendance (Bullock et al., 2002), stimulate peer and class discussion (Pelton & Pelton, 2006), provide feedback for both students and instructors to improve instruction (Caldwell, 2007), and improve learning performance (El-Rady, 2006; Judson & Sawada, 2002; Kay & LeSage, 2009a; Kay & LeSage, 2009b). The fundamental differences between the SRSs and traditional classrooms, benefits to using the SRSs, and challenges associated with the SRSs are described in following sections.

Fundamental differences between the SRSs and traditional classrooms

Feedback can be acquired by multiple means, asking volunteers to share answers, including a show of hands, use of small individual whiteboard or tables to display answers, or using colored cards (flashcard) to represent multiple-choice responses, in a traditional lecture (Draper et al., 2002; McCabe, 2006; Kay, 2009).

However these methods have notable drawbacks. A show of hands after students have answered a question for the second time is the simplest method. It gives a feel for the level of the class' understanding and allows the instructor to pace the lecture accordingly. The main drawback is a loss of accuracy, in part because some students may hesitate to raise their hands and in part because of the difficulty in estimating the distribution. Besides, some students are inclined to copy the responses of others. In addition, when hands are lowered, the data is lost (Abrahamson, 2006; Burton, 2006; Pelton & Pelton, 2006; Slain et al., 2004). Other shortcomings are the lack of a permanent record and the lack of any data collected before convinces his/her neighbor's discussion (Mazur, 1997).

In contrast to traditional lectures, the SRS-based classroom has several key advantages. The SRS allows students to enter their answers to the concept tests as well as their confidence levels, on a variety of handheld devices, ranging from graphing calculators to palmtop or laptop computers, which they share in small groups of three or four. Their responses are relayed to the instructor on a computer screen and can be projected so the students see it, too. The main advantage of the system is that analysis of the results is available immediately. In addition, student information is available to the instructor, making large classes more personal; the system can also handle numerical and non-multiple-choice questions, and sharing these handheld computers enhances student interaction (Al-Fahad, 2009; Beatty, 2004; Hussain & Adeeb, 2009; Keskin & Metcalf, 2011; Mazur, 1997; Pradhan et al., 2005).

Benefits of using the SRSs

As identified in the introduction section, whilst voting systems can support teaching and learning within lectures, any benefits will mostly depend on how effectively they are used on each occasion. In order to judge whether the system does, indeed, enhance the lecture format, it is first necessary to identify the assumptions that are made about what counts as "good" learning. Three key principles were discussed in the literature; student involvement, learning, and assessment and summarized in Table 1.

Table 1: Summary of the student response system benefits (Kay & LeSage, 2009)

Benefit	Description	References
Student involvement		
Attendance	Students go to class more	Burnstein & Lederman (2001); Caldwell (2007); Greer & Heaney (2004)
Attention	Students are more focused in class	Bergtrom (2006); Burnstein & Lederman (2001); Caldwell (2007); d'Inverno et al. (2003); Draper & Brown (2004); Elliott (2003); Jackson et al. (2005); Jones et al. (2001); Latessa & Mouw (2005); Siau et al. (2006); Slain et al. (2004)
Anonymity	All students participate anonymously	Caldwell (2007); Draper & Brown (2004); Jones et al. (2001); Siau et al. (2006); Simpson & Oliver (2007);

		Stuart et al. (2004)
Participation	Students participate with peers more in class to solve problems	Bullock et al. (2002); Caldwell (2007); Draper & Brown (2004); Greer & Heaney (2004); Jones et al. (2001); Siau et al. (2006); Stuart et al. (2004); Uhari et al. (2003); Van Dijk et al. (2001)
Engagement	Students are more engaged in class	Bergtrom (2006); Caldwell (2007); Draper & Brown (2004); Latessa & Mouw (2005); Preszler et al. (2007); Siau et al. (2006); Simpson & Oliver (2007)
Learning		
Interaction	Students interact more with peers to discuss ideas	Beatty (2004); Bergtrom (2006); Caldwell (2007); Elliott (2003); Freeman et al. (2007); Kennedy et al. (2006); Sharma et al. (2005); Siau et al. (2006); Slain et al. (2004); Stuart et al. (2004); Trees & Jackson (2007); Van Dijk et al. (2001)
Discussion	Students actively discuss misconceptions to build knowledge	Beatty (2004); Brewer (2004); Draper & Brown (2004); Jones et al. (2001); Nicol &Boyle (2003)
Contingent teaching	Instruction can be modified based on feedback from students	Brewer (2004); Caldwell (2007); Cutts (2006); Draper & Brown (2004); Elliott (2003); Greer & Heaney (2004); Hinde & Hunt (2006); Jackson et al. (2005); Kennedy & Cutts (2005); Poulis et al. (1998); Stuart et al. (2004)
Learning performance	Learning performance increases as a results of using the SRS	Bullock et al. (2002); El-Rady (2006); Fagan et al. (2002); Kaleta & Joosten (2007); Kennedy & Cutts (2005); Pradhan et al.(2005); Preszler et al. (2007); Schackow et al. (2004); Slain et al. (2004)
Quality of learning	Qualitative difference when learning with the SRS (e.g., better explanations, thinking about important concepts, resolving misconceptions)	Crouch & Mazur (2001); Caldwell (2007); d'Inverno et al. (2003); Draper & Brown (2004); Elliott (2003); Greer & Heaney (2004); Nicol &Boyle (2003)
Assessment		
Feedback	Students and teacher like getting regular feedback on understanding	Abrahamson (2006); Cline (2006); Draper et al. (2002); McCabe (2006); Pelton & Pelton (2006)
Formative	Assessment is done that improves student understanding and quality of teaching	Beatty (2004); Bergtrom (2006); Brewer (2004); Bullock et al. (2002); Caldwell (2007); Draper & Brown (2004); Dufresne & Gerace (2004); Elliott (2003); Greer & Heaney (2004); Hatch et al. (2005); Jackson et al. (2005); Siau et al. (2006); Simpson &Oliver (2007); Stuart et al. (2004
Compare	Students compare their the SRS responses to class responses	Burton (2006); Caldwell (2007); Draper & Brown (2004); Hinde & Hunt (2006); Simpson & Oliver (2007)

With respect to student involvement, there is considerable data to suggest that students using the SRS are more engaged in concepts covered, participate more, pay more attention in class, and are more involved in class discussion. One of the greatest of the SRSs is that they offer the opportunity to make the lecture "more interactive without appearing threatening".

It is likely that many students hold back from answering or responding through peer pressure or the potential embarrassment of publicly giving the wrong answer. This in turn may mean that only the more confident or able student respond, when they are least in need of instructor attention (Durbin & Durbin, 2006; Fies & Marshall, 2006; Kay, 2009).

With respect to learning, numerous studies have reported that students feel they learn more when the SRS is used in higher education classrooms (Greer & Heaney, 2004; Pradhan et al., 2005; Preszler et al., 2007). Furthermore, many experimental studies have been done where SRS-based classes score significantly higher on tests and examinations than classes who are exposed to traditional lecture formats (Kaleta & Joosten, 2007; Kennedy & Cutts, 2005; Reay et al., 2005; Reay et al., 2008).

Regarding assessment, the SRS helps improve the feedback cycle by ensuring anonymity, collecting, and summarizing responses from all students in larger classes very quickly, and limiting the copying of answers (Abrahamson, 2006; Beatty, 2004; Draper & Brown, 2004; Pradhan et al., 2005; Simpson & Oliver, 2007). In addition, the regular use of the SRS can offer feedback to both the instructor and students as to how well concepts are being understood (Bergtrom, 2006; Bullock et al., 2002; Dufrense & Gereca, 2004). Timely feedback to students about their performance can be greatly assisted by the use of the SRSs. Because answers are marked electronically and automatically, feedback on performance and presentation of the right answers can be achieved quickly (Kay, 2009). Students can then see how their performance compares to that of the rest of the group. When used for peer assessment students can gain immediate feedback on their work. The instructor can also gain feedback in this way. They can, for example, see how well the lecture has performed and use the information immediately to provide appropriate action such a re-describing a misunderstood item.

Challenges associated with the SRSs

Three categories of challenges were predominant in the literature. Technology, instructor, and student based challenges. Each of these challenges is presented in Table 2.

With respect to technology, on occasion, signals from some remote devices do not register on the instructor's computer, a particularly stressful experience when students are being evaluated for grades. Regarding new methods of learning, some students react adversely to the use of the SRS because the overall approach to learning changed. They are accustomed to lectures and a switch of methods leads to stress, frustration, and resistance at first. Other students are distracted by the use of the SRS (Kay, 2009).

Table 2: Summary of the student response system challenges (Kay & Lesage, 2009)

Challenge	Description	References
Technology-based challenges		
Bringing remotes	Students forgot or lost remotes and could not participate in class	Caldwell (2007); Reay et al. (2005)
SRS did not work	Remote devices did not function properly	El-Rady (2006); Hatch et al. (2005); Sharma et al. (2005); Siau et al. (2006)
Instructor-based challenges		
Responding to student feedback	Less experienced instructors cannot adjust to student feedback	Abrahamson (2006); Hu et al. (2006)
Coverage	Cover less course content if the SRS is used	Beatty (2004); Beatty et al. (2006); Burnstein & Lederman (2001); Caldwell (2007); d'Inverno et al. (2003); Burton (2006); Cutts (2006); Draper & Brown (2004); Fagan et al. (2002); Freeman et al. (2007); Hatch et al. (2005); Sharma et al. (2005); Siau et al. (2006); Slain et al. (2004); Steinhert & Snell (1999), Stuart et al. (2004)
Developing questions	Time consuming to create the SRS questions	Allen & Tanner (2005); Beatty et al. (2006); Boyle (2006); El-Rady (2006); Fagan et al. (2002); Freeman et al. (2007); Horowitz (2006); Paschal (2002); Robertson (2000)
Student-based challenges		
New method	Students find it difficult to shift to a new way of learning	Allen & Tanner (2005); Beatty (2004); Fagan et al. (2002); Siau et al. (2006)
Discussion	Discussion leads to confusion or wasting time	Draper & Brown (2004), Nicol & Boyle (2003); Reay et al. (2005)
Effort	Too much effort is required by students when using the SRSs	Trees & Jackson (2007)

Summative assessment	Using the SRS for tests may not be popular with students	Caldwell (2007)
Attendance for grades	Students do not like the SRSs used for monitoring attendance	Caldwell (2007)
Identifying students	Students want to remain anonymous	Abrahamson (2006)
Negative feedback	Students feel bad when receiving negative feedback	Carnaghan & Webb (2007)

The SRS is a new technology and has room for technological improvement and advancement. For example, students' responses sometimes could not be detected and received by the receiver. The receiver was not able to receive more than one concurrent response, or the transmitter was not within the range of the receiver. System can only capture quantitative data, thus limiting the responses to multiple-choice or true-false questions. Since using the wireless handheld transmitter was fun to the students, some of them did not take it seriously-by clicking multiple times on purpose, by clicking on answers that were obviously incorrect or by clicking on answers that were out of the range/choices given.

Many researchers have discussed that there are several key problems with current research on the SRSs including: a lack of systematic research, a bias toward using anecdotal, qualitative data, excessive focus on attitudes as opposed to learning and cognitive processes, and samples derived from limited educational settings. Several researchers have maintained that the majority of the SRS data collected to date is anecdotal or qualitative (Fies & Marshall, 2006; Kaleta & Joosten, 2007; Schackow et al., 2004). However, both qualitative and quantitative data is needed to fully understand the use and impact of the SRSs (Kay & Lesage, 2009a). This research provides both qualitative and quantitative results with the statistical analysis obtained from lived experiences of both instructors and students.

METHOD

In this study provided a unique look at the use of clicker technologies in university classrooms. The perspectives and lived experiences of both instructors and students were captured through rich, thick descriptions (Geertz, 1973). In addition, the actual activities used by instructors were compared to Bloom's taxonomy levels (Anderson & Krathwohl, 2001) to provide an entirely new component to our understanding of the impact of clickers. The attitudes of the students were also investigated quantitatively. The quantitative method was probed also to elucidate the gender differences in attitudes toward the SRS.

Four main research questions toward the purpose of the research guided this study were determined as follows:

1. How do instructors describe their experience of incorporating clickers into their university level classes?
2. Are instructors who incorporate clickers aware of the cognitive development of their students?
3. How do students report their experience of using clickers in their classes?
4. How do male and female students differ in their attitudes toward the SRS?

Participants

Six faculty members of various academic ranks who were using clicker technologies in their teaching and representing a broad range of disciplines, experience with clickers, and academic rank were selected. Firstly, an e-mail was sent to each of the instructors outlining the study details and requesting their participation in the research. Of the first six instructors emailed, all but two agreed to take part in the study. One pointed out that he was not currently teaching a class using clickers but noted a colleague who was teaching that course with clickers. When researcher contacted the colleague he agreed to participate. Another instructor did not respond to researcher's e-mail request for participation in the study, and thus another instructor from the list with a similar academic rank, discipline, and clicker experience was contacted and did agree to participate. One instructor who agreed to participate recommended also including a colleague with several years of experience with clickers.

Researcher's final sample of six instructors included two professors (chemical and physics), one associate professor (chemical), and one assistant professor (geology), two lecturers (geology and physics). The gender distribution was split three female and three male. University and college teaching experience ranged from 8 to

37 years and experience using clicker technologies ranged from less than two years to over ten years. The SRSs were applied at chemical, geology, and physics engineering departments.

Once the six instructors were selected and agreed to participate in the study, researcher attempted to recruit two students from each instructor's class in which s/he is using clicker technologies. The students were recruited by an in-class announcement by the instructor or the researcher. Students were asked to participate in a group interview relating to their experience with the use of clickers in that particular classroom. Rather than purposeful sampling, students self-selected themselves into the study by responding to the recruitment solicitation.

These interviews provided triangulation by source and also student opinions about the use of clickers. It was intended to secure two students from each instructor's class to interview as to their perceptions of the use of clicker technologies within that course and across campus. A total number of twelve students representing six instructors were able to be interviewed. The students represented various academic learning levels, from freshman to senior level. Student opinions and feelings about clickers may vary based on their year in school. Having only one semester left before graduation and being required to purchase a clicker during that semester might play a role in the student's perception of the use of clickers. However, the hunch was not fully realized because of the limited sample size of students researcher interviewed. In addition, students may voice varying opinions based-on the number or courses and experiences they have had with clickers. For example, if a student has had a number of experiences, s/he may have a different perception of the use of clickers than one who has had a very limited experience or only a single, either positive or negative clicker experience. As well, interviewing students in even a small group of two may affect their responses. Unfortunately, each student was not able to be interviewed individually because of student scheduling and time constraints and this might have impacted the results. However, still the interviews of twelve students provided some valuable information relating to their opinions and feelings about the use of clickers in the classroom. The student sample including six female and six male students consisted four freshman, four sophomores, two juniors, and two seniors. Furthermore total number of 523 volunteer students (241 males, 262 females) from the class of the instructors supporting the research was given the SRS attitude survey. The student were also freshman (n=135), sophomore (n=129), junior (n=131), and senior (n=128).

Procedure
The data of this research was collected with the help of three sources which are interview, observation, and survey.

An e-mail request was sent to those instructors chosen from the list of instructors currently using clicker technologies. On agreeing to take part in the study, the instructor participants signed an informed consent document and were asked to supply a class period in which researcher could observe them using clicker technologies. To see how to design clicker questions and evaluate the benefits and drawbacks of clickers, the courses of the instructors supported to this research were observed. This was purely a descriptive and exploratory observation during which field notes were taken; researcher served as a non-participatory observer in the class. Following the classroom observation, an agreed on date was set to conduct 30 minutes of semi-structured faculty interview. Transcriptions of the interview were provided to each instructor participant by e-mail as a member check for validity of the transcription. All six participants confirmed the validity of their interview.

In addition, researcher asked each instructor to provide four sets of classroom slides showing their range of use of clickers. The slides were considered document artifacts and analyzed for levels of cognitive process according to the revised Bloom's taxonomy (Anderson & Krathwohl, 2001). The instructors were asked to make an in-class announcement to the students for volunteer students. Interested students were directed to contact researcher by e-mail for participation and assured that their participation not only would be voluntary, but would be anonymous to all parties except the researcher. The students` interviews were audio-taped and transcribed using the interview question protocol. They consisted of either a group of 2-3 students or an individual student and lasted 25 minutes. Students were also allowed for free-flowing discussion on opinions and thoughts. The purpose of the student interview was twofold: to provide a voice to the students as to their perceptions on the use of clickers in the classroom and to provide triangulation related to the method and frequency of use of clickers in the classrooms represented. Both were partially accomplished through the student interviews. Also to examine gender differences in attitudes toward the SRS, the SRS survey was applied to volunteer 523 students at the end of the semester.

Data Analysis
The phenomenological approach was used in this research. The basis of phenomenology is an interpretive paradigm that investigates the qualitatively different ways in which people experience or thinks about something

(Marton, 1986). Phenomenography, an approach to educational research that appeared in publications in the early 1980s (Marton, 1981; 1986), initially emerged from an empirical rather than theoretical or philosophical basis (Akerlind, 2005). Phenomenology begins with an exploration of phenomena, in this case the phenomena of using or experiencing clicker technologies in university lectures. Following a traditional qualitative analysis approach, data collection and analysis occurred concurrently in this research.

The contextual experiences of instructors and students are the units of analysis for this study. In addition, researcher reviewed clicker slides used by the instructors for cross comparative analysis. This analysis of interview data from instructors and students, document artifacts, and observational data allows for triangulation by data source and method, thereby increasing the credibility and dependability of the study. Researcher transcribed and reviewed the interview narratives for emerging themes relating to the use of clickers to engage students in higher-level cognitive thinking. Researcher also reviewed the clicker technology slides and coded their contents according to a taxonomy table looking for emerging themes and patterns. A quantitative summary of the slide analysis was also formulated. The observation field notes were compared to the student and instructor interview narratives and documents supplied by the instructors. Finally, students completed the SRS attitude survey at the end of the semester. This survey consisted of nine, seven point Likert scale (from strongly disagree “1” to strongly agree “7”) items. Items were constructed based on a review of the SRS literature and focused on general attitude, student involvement, learning, and assessment. The internal reliability for the total nine-item scale was 0.89 (Kay, 2009).

Creswell (1998) provided an outline of analysis for a phenomenological study design Researcher followed his design which includes a focus on data management, reading and writing memos, description, classification, interpretation, and representation or visualization. Data management included recording audiotapes and taking field notes. Reading through texts, making notes in the margin, and the formation of initial codes followed. A constant comparative method of analysis as described by Glaser & Strauss (1967) was employed. Each statement had equal worth and statements were grouped into meaningful units or categories. Finally, a rich, thick description (Geertz, 1973) of the data was formulated, with the overall goal to develop a description of what students and instructors experience and perceive with regard to the use of clickers for fostering higher-level cognitive thinking.

To ensure rigor and credibility of this study, several verification methods were employed. Creswell (1998) provided eight procedures for ensuring the trustworthiness of a study: triangulation, prolonged engagement, negative case analysis, clarifying researcher bias, member checks, peer review, thick description, and external audits. Creswell (1998) recommended that “researchers must engage in at least two of these in any given study”. In this study, researcher used the following strategies as outlined by Creswell: triangulation, prolonged engagement, peer review, member checks, thick description, and clarification of researcher bias.

RESULTS AND DISCUSSION

The results of the interviews, observations, document artifacts and survey provided by the instructors and students were presented in the following sections.

1. Results of the interviews done with instructors

Semi-structured interviews based-on the interview question protocol were conducted with each of the six instructors. The purpose of the interview and question protocol was to explore the instructors’ methods of using clickers and to examine their experiences with using clickers in the classroom. *Four* themes emerged from the six instructor interviews.

I) There are various uses of clicker technologies for per instructor

General knowledge questions, problem solving questions included in upcoming exams, questions for formative assessment of the class about classroom procedures, questions related to course content that is about to be covered with or without point, questions as a review of course content previously covered with or without points, questions about high interest or current event topics.

An example toward using of clicker may be given the course of the lecturer in geology engineering department. “*As an example of assessing understanding, after teaching the students about the types of geologic faults, I can then show them pictures of faults and ask them what type of fault is shown, and type of stress and strain produced it. As an example of assessing changes in world-view, I ask the students how old they think the earth and the universe on the first day, and then after the geology section of the course I ask them again to see the changes in their conception of the age of the earth and universe. I also ask them about their views on evolution before the evolutionary lectures and then again afterwards”*.

II) Instructors view clicker technologies as a tool that enhances classroom learning and teaching
A subtheme within this idea of clicker technologies as a tool to teaching and learning was how clicker technologies are a tool to pace and modify their current teaching practice. Instructors mentioned that they have become much more thoughtful in the design of their lecture presentations. Instructors mentioned how clickers' slides provide for better pacing of the lecture presentations and allow for a reminder of what it is they want to discuss that day in lecture.

Another subtheme that emerged is that *i> clicker* (www.iclicker.com/dnn/) *technology has* provided a tool for the instructor to think about what questions they want to ask their students during their lectures. The associate professor in chemical engineering department declared "*certainly, because the questions associated with clickers are conceptually connected to a discipline's habits of mind, methods and objects of inquiry, ways of communicating, ways of knowing, and more*". He told *"don't use them for frivolous questions just to take attendance. That will probably make the students resentful of clickers. Ask questions that really pertain to the material that has been taught so the students can get immediate feedback on their level of understanding. Also, questions on the student's thoughts before and after being taught a subject can help an instructor tell what methods are most effective in learning".*

Instructors felt clicker questions generate discussion because students can see immediate feedback as to the responses of the entire class. Students know immediately that they are not the only person who got the answer correct or who feels a certain way about a topic. Instructors also described using the responses as a means for generating further discussion and for modifying their presentation of the content on the spot. The professor in chemical engineering department told, "*I just like the fact you can get feedback right now, right away, and use the teaching moment".* When asked about the benefits of clickers, this idea of immediate feedback for both the student and instructor continued to emerge. She continued, "*that they give each student an opportunity to contribute his or her ideas, and because the contribution is anonymous to the rest of the class, there is no punishment for being wrong. This makes students think more deeply, take a few more risks, and interested in why they were off the mark or correct*".

III) Instructors believe clicker technologies have a positive impact on student engagement and attendance
Student engagement and increased attendance were commonly mentioned by the instructors interviewed as a benefit of clicker technologies. And while none of the instructors interviewed used clicker technologies as many their course points or for solely tracking attendance, they saw the benefit that associating points to the questions has on student engagement, attendance, and possibly even academic performance. The professor in physics engineering department with 40 years of teaching experience explained *"I am sure it has increased participation. But the big thing we noticed right away is that the test scores went up. We draw our questions from a test bank, so we expect sort of similar performance across the years and last semester was then best semester we've had for a long-time, long-time in scores for the class. I think the best part is that we think it has cleared up questions before the exam".* The assistant professor in geology engineering department about attendance in the class said "*Students are more likely to come to class if their clickers are being used in some way to take attendance or for borderline grade cases as I do. The students also enjoy being able to speak-back to the instructor by clickers".* The lecturer in physics engineering department told "*positively, the questions focused their attention on particularly important issues".* The lecture in geology department declared *"I have not measured attendance before and after the use of clickers so it is hard to tell. I get a sense that a slightly larger proportion of students attend since I started using clickers".*

Another subtheme is the clicker technology which has had student engagement in the classroom and therefore impacted their teaching of the content. Instructors noted active engagement with the content, a decrease in student incivility, and occasionally, an increase in student attendance. The professor in physics engineering department stated "*students seem more engaged. To my mind as I lectured, they seemed more engaged and I am even asking more concept questions, you know also clicker questions"*.

IV) The benefits and drawbacks of using clicker technologies
Instructors noted technical issues and limits they encounter with clicker technology, but almost all cited personal error as the main reason for technical glitches they encounter. Instructors also cited frustration on the part of students and disappointment when technical errors occur in the classroom session. The lecturer in physics engineering department explained *they are difficult to use with open-ended questions and could squelch class discussion. They could also place too much focus on being correct rather than understanding why one is (or is not) correct".* She added, "*you only get five choices for responses. With more subtle subjects, that may not be enough".* On the other hand according to the associate professor in chemical engineering department, "*Overall,*

I have had a lot of fun with them. I have hoped that they have improved my teaching, overall they have helped improve my accessibility to the students because they ask more questions at the end of class. They are hard to get out of the room at the end of class. I think it is because they know I am interested in their responses, opinion questions, and they know I am interested".

The faculty interviews were filled with thick description of the clicker technologies, their teaching, and eventually the classroom learning environment. It was interesting to note that none of the instructors felt they had reached the pinnacle of clicker understanding and use. Each one mentioned the process as evolving and thought they could do more with the technology to improve student learning. However, another subtle theme that emerged through the overall interview process was the student-centered approach each of these instructors held. While researcher was not able to distinguish whether that approaches was held before the use of clickers or at their onset of using clickers. They seemed to feel that clickers allowed for this improvement to learning, not only by engaging students and soliciting student feedback, but also by changing the way they designed and carried out the lecture itself. Instructors went into their class sessions open to hearing what students knew and thought about content, open to the discussion that might be generated based on clicker questions, and open to modifying previously held ways of teaching in an attempt to improve the classroom environment for the students they teach. And in the process, the instructors realized this was not only beneficial but also fun.

2. Results of the researcher's observation toward using clicker

As a part of this study, an observation of each of the six instructor participants was conducted to view how they were using clickers in the classroom. Researcher served as a non-participatory observer, generally sat in the rear or middle of the classroom, and transcribed field notes as to happenings in the classroom. The observation was structured in such a manner so that the instructor did not change his/her normal teaching and use of clickers based on participation in the study. From the observation field notes, researcher conducted a cross-comparative analysis, looking for emerging themes on the observations of instructors. Four themes emerged from the observation field notes.

I) Full classroom discussion is initiated following clicker questions.

The observation revealed that almost each instructor encouraged students to hold a peer discussion relating to most of clicker questions posed. This peer discussion was fostered either before answering clicker question or after students answer clicker question but before showing the polling results. It was exciting to witness the explosion of student discussion given this opportunity. As an observer, it seemed the students were on target with their discussion and these discussions took only a limited time to complete in the overall time in the classroom.

II) Various technological tools are used in the classroom.

The instructors using clickers also used various other technological tools in the classroom. Instructors used PowerPoint, Graphics, Images, Video, etc., which is a necessity to the *i>clicker technology* (Fig. 2), was being used by each instructor. This combination of learning systems enhanced the engagement of the students in the class.

Figure 2. Student using i>clicker in the class

III) Most students had their clickers and were taking part in.

In the beginning of the course a headcount of the number of students present in the classrooms was conducted. This manual count was compared with the number of response registering in *i>clicker technology*. In every observation instance it appeared most of the students present were participating in clicker questioning a response.

Most students in this study seemed open and willing to use clickers and even desired greater use of clickers across campus. All students, regardless of their like or dislike of clickers, were able to identify benefits of clickers to their learning, given the instructor was component in clicker technology.

The only halting point was the technical issues that instructors encountered. Therefore the technical and pedagogical education instruction should be provided to instructors before implementation of clickers in the classroom, thus alleviating some of the student and instructor frustration with technological errors on the part of the students and the instructors.

In addition students often want to know why clickers are being used, how often clickers will be used, and what is expected of them on the use of clickers. While clicker technologies are relatively user-friendly, campuses should make technical assistance available to students. Instructors should also gain enough understanding of the technology to provide small technical assistance in the classroom and to explain their reasoning behind their use of clickers in the classroom.

3. Results of the slide's analysis provided by instructors

As a part of their participation in this research, instructors were asked to supply several sessions of their *i>clicker* slides to be compared to Bloom's taxonomy of cognitive domains. The slides they submitted were at the discretion of the instructors. Several instructors sent a range of their use of clickers, and they were free to select the slides to be shared with me for analysis.

The purpose of the slide analysis portion of the study was multidimensional. It served as a method of triangulation to support the observation and interview results as to how often, and in what manner, clickers were being used in the classroom. It also allowed for an analysis of the cognitive level of use of clickers in relation to Bloom's taxonomy.

On receiving the slides, the number of times was counted in which a clicker question was asked per session, and calculated the total number of slides presented in that session. Overall, researcher analyzed 12 sessions of slides included 143 clicker questions slides, provided a somewhat quantitative aspect to the study. Table 3 outlines the slide analysis results. Also sample clicker questions toward the courses were represented in Figure 3.

The six levels of Bloom's taxonomy, from the least complex to the most complex of thinking, include: knowledge, comprehension, application, analysis, synthesis, and evaluation. Each slide was placed within one of the six levels of Bloom's taxonomy of cognitive domains with instructors. When a question was difficult to place, it was placed in the lower of the possible levels rather than in a higher-level. Consistency was a key to analyzing the slides.

Table 3: The number of slides related to Bloom's Taxonomy

Courses	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Physics	17	12	19	2	2	3
Chemistry	16	4	27	3	4	4
Geology	8	-	14	-	-	8
Total	41	16	60	5	6	15

Note: Each session was 90 minutes and each course was observed four times. The physics and chemistry lectures were represented average 14 slides in each session. Also geology lectures were presented the average 8 slides.

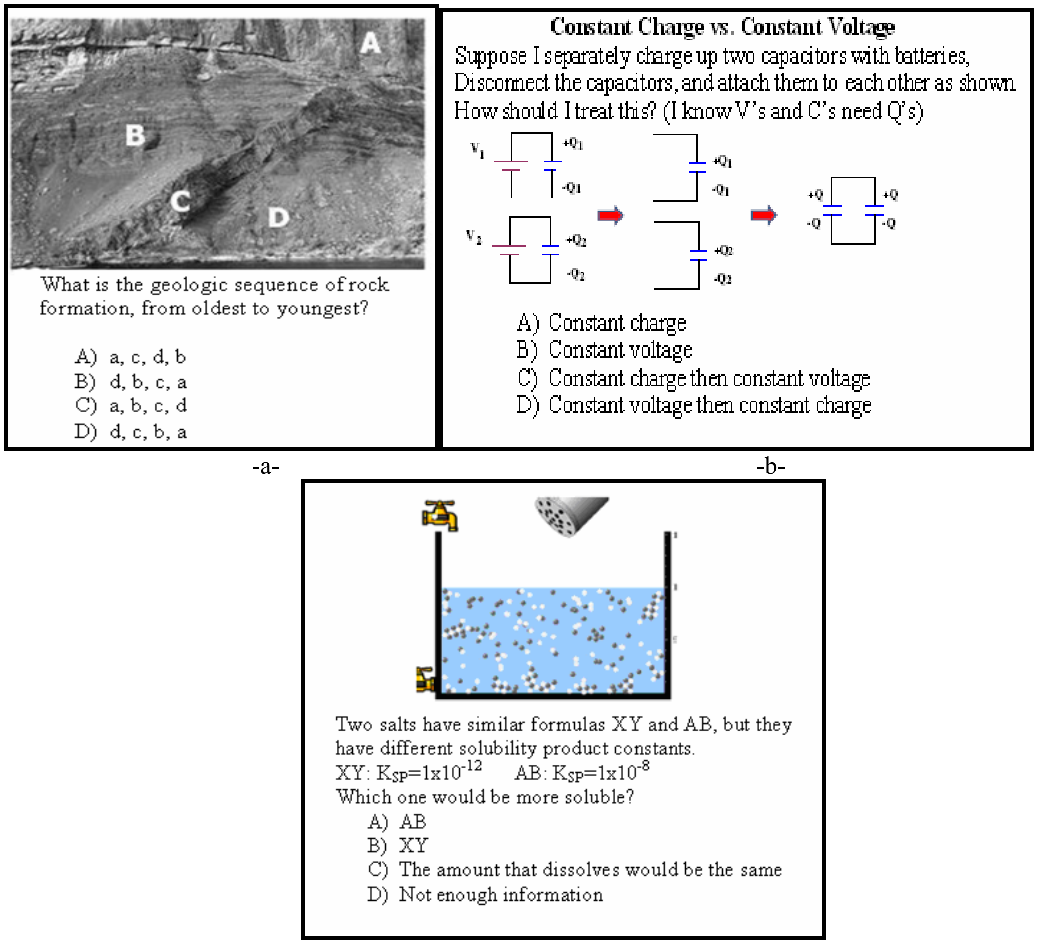

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Figure 3. Examples of applied reasoning questions presented in class with the SRS for (a) Geology, (b) Physics, (c) Chemistry courses.

What became evident in the analysis of the slides is the variety of use by instructors both within and across the disciplines represented. Recognizing this variety of use by instructors provided triangulation with the results from the observation and interviews, substantiating the idea that these instructors pose clicker questions in a variety of ways in the classroom.

It is interesting to note the large number of slides used in several of the classroom sessions. The classroom session slides analyzed did include most slides, some of which had only one minor difference from the slide before or after it. Instructors might also have used a single slide to include a graphic or a website link. It may also be that these instructors included a plenty of slides they may never actually get through in the designated class period and then carry over to the following class period. Figure 4 indicates the graphical representation of the total number of slides per domain. It is obvious that most of clicker slides analyzed fell into the application domain with the second most being knowledge level slides.

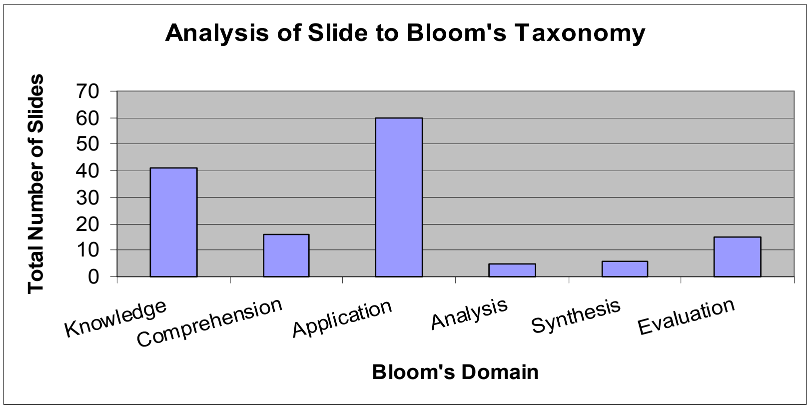

Figure 4. Analysis of the slides according to Bloom's Taxonomy

It was difficult to create higher-level thinking within multiple-choice questions; however it appeared with the thoughtfulness involved in asking clicker questions, these instructors have begun to foster higher-level of cognitive thinking. It was believed that this critical thinking was fostered not only in the manner in which the instructors posed the questions, but also in the discussion the instructors initiated after the question was posed. While knowledge, comprehension, and application type questions were most of the slides presented by clicker technologies, the level of cognition required increased as instructors forced students to make a decision, to stick to that decision, and to discuss that decision with peers.

The instructors also should pay attention while preparing the single question and question sequences according to Bloom's Taxonomy. The potential drawback of relating the different type of questions could be avoided by preparing a single question and question sequences. A single question usually fails to help students make context-dependent connections. Question sequences have three or four questions, each with a context that looks different to students, while the underlying concept looks equivalent to experts. By recognizing and applying a new concept in different contexts and conditions, students can obtain a better level of understanding according to a single question. By using question sequences, instructors can have a better understanding of where the students' difficulties are, and thus can provide corresponding feedback. Question sequences can also provide specific feedback to students themselves. A common difficulty when students learn science courses is that they cannot identify their mistakes. Question sequences can help students find specific difficulties. So, question sequences can create cognitive with less anxiety (Reay et al., 2005).

4. Results of the interviews done with students

The students had varying levels of experiences with clickers, from freshman to senior classes. Their opinions were thought-provoking, encouraging, and concerning. Four themes were emerged from the student interviews:

I) Students are able to identify benefits to their learning relating to the use of clickers in the classroom

As a part of the interviews, students were probed as to the methods used by their instructors, the benefits and limits of clickers, and the impact of clickers on learning. All students, whether they expressed a like or a dislike for clickers, were able to generate benefits from the use of clickers. Students liked the classroom and individual feedback that clickers provided. They liked being able to see potential exam questions before the exam as well as being able to know immediately if they were correct in their answer. Students also liked the interaction with other students that their instructors encouraged with regard to clicker questions. Finally, some students felt that clickers improved their learning and added to the level of cognitive thinking required in the classroom.

II) Students value technical competence in the instructors who use clickers.

Three students, all from one class where the instructor is a new clicker user, were frustrated with the level of technological competence exhibited by their instructor. Technical errors on the part of their instructor frustrated students, especially when the instructor used class time to try to resolve the errors. A senior student in geology engineering department recommended that instructors be required to take a clicker class to learn how to use the technology before implementing them in the classroom.

III) Students would like to see more instructors use clickers

Students expressed a desire for more use of clickers across campus and within their individual courses. This desire seemed to be expressed by both those students who felt their instructor was using clickers adequately, in that they would like other instructors to use clickers, and also by those students who felt their instructor was not using clicker technology enough in their specific course to justify the cost.

IV) Students would like information on the use of clickers
Students mentioned the need for the campus or individual departments to list which courses are currently using clickers or are most likely to be using clickers in the future to allow students to know if they should keep their clickers or sell them. In addition, students noted that simply having an instructor tell them to keep their clicker for the remainder of their time on campus would be a benefit since they might need to use it in another class.

Besides, students wanted to know what content their clicker quizzes would cover in the event points are associated with correct and incorrect answers. Also students wanted to know what was expected of them regarding their use of clickers and what will be considered academic dishonesty as it relates to the use of clickers. Students mentioned abuse by students who are giving their clicker to another student to click in for them during class. When asked if they felt this was academic dishonesty, most of students mentioned that it would depend on whether the instructor had stated it as such in the beginning of the semester or in the syllabus.

5. Results of the SRS attitude survey according to gender
With respect to total the SRS attitude score, male students (M=56.5, SD=9.2) had significantly more positive attitudes towards the SRS than female students (M=52.1, SD=10.1) (t=5.2, df=521, p<.001). The effect size of 0.45 is considered to be in the medium range by Cohen (1988). Since overall attitudes toward the SRS were significantly different, a MANOVA was run to compare male and female students on each of the nine-Likert scale survey items examining attitudes toward using the SRS. Hotelling's T was significant (p<.001), so individual comparisons were done on each survey question. Male and female students differed significantly on all items (Table 4).

Table 4: Gender differences in attitudes toward the SRS based on survey results

Measure	Males		Females		F
	M	SD	M	SD	
Overall Attitude					
When a SRS was used, the class was better	5.07	1.22	4.41	1.35	28.01*
Student Involvement					
I was more engaged in the lesson when a SRS was used	5.44	1.32	5.12	1.52	9.31**
I was more motivated when a SRS was used	5.43	1.41	4.99	1.52	19.28*
I participated more than I normally would when a SRS was used	5.61	1.33	4.97	1.47	7.55***
Using a SRS generated more class discussion	4.98	1.46	4.34	1.53	18.92*
Learning					
I learned more when a SRS was used	5.02	1.48	4.65	1.69	12.75*
Assessment					
Using a SRS was a good way to test my knowledge	5.67	1.35	5.19	1.48	7.81***
I liked seeing what other students in the class selected for answers	5.12	1.42	4.77	1.46	6.68**
I liked using a SRS for tests	5.23	1.54	4.83	1.62	29.63*

*p<.001; **p<.005; ***p<.05.

CONCLUSION
The results obtained from research questions can be reduced as follows.

1. It would seem from the comments of six instructors that incorporating student response system into their university level classrooms was both beneficial and enjoyable. Learning clicker technology and deciding on ways to incorporate technology has challenged the instructors to think about their lectures as a whole with respect to pacing, student interaction, and classroom engagement.

Instructor's perceived outcomes of the use of student response systems include increased student participation, increased student attendance, improved instructor-student interaction, active and collaborative learning activities, and an enriching educational environment.

Subtle benefits to clickers emerged and included a decrease in the amount of time spent grading and writing down answers, greater understanding behind pointing out wrong answers, an increase in student generated verbal questions, and a new thoughtfulness behind preparing class sessions.

2. While instructors generally answered by saying that they did not consider the cognitive level of the their students when designing clicker questions, the actual slides representing clicker questions and the interview and observation results represent a mix of cognitive learning domains according to Bloom's taxonomy. Many questions posed through the use of clickers are simply knowledge and application level questions. However, higher-level, synthesis and evaluation questions were represented.

It is also obvious that a higher-level of thinking can occur as an instructor fosters discussion with the use of clicker questions. A question is posed, students are required to make a decision, they have to choose an answer, and the instructor then encourages the students to talk among themselves, generating peer discussion or peer learning. The student now either has support for the answer s/he chose or must defend the answer to a peer. Further discussion as a large group might also be generated. As the instructor guides the students through the process of describing why they chose the response they chose and why that response is right, wrong, or indifferent, this higher-level thinking can emerge. In addition, students become more likely to ask questions when they are able to see that they are not alone in their thinking and when they feel the instructor cares about their opinions and learning. Instructors can clear up misconceptions and generate class discussions about course content immediately on seeing student responses.

3. While there were slightly mixed thoughts on student experiences with clickers, most of the twelve students interviewed in this study held a favorable regard for the use of clickers in the university classroom. Students noted the use of clickers associated with class credit points increased their likelihood of attending class and noted the improved learning that occurs on attending class.

Students felt that being able to make peer comparisons and being able to validate their understanding of the course content were also benefits of the use of clickers. They enjoyed the peer discussions that instructors facilitated with regard to the use of clickers. Some students felt frustration over the competence level of instructors with clicker technology while other students were forgiving about the learning curve associated with the technology.

The most beneficial activities cited by the students in this study related to clicker use were content comprehensions review, generation of classroom discussion, application questioning, and attendance checks. Students did desire that instructors use clickers daily and in various ways mainly to justify their purchase of clicker. The students also requested this increase in use because they felt the use of clickers did supported or improved their classroom learning.

Most students in this sample were not able to make the connection between the use of clickers and the enhancement of higher-level thinking, but they did desire more information from their instructors as to why clickers were used in their classrooms. Several students were able to formulate a connection between the use of clickers and the improvement of higher level cognitive thinking.

4. Student involvement, assessment, and perceived learning were examined with the help of the SRS attitude survey. A simple comparison indicated that male students were significantly more positive than female students in all three categories. Male students were more motivated and engaged when using the SRS, participated more in the SRS-based classrooms, liked using the SRS to test their knowledge, especially in summative evaluation, thought the SRS generated more class discussion, felt the SRS helped improve their learning, and overall, thought the SRS-based classes were better. Female students on the other hand, would seem more stressed when using the SRS.

The benefits and drawbacks of the SRS were clearly reported in the literature. The research supports those outcomes obtained from the literature. However, the author could not find any statistical (qualitative and quantitative) analysis applied in any researches. It was believed that this research will elucidate the details about SRS and encourage other researchers to investigate various parameters affecting the success of the learning system.

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CHILDREN AS EDUCATIONAL COMPUTER GAME DESIGNERS: AN EXPLORATORY STUDY

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ABSTRACT
This study investigated how children designed computer games as artifacts that reflected their understanding of nutrition. Ten 5th grade students were asked to design computer games with the software *Game Maker* for the purpose of teaching 1st graders about nutrition. The results from the case study show that students were able to express their personal thoughts and intentions by designing and developing realistic computer games in a complex programming environment. Our findings point to gender implications and other contextual factors that motivated social interaction around game design and programming strategies.

INTRODUCTION

In the early 1990's, Seymour Papert forwarded the notion of "constructionism" to suggests that learning is most meaningful when learners are actively engaged in building artifacts (Papert, 1991). Constructionism is based theoretically on Piaget's ideas of students as builders of their own knowledge. Piaget's statement "that children don't get ideas; they make them" guides the direction of constructionism (Han & Bhattacharya, 2001). Constructionism is also tightly connected with Papert's early work with Logo and its subsequent form of Lego-Logo toys.

Papert characterized constructionism as encompassing two interconnected processes: The first is an internal and an active process where students construct knowledge from their experiences of the world. The second process is external, reflecting the belief that students learn best by making artifacts that can be shared with others (Grant, 2002; Kafai & Resnick, 1996; Papert, 1991). In other words, constructionism takes knowledge from an abstract mode to a concrete mode. Student artifacts can be anything from a poem or a webpage, to more complex artifacts like an origami, or a computer game.

Papert's LOGO project with elementary school students to learn math is perhaps one of the best known for illustrating learning-by-constructing. However, prior studies have been conducted in the domains of math (Harel, 1991; Kafai, 1998), science (Hmelo et al., 2000; Kafai, 2005; Brandes, 1996; Kolodner, et al., 2003), music (Gargarian, 1996), and Thai language and emotional development (Tangdhanakanond, Pitiyanuwat, & Archwamety, 2006).

Artifact development in constructionist environments can be facilitated in various ways. Recent work in "learning by designing" emphasizes constructing artifacts by programming computers or designing games (Kafai, 2005). Designing sharable artifacts that reflect students' different styles of thinking and learning is key. Kafai claimed that designing artifacts by programming software helps students reformulate their understanding and express their personal ideas and feelings about not only the subject but also the artifact. Papert also sees programming or game making as a construction tool for personal expression and knowledge construction, and this helps students explore psychological and cultural aspects of learning (Papert, 1995).

BACKGROUND ON GAME DESIGN FOR CONSTRUCTIONIST LEARNING

In recent years, considerable interest has been generated in the educational potential of computer games (Dickey, 2005). With the commercial success of virtual gaming worlds for children, such as *Webkins* or *NeoPets*, computer games have become an important part of everyday life for children. Whereas most research concentrates on the design and effects of gaming, our research builds off the work of Papert and others (Harel, 1991; Kafai, 1998; 2006; Overmars, 2004) to investigate the educational impact of children designing their own computer games. That is, children were supported to become "producers" rather than "consumers" of computer games (Kafai, 2006). Overmars' research led to the development of software (*Game Maker*) that supported game design by students with no knowledge of programming code. The educational advantages of students creating computer games for other students was recently discussed by Lim (2008) and Prensky (2008) as a way to integrate gaming into the sociocultural fabric of schools. Prensky identified three main strategies for incorporating student game design into classrooms: (a) students create games for material they are currently studying; (b) students create games for other, younger students; and (c) students create games for design-only competitions. Our work incorporates the first two strategies.

Constructionism also emphasizes the social nature of learning. Artifacts are developed, in part, so they can be publicly shared and discussed. Thus, collaborative settings are commonplace. Shaw (1996) noted that students in social settings engage in a cycle of development leading to external and shared social constructs. Constructionism mobilizes the knowledge of the community to support learning among its members (Gargarian, 1996). Hence, artifact development should entail exposure to activities that promote collaboration and sharing. For example, Kolodner and her colleagues (2003) used a "class pin-up session" to support students to collaboratively predict how their designed artifacts would behave, and whole-class discussion around a whiteboard to review what students learned form previous steps. They used small group and community rituals to explain, justify, and prepare reports about what they were learning, and poster sessions to present final products with the entire study group.

Although computer gaming may be perceived as a solitary activity, the act of creating games would involve a responsive social community. Even among single game players, peers watch each other, and compare and share strategies and tips (Lim, 2008). In the context of game design, many opportunities can be created for sharing strategies and designs based on a need to know. Kafai (2005) used group discussion during her game design project to help the students share their game designs, ideas, and difficulties with applying the subject to games. Similarly, Brandes (1996) implemented ethnographic observations and small group projects into her study where students had the chance to try each others' designs and leave feedback or incorporate some ideas for their own designs.

THE PURPOSE OF THE STUDY

The purpose of this study was to explore how children designed computer games as artifacts that reflected their understanding of nutrition. We wanted to examine the process used by elementary school students to construct understanding of nutrition knowledge by designing the games. In order to accomplish this goal, we focused on the following research questions:

1-What conceptions of nutrition knowledge were used or evident in the game design?
2-What programming strategies did students use to develop their game over time?
3-What was the role of social interaction on students' game design?

THE MOTHODS

Participants and Context

Ten 5th graders, 4 girls and 6 boys, participated in this study as part of their science class during a unit on nutrition. All students' names presented are pseudonyms. Prior to the game design task, students were taught basic nutrition concepts such as food groups and serving sizes, over a period of four classes. The main task assigned to students for our study was to design a computer game using a program called *Game Maker* to teach first graders about nutrition. Two students in the class had prior experience using the *Game Maker* software, but none of the remaining eight students had used the software before. At the end of the project, the first graders from the same school played the games designed by 5th-graders. Students spent approximately 8 weeks developing their games.

GameMaker: The Design Software

All students used *Game Maker* to design their computer games. *Game Maker* (Overmars, 2004) was designed to support the rapid development of computer games and learning of computer science principles. The software is available to download free of charge (http://www.yoyogames.com/make), which was an important consideration for use in our project in a public school. A simple graphical interface allows users to create characters, settings, and behaviors without writing traditional code. The software comes with a collection of freeware images, sounds, and sample games to help novice designers with their design and development. Indeed, one of the most powerful attributes of *Game Maker* is its library of existing games. These can be modified, or *modded*, to create new games.

Modding offers a number of advantages over designing games from scratch (Emmerson, 2004; Seif El-Nasr & Smith, 2006), and this feature was central in our decision to use *Game Maker* for the current study. Because modding begins with popular, proven game concepts, the resulting variations are more likely to have elements of challenge, curiosity, fantasy, and other properties associated with engaging games. For instance, one student in our study began her project with a Pac-Man game since she and others in her class enjoyed playing it. She was able to modify one of *Game Maker*'s Pac-Man games, changing the icons to food images and developing new scoring models that rewarded the Pac-Man for eating healthy (see Figure 1). *Game Maker*'s facilities to grab and modify existing games allowed her to develop a working prototype that addressed nutrition ideas in one week by eliminating many of the burdens associated with implementing computer games.

For instance, much of the technical knowledge related to computer programming can be overcome with *GameMaker*'s graphical approach to creating characters, levels, events, and other game objects. Designers can choose actions from libraries, drag and drop these onto existing or created game objects, and essentially transform games into similar yet different versions of themselves. With *Game Maker* students start with making sprites either using the given images or making their own images with its image editor. The students then turn these sprites into objects and add actions to them (Figure 1). Then students design rooms (levels) and add objects to make platforms ready for playing. Depending on their game style, some students used only one room, but others students used more than one room. Figure 1 shows a sample screen shot of a student's game as it was being developed.

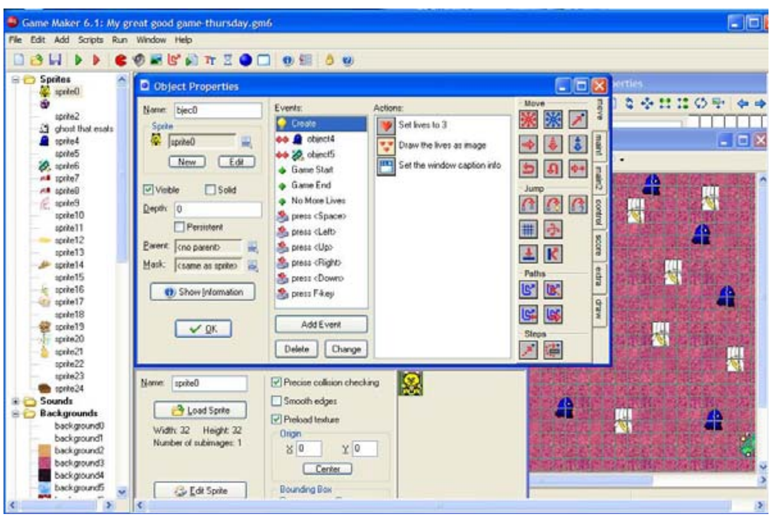

Figure 1. A screenshot from a girl student's *Game Maker* platform: Adding actions to the character

Procedures

The students met for 45 minute sessions twice a week for 8 weeks. Students were first taught how to use the *Game Maker* software. Similar to Hmelo and her colleagues' (2000), students were presented with some design examples and challenges in *Game Maker*. In order for students to understand the software, they were asked to modify some part of the template games that came with *Game Maker*. Two teachers, the technology teacher and science teacher, facilitated the students in their designs. The technology teacher, who is also the lead author, checked the students' games and left feedback during the class sessions. Feedback mainly consisted of questions to students to prompt new ideas in the designs. He also supported the students if they had any questions on programming. The science teacher played students' games and gave them guidance on implementing nutrition facts correctly. However, the students were not required to change their games based on teachers' feedback.

The study was designed to promote collaboration among students. Similar to previous studies (Kolodner et al., 2003; Harel, 1991; Hmelo et al., 2000), students were encouraged to look at peers' games to not only give feedback but also to get ideas for their own designs. Since it was a small class, the students would typically ask the entire class for guidance on how to perform certain programming tasks. That collaboration was informal, in that students could ask for help at any time during the sessions.

After the students designed their games, 16 first graders came into the class and tried out the games. The first graders played the games in pairs, with the game designer of each game (5th graders) sitting next to them. The first graders provided the game designers with their opinions as they played each game. Each student's game was tested by approximately 6 different pairs of 1st graders. Once the project ended, all ten 5th graders were interviewed individually for one hour. The interview began with a series of guided questions regarding students' goals, strategies, and perceptions for the game design process. Emphasis was placed on what students believed they learned about nutrition, how they learned the programming strategies, and why they made specific game design decisions.

Data Sources and Design

The research used a case study as the research methodology (Yin, 2002). This methodology is appropriate for investigating complex, contemporary phenomena within its authentic context. The unit of analysis for our case study was the entire classroom learning environment, including all students, teachers, and artifacts. Case results were compared against, and explained according to, previous theoretical models developed by Kafai (1998) and Kafai, (2006).

A primary data source for this study was the participants' computer games. Of the 10 games designed by the students, eight games were analyzed, as two of them were not accessible due to technical problems. The students' games were saved separately by weeks, so multiple iterations of the games at various stages of development were examined. Most of the students started with a draft game in the first week and then decided on one design idea that was developed throughout the activity.

The following data sources were collected and used in the interpretation of results: (a) students' written goals for their game design: (b) interviews with the participants following the game design; (c) the participants' games; and (d) classroom observations. The lead author was present for all sessions. All interviews with participants were transcribed and later analyzed for insights into each research question. Initially, data were examined according to each participant, using matrices that represented each student's activities and verbalizations that were relevant for each research question. Stored iterations of the games were examined and coded for changes across time. Then, data were examined broadly for different examples of game design activity; similar instances were grouped according to major categories. This approach allowed us to identify trends within and across participants for a given question (Miles & Huberman, 1994). Two researchers (the first and third authors) collaborated on the analyses, allowing for discussion and agreement on how the data was to be interpreted.

RESULTS

An overall description of the characteristics of the students' games is first presented, along with the results according to each research question (nutrition concepts, programming strategies, social interaction).

DESCRIPTION OF THE STUDENTS' GAMES

Students' games were analyzed in order to generate an overall description of the artifacts they created. The games were analyzed according to three characteristics identified by Kafai (1998): (a) game genre (b) game world and game characters (c) interaction and feedback.

3.1.1. Game genre. The genre all of the students' games can be categorized as arcade. All of the games were comprised of several levels where each level was progressively harder for the players. Similar to other commercial games, such as *Pac-Man*, the players' goal in all of the games was to keep the main characters alive to finish the game. The game would end if the game character lost life or a certain number of points.

The games all involved a series of actions needed for a main character to stay alive. We observed some differences in the methods used to save characters, some of which may point to gender differences. One should note, however, that the small sample size of students in this study limited such interpretations. Nonetheless, we observed that all the boys' games involved destroying enemies or unhealthy foods to make the main character survive. For example, Tom's character shoots the brownies. Markus' stays away from enemies and makes them crash. Sammy's character also destroys all the "bad foods" by touching the magic food. On the other hand, none of the girls' games involved destroying characters. In order to survive, the players of the girls' games had to simply stay away from the "unhealthy food" and get the "healthy food".

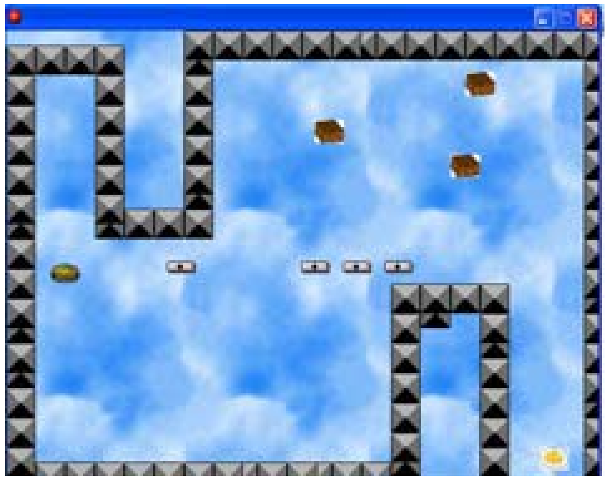

Figure 2. Another example from students' game designs; Tom's actual game that he tyied shoot 'unhealthy food' on his way.

Game world and game characters. The students' game worlds, or as Robertson (2004) describes as "game settings", had several commonalities. Interestingly, in this study none of the students used a real world environment as the setting for their games. Most the games took place in an imaginary setting with boundaries around which the character bounced. Otherwise, almost all the environments allowed the players to move in four directions (left, right, up, and down). The one exception was Markus' game, and his game was a food driving game that was modified from a car driving template game. The environment in his game was similar to a highway where food icons tried to escape from the "bad food" and drive carefully.

All the students chose a main character that represented the player whose goal was to eat "healthy foods" and stay away from "unhealthy foods". None of students designed a main character with a specified gender. Table 1 summarizes characteristics of the students' game characters.

Table 1: Students game settings and characters

Student	Main Character	Supporting Characters	Design/ Gallery	Character Gender	Known character
Carol	a stick man	8 characters and 1 of them moves	Her own design	No gender specified	Not for the games that she had played
Flora	Initial of her name in a circle	20 characters and 2 of them move	Her own design	No gender specified	Not for the games that she had played
Erin	Teddy bear	31 characters and 1 of them moves	From the image gallery	No gender specified	Not for the games that she had played
Amanda	Pac-man	Added 7 new characters to the original game; 2 of them move	From the image gallery	No gender specified	Common character
Tom	Hamburger	12 characters and 5 of them move	From the image gallery	No gender specified	Not for the games that he had played
Sammy	a Pokémon character	13 characters and 3 of them move	From the image gallery	No gender specified	Common character
Markus	Pac-man	Added 3 new characters to the original game; 4 of them move	From the image gallery	No gender specified	Common character
John	A bird	14 characters and 2 of them move	From the image gallery	No gender specified	Common character

Game interaction and feedback. In most games, the feedback for the players was based on action rather than text feedback. When players lost the game, most of the students required the players to either restart the game from the beginning or end the game by showing the score. Except for two girls, Flora and Erin, no students gave any directions for the players to explain the steps in the game. However, these two girls informed the player of the goal and provided a brief message when the games ended. For example, Erin's game started with the following message: "*Avoid the blue ghosts and collect all of the balls*". When the game ended, the message stated; "*Sorry you lost. Come back and try again later!*" Similarly, Flora added a character that resembled Einstein to guide the player throughout the game. In her game, when the main character touched that character, the following message popped-up; "*Hi my name is Bob... When you're done, come to me!*" Flora's games ended with the standard "*Game Over!*" message.

How was nutrition knowledge used or evident in students' game designs?
For this question, we examined what conceptions of nutrition knowledge were evident in the students' games. Based on analyses of children's games and interview data, most students represented the nutrition concept of "eat healthy foods and avoid unhealthy foods' in their game design. For instance, typically healthy foods (e.g. vegetables and fruits) were used as a good/positive character such as fuel, point-gaining agent, or key to the next level; while unhealthy foods (e.g. hamburger and desserts) were used as a negative character such as speed reducer, point/energy-losing agent, or game-over agent.

Although many children simply used healthy foods as good agents vs. unhealthy foods as bad agents in their games like conventional game characters, the interviews revealed that a few children connected it to the concept of healthiness of our body. For instance, Tom's main character moved faster when it ate or touched salads. Tom explained that salads were selected because they would give nutrients that our body needed. Therefore, eating salads would make our body stronger 'like protein' and that's why his main game character could move faster.

In addition, some of the children tried to apply 'portion size' (eating adequate amount of each food group) to their game in various ways. For example, Flora tried to deliver the portion size concept indirectly by limiting the number of blueberries used on her game because she knew eating too much fruit is not optimal; Markus used the portion size concept more directly in his game: "…if you ate the strawberries too much or if you ate the green beans too often it would actually give you a "power down," you would lose the propane that you had…"

However, children's applications of the portion size concept to their final version of the game appeared limited and superficial rather than complete and showing deeper understanding of the concept. This could mainly be due to time limitations or technical skills. For example, Flora adjusted the number of blueberries based on the portion size recommendation but didn't apply correct portion size to the all the food items used on her game. The interview revealed that Flora was fully aware of it and wanted to apply the right portion size for all food items on the next version of the game if she had more time for the project. Likewise, Markus described the technical difficulties he experienced to apply serving size to his game:

> Researcher (R) : …Do you have an example of not eating too much?
> Markus (M) : Well that's one of the features I couldn't find out…I was going to put on a limit and it would go down slowly and if you ate the green beans every time it came down or every time the strawberries appeared, you would fall back of course
> R: So like when you were trying to put the serving size in this game too?
> M: Yes
> R: OK, so you were aware of the serving size? How many veggies?
> M: I couldn't find out how to put the limit on…

Overall, it was observed that most of the children applied a basic nutrition concept of "fruits and vegetables are healthy but too many desserts is unhealthy" in their game design. A few children tried to apply the concept of portion size to their game but it was not easy for them to implement with limited time and technical skills.

What programming strategies did students use to develop their game over time?
To address this question, we examined the students' planning process and strategies that they used to program or design their educational games. Although more than half of the students reported playing video games often, only two students had explored *Game Maker* or similar game design programs before the project. However, by the end of the project, all the students were able to build functional games even in a complex object-oriented programming environment. Two primary strategies were used to design the games overall. One was to start from the existing "template" games available in the software and then to add on to them to make their own games. The second strategy involved designing a custom game from beginning to end, with students building their own

overall structure, objects, characters, and rooms. Among the 8 games examined, two students used the templates to build their games and the remaining 6 designed their own games without using templates. The latter strategy is considerably more complex.

Overall, all students kept with their game theme over time. That is, once students started work on their games, they did not alter the overall theme and design. Even though students made changes to the games by adding new features throughout the project, the overall concept and theme of the games remained. This finding differed from prior research conducted by Kafai (1998) that showed that students made changes in overall game theme and concept.

Nevertheless, the students' games reflected substantial progress in terms of students' design skills over a short time. For example, Flora indicated that she played games often but had never before used game design software. Yet, by the end of the project, she was able to design an educational game that reflected nutrition concepts. The characters in her game not only performed basic moves but also functioned to make the player lose points when the main character touched "unhealthy food". She also added interactive feedback, a more advanced function that few students included, to guide the player of her game.

Analyses of interviews, artifacts, and observations showed that the students used various strategies to design their games. One of the strategies that all the students used was exploring the coding examples in the template games. Since the students could access the coding part of the template games, they were able to see how each coding feature made the game different. The students used that resource wisely. However, that strategy may have also led the students to pursue game themes and ideas that were driven by those available as templates. Overall, students interacted with their games by designing, debugging and redesigning. This trial and error process helped the students to correct some programming errors in their games. The students tested their games after adding each function, learning what worked and did not work, thus refining their skills.

Role of social interaction

Social interaction was supported in the classroom through informal teacher and peer interactions during the design process, as well as at the end of the project through structured feedback when first graders were invited to the class to try out the games. The class was structured loosely in a setting that encouraged students to move around and share knowledge and strategies informally. It was common in the classroom for a student to vocalize his or her excitement over getting a strategy to work, and then to have several students stop their work to come over and see the new development. Also common were informal requests to have peers test out part of a students' game, or for others to ask around to the class for help in accomplishing a specific programming goal. One student in particular was experienced in designing games using *GameMaker* (Alan), and he became the peer "expert" of the class who was frequently sought out for help. These highly informal ways of interaction were central in influencing the development of students' games over time. Through the simple act of observing what others incorporated into their games, ideas and techniques would spread throughout the class.

The teachers acted as facilitators in the design process. Instead of teaching every step of how to design a game, the teacher showed the students how to access necessary information. The technology teacher was a useful resource when students were seeking technical help. Moreover, the teacher promoted peer collaboration by referring students' questions to other students who might have good answers for a specific problem. As mentioned previously, this type of peer collaboration was the dominant strategy used to design and build upon games. Similar to what Kafai and Harel call as learning through consulting (Kafai & Harel, 1991), in this study, learning from peers helped students not only learn basic coding from each other but also to collaborate on game designs throughout the project. For example, Alan was the only student at the start of the project who knew how to write code in *Game Maker*. However, with Alan's help, most of the students added some coding or scripting to their game designs. Collaboration in game design seemed to influence students to add new features to their games.

Collaboration among the students was not limited to the game design process. The students also asked questions to each other regarding nutrition. For instance, we observed some students asking others if they had proper portion sizes of certain foods in their games. Another way of student collaboration during the design project was students' testing each others' games. For example, one student (Erin) said: "*During class, they were like, 'Erin'! 'You wanna come and see? Do you like this?' and things like that…*" Testing each others' games helped students provide peer feedback and to build new features into their games, as a result of being exposed to new ideas. In addition, testing games was useful to see the errors in coding, giving them the chance to make necessary changes to their games.

The interaction between fifth graders and first graders added value to our study. Since the designers were asked to design their games for a target audience, students tried to design for that grade level by considering usability, accessibility, and other game design components. After observing the first graders' testing process of their software at the end of the project, fifth graders had a chance to interact with them. Most of the first graders commented that they like the games, and noted that they should not eat unhealthy food. They were also asked if they were able to move the main character and get points in the game they played. Even though some students thought the games they played were hard, they were able to move the main character and pass at least the first level of the game. The first graders reported being excited about the games, and wanted to play more of them. Based on our interviews, the fifth graders concurred that the feedback they received from the first graders was productive for considering how to improve their game design and content.

CONCLUSIONS

This study investigated how children designed computer games as artifacts that reflected their understanding of nutrition. Our study showed that the students were able to successfully express their personal thoughts and intentions by designing and developing computer games in an accessible programming environment. Although the focus of our analyses was on the children who designed the games, the first graders who played them also reportedly enjoyed the games. They expressed awareness of which foods were healthy and unhealthy in the game, and indicated that they wanted to play the games again during the try-out period.

One noteworthy aspect of this study relates to the girls' engagement in designing computer games. The girls in our project designed computer games, as opposed to just playing games. Also important is the fact that some of the girls continued to design computer games in after-school activities after the project ended. Erin, for instance, continued designing computer games six months after the project ended, even though she stated that she didn't play computer games before the project. In the end, the girls' games were as educational as boys' games. Our study findings are consistent with the idea that boys are likely to see computers as a playful recreational toy, whereas girls see them as a tool to accomplish a task (Miller, Chaika, & Groppe 1996).

Nevertheless, the project also dealt with some challenges. Since it was largely the students' first time designing computer games with *Game Maker*, the students had technical difficulties to implement the ideas they planned. Some students, for instance, had to draw their own food icons since the icons they wanted to use in their games either were not provided or were oversized for their games. Like other studies of students developing artifacts, the process of making the artifacts themselves sometimes becomes the overwhelming focus, rather than the knowledge goals of the activity (Barron et al., 1998).

Our study was also limited due to the size of the sample (n=10). Our study pointed to some possible gender-influenced differences in how games are designed that could be explored in future research. Future studies could also focus on addressing issues of concept learning and measurement – particularly in regard to assessing the knowledge gains associated with such an activity. To gain traction in school settings, strong evidence of concept learning and programming skills need to be established. Notwithstanding, our findings provide some insights into the process used by students to design computer games that reflect nutrition concepts. Our preliminary data support the notion that learning by designing computer games promotes engagement during learning, regardless of gender, and also can lead to productive social interaction.

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DESIGNING A VIRTUAL ITEM BANK BASED ON THE TECHNIQUES OF IMAGE PROCESSING

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ABSTRACT
One of the major weaknesses of the item exposure rates of figural items in Intelligence Quotient (IQ) tests lies in its inaccuracies. In this study, a new approach is proposed and a useful test tool known as the Virtual Item Bank (VIB) is introduced. The VIB combine Automatic Item Generation theory and image processing theory with the concepts of figural tests and Computerized Adaptive Testing (CAT). It is believed that this tool will assist in improving traditional figural tests – in terms of solving previous issues relating to item exposure and allowing a figural test to be more easily developed.

INTRODUCTION

With the development of technologies, the computer has evolved into a tool that can improve the accuracy and efficiency of tests. In effect, computers have largely transformed the way in which testing has been conducted over the years. Computer-Based Testing (CBT) has been adopted both in Taiwan and overseas. Examples of CBT include the Graduate Record Examination (GRE), the Graduate Management Admissions Test (GMAT), Test of English as a Foreign Language (TOEFL), and On-line Computer Basic Competence Test of High School and Vocational School Students (http://www.onlinetest.org/).

In comparison to the CBT, the Computerized Adaptive Testing (CAT) is a more complex form of testing. A CAT system chooses items for a given examinee based upon the examinee's responses to earlier items, as well as estimating one's ability according to his/her responses. As a result of the reduction in both testing time and testing items, many studies have since focused on the application of CAT (Ho, 2000).

Both CAT and CBT have security problems. Theoretically, these problems can be solved only when the item bank is so huge to the extent of infinity. As a matter of fact, creating a huge item bank is a lot of work as it needs a lot of manpower, resources, time and budget (Yu, 1993). Therefore, it has been an important task for researchers to look for different ways to solve test security problems.

Today, two major indicators for test security are the item overlap rate and the item exposure rate (Tsai & Kuo, 2005). The item exposure rate refers to the frequency at which a certain item appears for all examinees, while the item overlap rate refers to the frequency at which the same item appears for two examinees. As higher item exposure rate and item overlap rate mean higher risks for test security, it is necessary to put the two indicators under control in a real test. However, today's research only focuses on the control of the item exposure rate, while there has not been an effective way to control the item overlap rate. Accord to studies, the item exposure rate and the item overlap rate are not independent but interdependent (Tsai & Chen, 2005).

To solve item exposure and overlap problems, Virtual Item Bank (VIB) is proposed in this study. VIB does not attempt to control the item exposure rate and the item overlap rate, but it replace item for "object" and "rules" in the VIB. The VIB combines "object" and "rules" into items required in the test. These items not only satisfy the needs of CAT and CBT, but also solve the test security problem by minimizing the risks of item exposure and overlap problems.

This study will plan to use VIB in figural tests. Figural tests are comprehensive mental ability testing tools for children and the illiterate. However, it is acknowledged that building a figural test can be rather challenging (Cronbach, 1990). It analyzed items in APMs for their problem-solving rules using this technique to create a VIB. This item bank can solve problems concerning the item exposure rate and the item overlap rate. It can also help test editors to solve the test security problems and accurately calculate examinees' ability in a more efficient and safer way.

Test Security

CBT or CAT is administrated by selecting items from item bank. However, test security problems concerning item overexposure will arise when a great number of examinees have participated in the test over time. We can assess the test security by two key indicators: one is the item exposure rate and the other is the item overlap rate.

Initially, we protected test security by randomly selecting items for a more even item distribution (Chang, 2003). However, no desirable results were seen in this method. Therefore, some researchers solely focused on the control of the item exposure rate in the hopes that this problem could be solved. Most discussed control method in their study is SH Procedure (Sympson & Hetter procedure) proposed by Sympson & Hetter (1985). This method was done by using the ability distribution of a group of simulated examinees to control the item exposure rate prior to the test. To achieve better control, the ability distribution of this group of examinees should be similar to that of the actual test takers. To make this happen, different exposure control parameters were used in examinees with different levels of ability.

Chang (2003) proposed SHC (Sympson & Hetter conditional procedure). SHC is a kind of control mode which divides examinees with different levels of ability into different groups, obtains the exposure control parameters of each item in different levels of ability, and combines the parameters into an exposure control matrix as the basis of exposure control in a real test. For fewer examinees with higher and lower ability, the maximum expected exposure parameter should be adjusted higher; On the contrary, for more examinees with medium ability, the maximum expected exposure parameter should be adjusted lower to increase the usage rate of the item (Chen, 2007). Other methods which can control item exposure rate includes Stocking & Lewis (1995) unconditional multinomial (SL) procedure , Stocking and Lewis (1998) conditional multinomial (SLC) procedure, Davey & Parshall procedure (DP, 1995), SH online procedure with freeze control (SHOF) (Chen, 2005). However, these methods do not take item overlap rate into consideration so that item overlap problems remain.

According to studies, item exposure rate and item overlap rate are not independent but interdependent (Chen, 2004). That was when Chen& Lei (2005) developed SHT that controlled both the item exposure rate and the item overlap rate to complement SH. Like SH, SHT requires pre-simulated exposure parameters as they both have time-consuming and test scenario problems. To solve this problem, Chen, Lei& Liao (2008) extended SHT into SHTO so that the efficiency of controlling item exposure problems can be dramatically enhanced by controlling item exposure rate and item overlap instantly online without having to pre-simulate exposure parameters. Nevertheless, either SHT or SHTO can only control the item overlap rate between two examinees. In fact, an examinee can obtain test information from more than one person. Therefore, it is necessary to control the item overlap rate between one prospect examinee and a group of examinees who have already taken the test. To broadly control item overlap rate, Chen (2008) proposed SHGT control method. Similar to SHTO, SHGT can instantly control item exposure rate and overlap rate on line. They differ from each other in that SHTO can only control item overlap rate between two examinees, while SHGT can do so for one prospect examinee and α past examinees ($\alpha \geq 1$).

Although researchers have come up with different ways to control both item exposure rate and item overlap rate, test disclosure remains a problem when there are too many users over time (Chang, 2003). Thus, some researchers use Automatic Item Generation (AIG) technique to generate items. AIG has not been used until recently (Irvine & Kyllonen, 2002) although it has been proposed for 30 years. There are numerous approaches for generating items using a computer (Millman & Westman, 1989), but they generally require the availability of an item model. An item model (Bejar, 2002; Drasgow et al., 2006) is a general prototypical representation of the items to be generated. Furthermore, each component of an item model can contain both fixed and variable elements (Lai, Alves & Gierl, 2009). Using item model, AIG can generate countless items to solve item exposure rate and overlap rate problems. However, this method cannot be applied in CBT or CAT as it cannot accurately calculate examinee's ability.

Designing CAT and CBT is challenging as it takes a lot time and resources to create the item bank. According to a study conducted by Chen (2007), only 78 research papers done by PhDs and graduate school students in Taiwan are on tests (10 on traditional Computer-based Testing, CBT; 35 on Computerized Adaptive Testing, CAT; 33 on Online Testing). It is even rare to see papers on figural testing. Therefore, it is an important job for researchers to help test editors to design the item bank for figural tests using fewer manpower and resources in a shorter time. This study will develop a new technique, called VIB, based on AIG and using item exposure rate and item overlap rate as indicators. This study will use this technique in figural tests to solve both item exposure and overlap problems. To generate desirable distracters in figural tests, this study combines Content-Based Image Retrieval technology to generate options with higher distractibility.

Content-Based Image Retrieval

Generally speaking, figural tests were more difficult for test editors to generate than text tests. In the selection verification, examinees paid full attention to the accuracy of the selection and the problem introduced by the option. As multimedia technology advances, this study would use content-based image retrieval to help examinees solve the problem of selection verification. Image comparison has been applied in many fields such as identity authentication, surveillance, human-computer interface, multimedia etc. In this research, content-based image retrieval techniques in image processing would be employed. Also, the main parts of the figure would be identified in order to perform data mining. The concepts and methods of content-based image retrieval are described below:

(1) Formula without considering color characteristics.
The characteristic vector is used in the computation to represent the figure, as shown below:

fi=(i1,i2,i3,... in) ……………………………………………………………………………(i)

f is the characteristic vector of the figure, and n is the code for the content characteristic. The similarities of two figures are obtained by computing the Euclidean distance of the characteristic vector (as shown in Formula i). The smaller the value, the more similar the two figures and vice versa.

$d(Q,I)=\sqrt{\sum_{j=1}^{n}(f_j^Q - f_j^I)^2}$ ……………………………………………………………………(ii)

While d(Q ,I) is Euclidean distance of the characteristic vector of figure I and Q (Berretti, Bimbo & Pala, 2000; Euripides, Petrakis & Evangelos, 1999).

(2) Formula that considers color characteristic:
Mehtre, Kankanhalli & Lee (1998) proposed a solution to consider the figure color and shape together to calculate the figure similarity. The methods are described as follows.

Step 1: Find the color clusters in the figure. The formula for the color distance is shown in Formula iii. While clustering 400 x 400 figure color, the minimum threshold of the color distance between each cluster was set to 50.

Color distance= $\sqrt{(\Delta R)^2 + (\Delta G)^2 + (\Delta B)^2}$ ………………………………………………………... (iii)

Step 2: Find the clusters in the figure. In step 1, we categorize color clusters into layers. In step 2, we mark the shape cluster of each layer, and line up the shape cluster according to pixels in each layer pattern. If the number of pixels in the shape cluster is less than 50, then this shape cluster is omitted. In order to avoid mistaking thin lines for clusters, the minimum density (see Formula iv) of shaper cluster as the shape threshold is set.
density,

$$\rho = \frac{population \ \ of \ \ Cluster}{(l_{\max})^2}$$ ……………………………………………………………………(iv)

$l_{\max}$ =max(||x2- x1||, ||y2- y1||) (x2, y1) and (x2, y2) are corner points of shape cluster.

(3) Similarity calculation:
Using the formula for the color and shape distance (Formula iv and v), the similarity of the color and shape can be calculated. Next, use Formula vi to compute the similarity of the two features (Finlayson, Chatterjee & Funt, 1996).

$coldis(C_i^Q, C_j^I) = \sqrt{(R_i^Q - R_j^I)^2 + (G_i^Q - G_j^I)^2 + (B_i^Q - B_j^I)^2}$ ……………………………………………….(v)

Figure Q has m color cluster and p shape cluster. Figure I has n color cluster and q shape cluster.

$shpdis(C_i^Q, C_j^I) = \sqrt{\sum_{i=1}^{7}(m_i^Q - m_i^I)^2}$ …………………………………………………………………(vi)

i is moment invariant.

$D(Q,I) = \omega_1\psi_1 + \omega_2\psi_2 + \omega_3\psi_3 + \omega_4\psi_4$ ……………………………………………………..(vii)

$$\psi_1 = \sum_{i=1}^{\max(m,n)} cdist(C_{c,i}^Q, C_{c,Pc(i)}^I) \quad , \quad \psi_2 = \sum_{i=1}^{\max(m,n)} \sqrt{(\lambda_{c,i}^Q - \lambda_{c,Pc(i)}^I)^2}$$

$$\psi_3 = \sum_{i=1}^{\max(p,q)} shpdist(C_{cs,i}^Q, C_{cs,Ps(i)}^I) \quad , \quad \psi_4 = \sum_{i=1}^{\max(p,q)} \sqrt{(\lambda_{s,i}^Q - \lambda_{s,Ps(i)}^I)^2}$$

$\omega_1, \omega_2, \omega_3, \omega_4$ are weighted index.

Pc is the closest color cluster assignment function, and can map every color cluster i of image Q to the closest color cluster Pc(i) of image I. Formulas that consider the color instead of color characteristics helped generate suitable answers in this study. We proposed the process of building VIB along with the above studies. This process does not only apply to figural tests, but to all types of tests. This technique and process will also provide best practices for researchers working on testing theories to solve test security problems.

METHODS

This study has developed research tools and VIB based on the principles of test design and APM materials. Research tools are used to generate VIB by defining object and its composition method. The development procedure of this study is shown below:

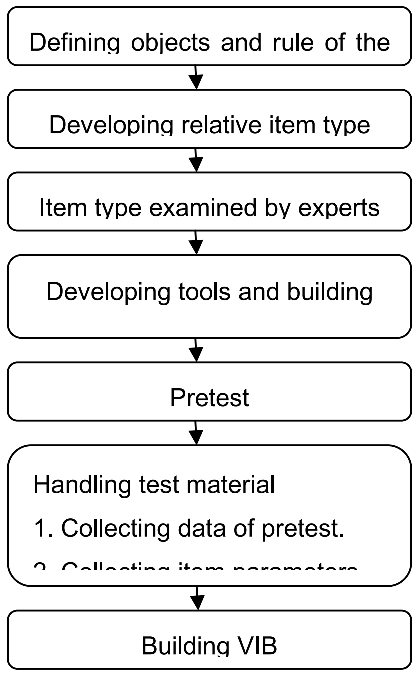


Figure 1, The development procedure of this study.

Participants

This study was conducted for a total of 310 six graders in 10 classes of an elementary school in New Taipei City, Taiwan. These participants must have basic computer literacy and have been involved in APM testing. This study will test these students using our self-developed CAT system and VIB. Test results will be analyzed with APM scores to demonstrate the feasibility of VIB.

Defining Testing Object and Rules

The word "object" defined in this study means the fundamental element of forming a test. In a Cube Counting Test, the "object" is the "Cube". In Four Arithmetic Operations, the "object" is numbers. In Test of Nonverbal Intelligence (TONI) (Brown, Sherbenouv & Johnsen, 1982), some basic shapes in their original form such as Circle, Triangle, Square, Rectangle, Parallelogram, Trapezium, Ellipse and Sector are the "objects" in a TONI test. Rules refer to how an object works. In a Cube Counting Test, piling the boxes is the "rule" of the test. In Four Arithmetic Operations, adding, subtracting, multiplying, and dividing are the "rule". In a TONI test, the variation of the shapes is the "rule".

This study uses APM as the material to build VIB. There are 36 formal items in APM suitable for examinees of 12 years old or above with higher intelligence. As this is not an adaptive test, an item contains a 3×3 matrix stem and several distracters. There are known shapes in the first eight boxes of the graphic matrix, while there are not any shapes in the narrow box in the lower right. Examinees must carefully observe the difference and variation of the shapes in the boxes in the horizontal or vertical direction, find out the correlation among shapes and their variation rules, and decide which shape to fill in the blank box according to their correlation or rules. This test contains a series of analytical and reasoning items in which graphic matrix will progressively change their directions horizontally or vertically. During the process, changes may involve increase and decrease of the shape size, addition or subtraction of elements, flip-over, turn-around or progressive changes in other forms.

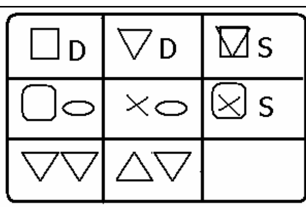
In short, this is correlation search and target management (Carpenter, Just, & Shell, 1990) and the rule defined in this test. APM puts a great emphasis on test-retest reliability (the reliability every other four week is and .71~.78 and the split-half reliability is .59~70). In terms of validity, the correlation between APM and the graphic IQ test is .51~.75; the correlation between APM and math scores in junior high schools is .45~.72. APM is good for both individual and group tests and also an ideal test tool to analyze human fluid intelligence (Yu and Huang, 1990). In this study, the "objects" in APM are known shapes, such as triangle, circle, square, and graphic elements randomly generated by the computer. As for the "rule", there had been a lot of research conducted on APM. Arendasy and Sommer (2005) concluded six "rules" as shown below using geometry as the element:

(1) Addition: Add the same graphic elements in the first two boxes and put them together in the last box.
(2) Intersection: Only the graphic elements in the first two boxes in the same position will be reserved for appearance in the last box.
(3) Seriality: Move progressively in a fixed direction (clockwise or counter-clockwise) in the box.
(4) Completeness: The same shape elements of all types appear in all boxes at the same frequency. For example, there are three shapes that need to appear three times.
(5) Neighborhood: Shape elements in adjacent boxes will appear in a connected position.
(6) Subtraction: The same shape elements in the first box should appear individually in the second and third box. Their appearance should not repeat or skip.

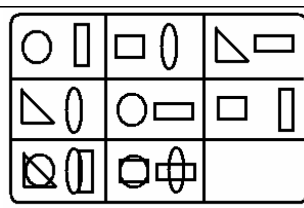
Freund, Hofer & Holling (2008) proposed five principles for figural matrix in APMs:
(1) Complete Addition: Piling elements stay in their original position, while other shape elements are all added and combined together in the last box.
(2) Addition-1 Element: Shape elements that appear only once in the previous box will be reserved in the last box. Elements that have already appeared more than twice will not be shown.
(3) Addition-2 Elements: Shape elements that only appear twice in the previous box will be reserved in the last box. Elements that do not appear twice will not be shown.
(4) Progression-Position: Shape elements move their position in a fixed direction, such as clockwise or counter-clockwise.
(5) Progression-Form: For example, each shape element will appear twice in all narrow boxes. Therefore shape elements that only appear once will be shown in the last box.

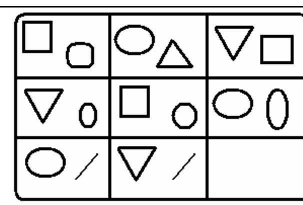
This study combines the rules proposed by the above two scholars and uses image processing technique (And, Or, Xor, Sub) to create the rule for virtual item banks. For example, "adding" is when two "objects" are processed by Or; "subtracting" is when two "objects" are processed Xor. This study uses image processing technique to execute the "rule" in the above APM test and save them into VIB.

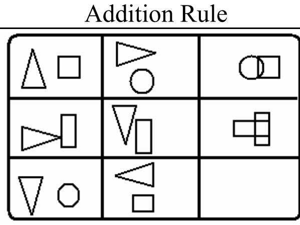
Developing Relative Types
This study uses APM as the material through self-observation to define 12 rules as shown below. These 12 rules can create 48 different rules when working with four operations (And, Or, Xor, and Sub) of image processing technologies.

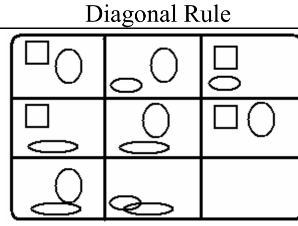


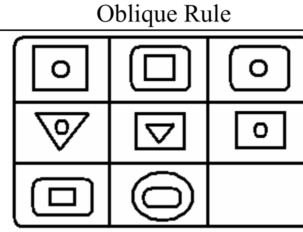
Addition Rule


Diagonal Rule


Oblique Rule


Allocation Change Rule


Quantitative Pair Wise Progression Rule


Size Change Rule

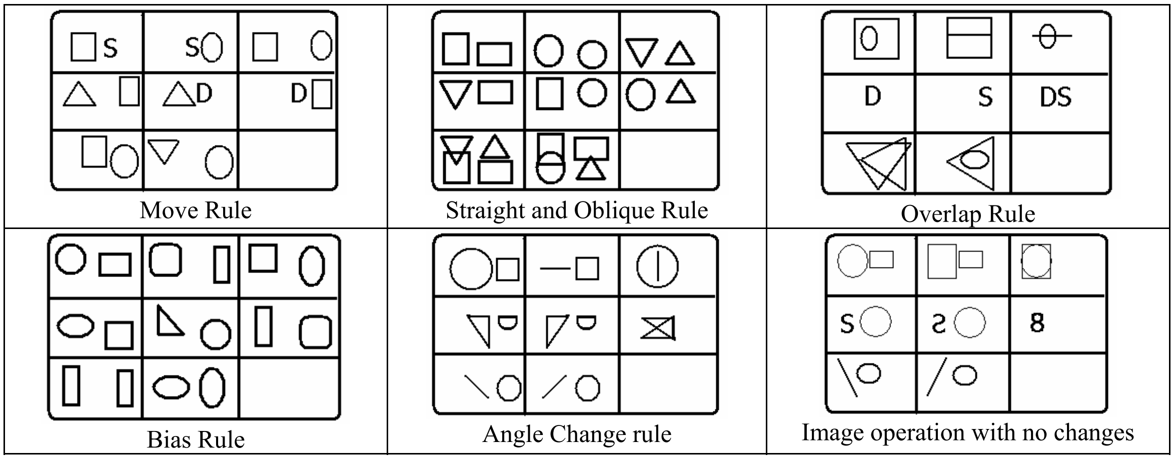


Figure 2, Item generation rules without image processing operation.

Building an Item Bank for pretest
When building a pretest item bank, the bank should contain requires four materials as shown below:

(1) Examinee's personal information
(2) Test paper which includes test number, test name, and correct answers
(3) Examinee's question-answering response form for recording the examinee's test name and question question-answering response.
(4) Correlation Form of examinee's question-answering response versus correct answers to check if the examinee answer questions correctly so that the examinee can give an appropriate feedback.

We asked experts and scholars to validate if the 48 item types conform to the content indicator in relative space ability testing and check if the meaning of the questions is clear enough. Following the validation, appropriate corrections will be made. A total of 48 questions will be designed based on the 48 question types and they are numbered 1 to 48.

Pretest
Pretest taker: This study focuses on users who can use the computer to browse webpage and use the mouse to click on the question options. Basically, the age of examinees is not limited. However, if the examinee is too young to use the computer or have difficulty reading question sentences, assistance will be needed to help him answer the questions. This study involved 207 six-graders of an elementary school in New Taipei City, Taiwan, in the pretest. Individual test item and the whole test system were corrected or adjusted based on the student's test results. The table shown below is the descriptive statistics of the difficulty level and discrimination index of the pretest. The average difficulty level is the average discrimination index is .68, which is of medium levels

Table 1, Descriptive Statistics of Difficulty Level and Discrimination Index of Pretest

	N	Minimum	Maximum	Mean	Std. Deviation
Test Difficulty Level	207	.3100	.6811	.5101	.0687
Test Discrimination Index	207	.4121	.9012	.6801	.0872

Developing research tools and building VIB
This study has developed VIB and the research tools specifically for them. Their functions are described as below:

(1) Virtual Item Bank (VIB)
Virtual item banks will replace traditional item banks and become the item source for CAT or CBT. There are only "objects" and "rules" in virtual item banks. The parameters of each item are obtained from the pretest.

(2) Research tools
This study has developed four systems: 1.item rule definition subsystem, 2. item generation subsystem, 3. answer retrieval subsystem and 4.CAT system. Each subsystem has different tasks and functions and is described below:

I. Item rule definition subsystem:

This system helps test editors to define “objects” and “rules”. Test editors can define “objects” and the “rule”. From the system screen, we can see the position of each “object” can be defined when a figural test is being designed in the system. We can also select the method in which how these objects are formed. The item parameters generated by the “objects” and “method” will be obtained in the pretest. “Objects” and “rules” defined by this system will be recorded in VIB. Items will be generated by the VIB along with the Item Generation Subsystem. The functions of the Item Generation Subsystem are described as below.

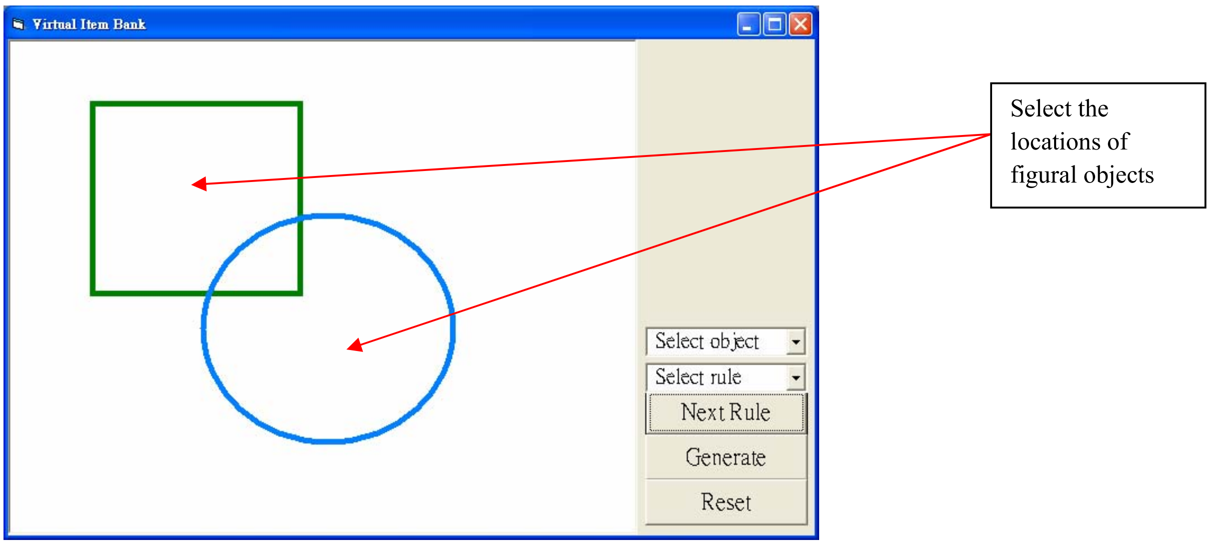


Figure 3, Defining object position

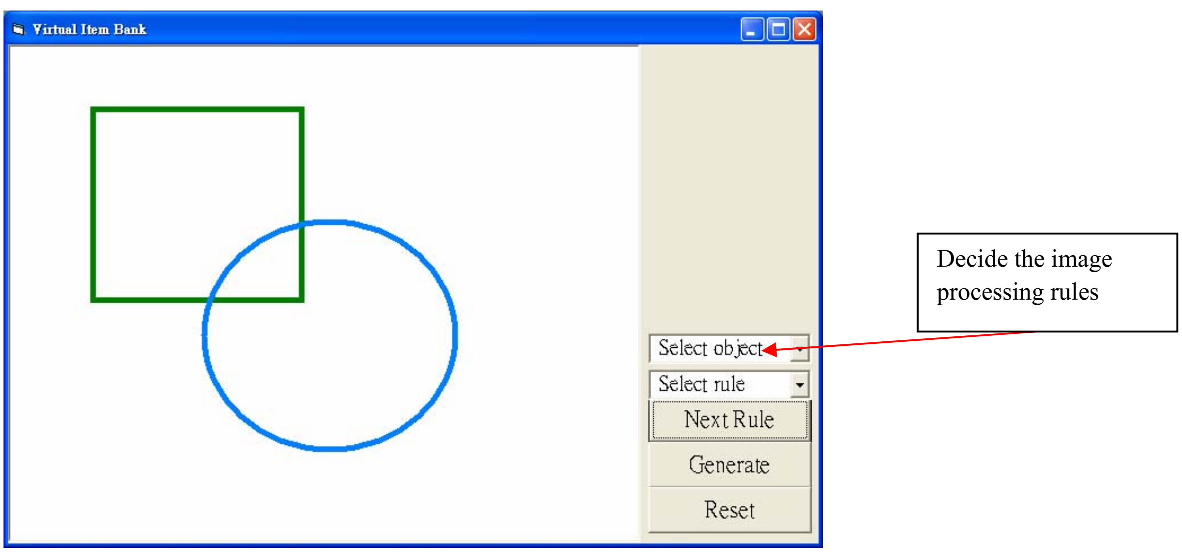


Figure 4, Defining the composition “rule” of the objects

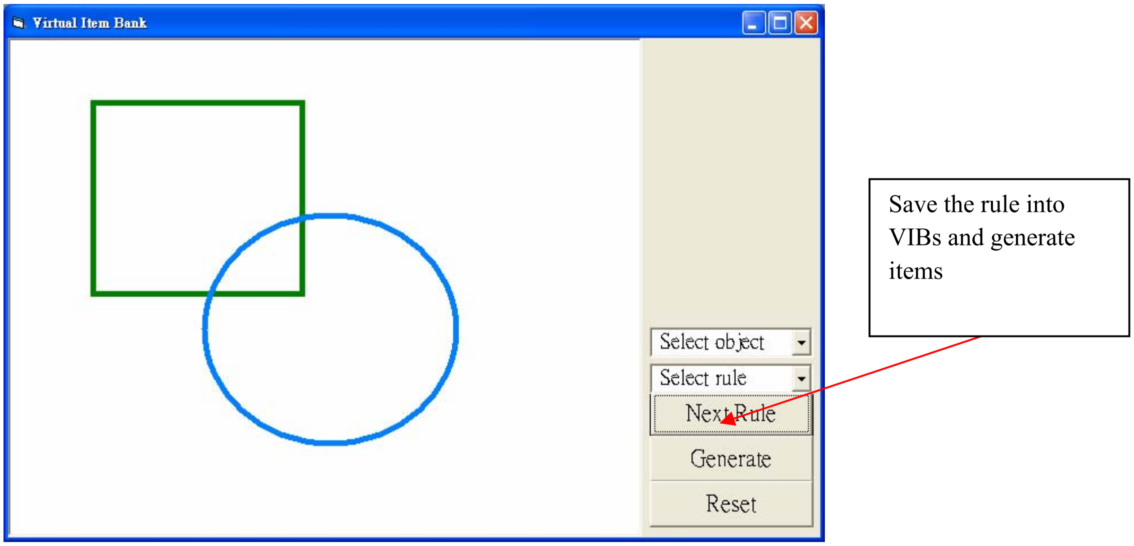


Figure 5, Save "objects" and "rules" into VIB and get ready to input the next item

II. Item generation subsystem:

The main function of this system is to read the "objects" and "rules" in VIB and generate relative items. The system can transform an object, for example, from "circle" to "hexagon" or from "square to "triangle". Theoretically speaking, with random transformation of objects and formation of "rules", there should be countless items in VIB. However, not every object transformation is reasonable. Therefore, there are three additional functions in this system that are responsible for forming and validating "objects" and "rules" to make sure all items generated by the system are reasonable and effective.

Function 1: Image processing function

This function can combine objects through image processing technique according to the "rules" defined by test editors. Besides, this function can make subtle changes to the size and position of each "object" to make the best combination for an effective item.

Function 2: Data retrieve function

This function can take items through the content-based image retrieval process. It can avoid multiple answers to one question or similar questions that may confuse examinees. When validating items, the function uses the above-mentioned content-based image retrieval technique to analyze the similarity between two items. Items with higher similarity are not to be used to avoid risks of item exposure.

Function 3: 3*3 Matrix Control function

This function focuses on the control of the 3*3 Matrix of item stems. It generates items by making changes to the "rules" defined by test editors from left to right, "up" to "down", or "diagonally".

III. Options retrieval subsystem:

Alternative options of each item were generated by image comparison. First, we computed the RGB value of the figures' pixel as the characteristic value. Then, we saved the figure characteristic into a 2-dimension matrix, and compared it with figures in the database. The similarities of the two figures were used to calculate the Euclidean distance (as shown in formula viii) of the characteristic value, and we select the lowest three as the alternative option.

$$d(Q,I)=\sqrt{\sum (f^{Q}-f^{I})^{2}} \quad \text{...(viii)}$$

IV. CAT System:

The main function of CAT system is to select appropriate items for examinees and evaluate examinees' ability based on IRT model. In producing items, CAT system is only an application interface, and does not perform image process, item design or retrieval. These tasks are done by VIBS, and the results are sent back to CAT system to administer tests. In terms of ability evaluation, this system uses IRT to process. The psychometric model includes Rasch model, Two-parameter models (2PL model), and Three-parameter models (3PL model). The formulas are below:

Rasch Model $$P(\theta)=\frac{1}{1+e^{-1.7(\theta-b)}}$$

2PL model $$P(\theta)=\frac{1}{1+e^{-1.7a(\theta-b)}}$$

3PL model $$P(\theta)=c+\frac{1-c}{1+e^{-1.7a(\theta-b)}}$$

Among them, θ represents the examinees' ability; $p(\theta)$ represents the chances of examinees with θ ability answer an item correctly; b is the difficulty parameter; a is called the discrimination parameter which allowing an item to discriminate differently among the examinees; and c, the guessing parameter, represented the probability that an extremely low ability examinee would get the item correct. Since the system simplifies factors that affect the items, the Rasch model is used in this study. The functions of the research tools are described as follows.

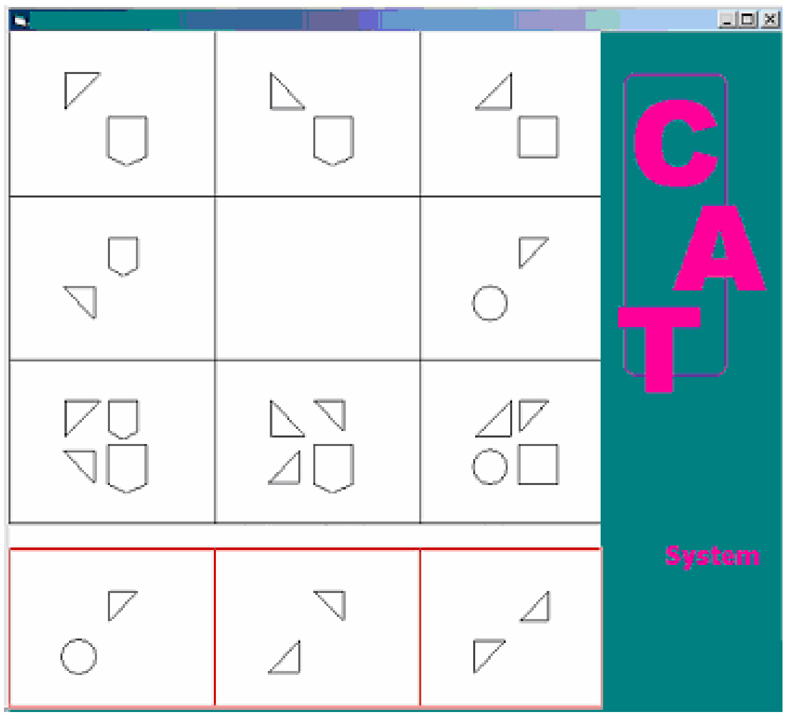


Figure 6, CAT System

RESULTS

The result was discussed in three parts: first was the descriptive statistics; second was item exposure and overlap rate validation and finally was VIB validation. This is to show that the feasibility of the VIB can be validated and security problems of the item bank can be addressed.

Descriptive Statistics

In this study, a VIB has been built specifically for figural testing. This VIB contains 48 rules. Each rule is composed of an image processing operation and a problem-solving rule. The primary parameter of this study was item difficulty parameter. An experiment deploying an online CBT system was designed to collect and estimate the items created by the VIB. 207 elementary school students participated in this experiment. The results of this experiment are presented in table 2. The structure of the CBT system and the results of the estimation are discussed as follow. An online CBT system is use to collect data of the item-generation rules in the VIB. An instruction example of this system would show to examinees before testing start. When examinees finished the test, the results would be transfer to the server and be analyzed in a short time.

Table 2, Difficulty parameter estimations of item generation rules

D1	Difficulty	D2	Difficulty	D3	Difficulty	D4	Difficulty
1	0.21	13	0.46	25	0.21	37	0.65
2	0.56	14	0.44	26	0.39	38	0.4
3	0.49	15	0.49	27	0.4	39	0.63
4	0.08	16	0.71	28	0.48	40	0.35
5	0.8	17	0.27	29	0.22	41	0.34
6	0.12	18	0.22	30	0.83	42	0.43
7	0.4	19	0.19	31	0.29	43	0.42
8	0.39	20	0.31	32	0.72	44	0.65
9	0.4	21	0.83	33	0.7	45	0.61
10	0.27	22	0.27	34	0.6	46	0.6
11	0.34	23	0.76	35	0.63	47	0.6
12	0.4	24	0.45	36	0.6	48	0.51

D1 : Item generation rule are composed of SUB operation and 12 processes
D2 : Item generation rule contains OR operation and 12 processes
D3 : Item generation rule are consisted of AND operation and 12 processes
D4 : Item generation rule are composed of XOR operation and 12 processes

The item difficulty parameters created by the same rule were closed to each other. The results of the experiments are described as table 3.

Table 3, Results of item difficulty parameters generated by the rule A, B, C

Rule A	Difficulty	Rule B	Difficulty	Rule C	Difficulty
A-1	0.63	B-1	0.5	C-1	0.28
A-2	0.69	B-2	0.5	C-2	0.39
A-3	0.67	B-3	0.56	C-3	0.41
A-4	0.7	B-4	0.53	C-4	0.38
A-5	0.73	B-5	0.59	C-5	0.34
A-6	0.72	B-6	0.52	C-6	0.16
A-7	0.72	B-7	0.52	C-7	0.25
A-8	0.64	B-8	0.59	C-8	0.42
A-9	0.81	B-9	0.59	C-9	0.34
A-10	0.72	B-10	0.48	C-10	0.38

Table 4, Standard deviation of difficulty parameter of rule A, rule B, and rule C

Rule A	Rule B	Rule C
0.051218	0.04158	0.082226

The VIB generated items with similar item difficulty parameters by the same rules. The result indicated that the item difficulty parameters created by the same rule were closed to each other, which meant that the VIB is a powerful tool, and it can solve the problem of item exposure.

The Item Overlap Simulation

In this study, an item overlap simulation was conducted. According to the item overlap rate (given in formula ix), when max length of the test = 48, subjects = 30000, the simulation results are as follows.

$$R_t = \frac{T_O / C_2^N}{(\sum_{i=1}^{N} L_i) / N} = \frac{2T_O}{(N-1)\sum_{i=1}^{N} L_i} \qquad \text{(ix)}$$

R_t – test overlap percentage

T_O – the total numbers of items that both subjects overlap

L_i – the test length of the ith subject

Table 5, Results of the item overlap rate simulation

Item overlap rate (R)	$2.43488E^{-10}$
Mean of test length	36.5078
Mean of Theta-Estimated	-0.106
Mean of SE	0.4023

Table 6, Use frequency (times) of each item-generation rules

D1	frequency	D2	frequency	D3	frequency	D4	Frequency
1	22965	13	25020	25	21256	37	22966
2	25055	14	22870	26	22550	38	19741
3	24651	15	23302	27	20359	39	22747
4	26672	16	21622	28	24849	40	23579
5	21806	17	22000	29	20948	41	22762
6	23813	18	22271	30	20147	42	21263
7	21389	19	24464	31	24956	43	21142
8	25197	20	23895	32	21689	44	21860
9	22124	21	20891	33	22063	45	23353
10	22814	22	20581	34	24960	46	23111
11	23651	23	21064	35	23918	47	21411
12	21251	24	24848	36	24838	48	24549

Table 7, Item exposure rate of each rule

D1	Item of Exposure Rate	D2	Item of Exposure Rate	D3	Item of Exposure Rate	D4	Item of Exposure Rate
1	0	13	0	25	0	37	0
2	0	14	0	26	0	38	$1.0128e^{-4}$
3	0	15	0	27	0	39	0
4	$3.74925E^{-05}$	16	0	28	0	40	0
5	0	17	0	29	0	41	0
6	$4.19939E^{-05}$	18	0	30	0	42	0
7	0	19	0	31	0	43	0
8	0	20	0	32	0	44	0
9	0	21	0	33	0	45	0
10	0	22	0	34	0	46	0
11	0	23	0	35	0	47	0
12	0	24	0	36	0	48	0

The simulation results proved that VIBS solves the problems of item exposure.

Validating VIB

After the VIB was built, a test was administrated for 310 examinees. We used examinees' APM scores as the external criterion and the total score of computerized figural testing in this study for Pearson Product-Moment Correlation analysis. The examinees' scores in "computerized figural testing" and the descriptive statistics of their APM scores are shown in Table 8. The two scores are positive correlated to a desirable level (r = 0.683, n = 310, p = .000). It means the result in computerized figural testing is relevant to the examinees' IQ scores calculated by APM.

Table 8, Descriptive Statistics of "Computerized Figural Testing" Score and APM's Score

	Mean	Std. Deviation	N
Computerized Figural Testing score	38.68	5.450	310
APM' Score	29.40	3.620	310

Table 9, Correlated Coefficient of "Computerized Figural Testing" Score and APM's Score

		Computerized Figural Test	APM Score
Computerized Figural Test	Pearson Correlation	1	.683**
	Sig. (2-tailed)		.000
	N	310	310
APM Score	Pearson Correlation	.683**	1
	Sig. (2-tailed)	.000	
	N	310	310

**. Correlation is significant at the 0.01 level (2-tailed).

CONCLUSION

In this study, we proposed a new technique called, "VIB", to address test security problems. This technique integrates AIG, Content-base Image Data Retrieval, item exposure rate control, and item overlap rate control to do so. Using VIB to administrate a test can rule out item exposure and overlap problems. Using VIB can also precisely calculate examinee's real ability without an error.

To validate the study, we conducted a test using APM as the material to build a VIB for figural testing and using CAT system to link the VIB. This study found out the combination rule of APM tests some research on APM and uses image processing operations, such as And, Or, Xor, and Sub to establish these rules. In this study, using image processing techniques helped us to easily and quickly generate items.

To address the technical problems on distracters, the purpose of this study aims to prevent similar distracters that may confuse examinees. We used the content-based image retrieval technique to analyze the similarity of two options. Options with higher level of similarity will be removed by VIB. Likely, items with similar stems will also be taken out by VIB so that the items will make more sense to examinees.

Working with all the above techniques, we developed research tools that included item rule definition subsystem, item generation subsystem, answer retrieval subsystem and CAT system. Using these tools, test editors can easily build a VIB. This study refers to APM to build the basic element of figural testing and transform the item combination rule of APM into image processing actions to be into the VIB for final test and validation.

The result of the test shows a positive correlation with that of using APM and demonstrates a desirable correlation coefficient(r = 0.683, n = 301, p = .000). The item exposure rate was extremely low with the rate ranging from 0 to $1.0128e^{-4}$, while the item overlap rate was $2.43488E^{-10}$which could be excluded from calculation. Conclusively, when VIB is used, test security is the highest and an examinee's ability can be correctly calculated.

Above all, the VIB building process proposed in this study are well-acclaimed by both test editors and experts. We can use this technique to build a VIB on all tests. With regards to research tool manipulation, both test operators and experts involved in this study think the tools are easy to use. Using graphic design technique to build objects and rules make it easy to build a VIB. On the test interface, CAT can quickly generate an item. Besides, both test operators and experts have not seen any duplicate items during this study, which means test security was ensured along the way.

SUGGESTION

However, this study also met some limitation along the way. In terms of developing research tools, for example, some test editor thought that they are difficult to input other item types. Also, some rules, such as four arithmetic operations, cannot be correctly loaded into the system. Besides, the problem-solving rules and item composition rules of some tests are extremely complicated as they need more time, manpower, and resources to be loaded into the system than designing a test. In an English grammar test, for example, we should take into consideration the item composition rule, but also should make sure the whole context is meaningful. However, VIB can't check if the whole context is meaningful. Another example is Cube Counting testing. Cube Counting testing is extremely complex as it should take into consideration the angles that human eyes cannot see. Therefore, items generated by a VIB may not be solvable.

In terms of difficulty assessment, some test editors found it difficult to assess the difficulty of a test. Because Items of similar types has different levels of difficulty, there is still room for improvement when assessing the difficulty of a test. It is even challenging to assess the discrimination parameter and guessing parameter. Besides, it is more difficult to assess the discrimination parameter and guessing parameter of VIB than a traditional item bank.

In terms of examinees, some examinees found distracters too difficult. As distracters were generated using content-based image retrieval technique, some distracters were so similar that examinees made misjudgments and their scores were affected. Besides, sometimes item variety can be extremely small to mislead the examinees. Some examinees suggest VIB be used in practice systems because there are almost no item exposure problems in VIB. Some examinees have shown improvements of some extent in their grades through extensive practice.

In this study, we have seen great results in tests with simple objects and easy problem-solving technique. This study will take a different approach, such as human intelligence and fuzzy computing technique, to solve the above-mentioned problems concerning research tool development and difficulty assessment. As human intelligence evolves over time, we hope that fast-speed computing can easily solve all kinds of problems in test theories. This study will also plan to use VIB in all types of tests so that we can find flaws in VIB and correct them to ensure a safer and more efficient VIB.

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DEVELOPMENT OF A RELATIONAL DATABASE FOR LEARNING MANAGEMENT SYSTEMS

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ABSTRACT
In today's world, Web-Based Distance Education Systems have a great importance. Web-based Distance Education Systems are usually known as Learning Management Systems (LMS). In this article, a database design, which was developed to create an educational institution as a Learning Management System, is described. In this sense, developed Learning Management System consists of basis of Virtual Education Institutions. In this study, a fully relational database design has been realized in compliance with SCORM standards and got ready to be used as Virtual Education Institutions. This system can be used for any required education institute and it can be run within the same interface. In LMS that will be generated, a faculty or institute can be defined and academic and all administrative processes of the defined institute can be managed with the designed system. Proposed database design has been used in a LMS of Afyon Kocatepe University. In this system, many processes like indexing, uploading, downloading, production and editing of web based learning materials can also be performed easily and safely.
Keywords: Distance Education, E-learning, Web-Based Distance Learning Systems, SCORM, Relational Database Design.

INTRODUCTION

In today's modern age, changes are observed people's life style. Development of mobile communication systems and mobility of the people play the most important role about this issue. People's daily activity programs are divided into many different type activities. The main concern in education is that how classical education institutions will establish education environment of increasing active population. The purpose of mobile education is to move today's stable education environment to a virtual, flexible education environment of the future (Yuen and Wang, 2004).

Today, there is a growing interest in online learning all over the world (Elango, 2008). Electronic learning plays important role not only in academic institutions but also in small and medium-sized enterprises, which have the will to renew knowledge and experience of their staff. E-learning provides practical solutions to the students, who did not participate in the past education processes (Roy and Raymund, 2008). At this point, scientists have emphasized on customization, interaction and control (Piccoli, 2001). An e-learning program should be especially prepared for all students with the integration of different objects, past experiences and also these students should increase their own activities (Collins, 2005; Collins, 2006; Hodges, 2004).

E-learning trusts in current information and communication technologies for distribution of learning contents. Learning process or its ambiance is organized according to either synchronous or asynchronous method. E-learning, which has been developed as a learning solution, represents the distance education with the flexibility of educational software and process covering synthesis of different technologies (Yapicioglu, 2001).

Increasing internet using rate and developments in the infrastructure of today's internet have caused many improvements in web-based software and services. As a result of these improvements, education activities have begun to be performed by using the internet and network technology. Many technological tools like electronic books, electronic mails and conference environments have also taken active parts in these kinds of education activities. Due to increasing rate in using these tools and related education methods, a special education system has appeared. The whole education system is called as "Web-based Distance Education System" (WBDES). Today, distance education systems are established in many universities and education-teaching activities are performed via these systems. One of the big reasons in increasing using rate of Web-based Distance Education is requirements to these kinds of systems in parallel with developments in the information technology.

One of the most important advantages of WBDES is being able to provide asynchronous education within a virtual education environment. In a WBDES, students can easily access to the educational contents, which was transferred by educators to the system and take advantage of these sources by using different educational tools. Because of its advantages on costs, WBDES is also preferred to be used rather than other models or systems (Carswell and Venkatesh, 2002). Today, the most important reason in increasing the number of WBDES and to be accepted by students is their independent working mechanism from time and location (Bullen, 2006). It has been an important preference reason for the people who suffer shortage of time and can not take active part in the location where education activities are performed. Generally, Web-based Distance Education Systems are called as Learning Management Systems (LMS). Factors and methods, which are considered in designing LMS, have been examined in the literature from various perspectives (French, 1999; Harris, 1999; Joliffe, 2001). When they are evaluated in terms of cost, it is seen that the cost of WBDES is approximately half of a typical traditional and formal education cost. On the other hand, interactive education feature of WBDES and up-to-date content presenting function should also be considered (Balbieris and Reklaitis, 2003).

In this study, a database model, which was designed and developed to be used for Learning Management Systems, is described. The database model was developed in a relational structure and designed to be suitable for LMS, which are in compliance with SCORM standards. Additionally, the developed model has a portable, easily accessible and easy-to-manage structure and can be used in long-term studies. With this database model, a virtual education institute can be established and published via required interface structures. In the related Learning Management System, a faculty or institute can be defined and all academic and administrative processes of these institutes can be managed with the help of developed database model.

SCORM Standards

SCORM is a Content Management System Standard and can be defined as “Shareable Content Object Reference Model”. SCORM includes a framework for running lesson contents. SCORM standards are interested in publishing rather than teachable features of the lesson content (Su, 2006; Him, 2005).

While explaining the content management aspects of distance education systems, SCORM standards must also be examined in every respect. While applying SCORM standards, some factors, which belong to SCOM standards, must be stated. These factors are;

1. *Interoperability:* Merging contents from different sources for interaction and to be able to run in different systems and communicate with other systems.
2. *Re-usability:* The situation that defines re-usability for information and objects, which consist of e-learning content (script, graphic, sound, animation, video, code…etc.) and turning into a different education object, which includes all of these objects.
3. *Manageability:* Monitoring the information, which belongs to the user or content management system.
4. *Accessibility:* To be able to access a learning object at any time.
5. *Durability:* A technological development, which describes generating new versions for the tools requiring re-design and coding.
6. *Scalability:* Being able to change according to quantity of users, number of the technology, number of courses or content.

If SCORM standards are taken into consideration, the developed system or model can be used for a long time and updated easily. System or model contents can also be accessed easily from any location.

Relational Database Model for a Learning Management System

Database design is a detailed study, which must be overviewed plenty of times in the period of analyzing performance. Tables and properties of these tables must be examined in any module structure during the analyzing and designing process. Because of some processes like information filtering or information access, the database model should have an integrated structure. In every phase of the analyzing process, features and functions of a typical relational database must also be considered. Moreover, handicaps appeared by relation scenarios can jeopardize information integrity and also information security. So, these factors must also be considered.

Database structure of a typical distance education system presents a relational and complex structure. Different user types, authorization features and behavior rules also requires a relational database model. For instance, if a new user is added to the system, the necessary space, which this new user will need should be arranged automatically according to the user type. Different information depend on a user is kept in different tables like exams, personal information and course lessons in the distance education system. A relational model is also required to ensure a flexible model, which provides needed spaces for each new user added to the database. Congruently, the model can also remove related information and records automatically when a specific user is removed from the database.

MS SQL Server – Database Management System has been used in designing the LMS database structure.

Before designing the database structure, an analyzing performance has been performed and structure of the education system has also been adjusted. At this point, the features, which will be needed in the LMS, are considered. Designed LMS system consists of 38 main modules and 153 tables. Each module includes an integrated sub table structure.

While realizing the association process, a semantic scenario among database tables has been generated and according to this scenario, 14 different associated groups were created.

These groups are:

1. Application
2. Users
3. Financial Services
4. Workshop
5. Test
6. Menu
7. Academic Information
8. Chat
9. Group
10. Forum
11. Other Applications
12. Course
13. Demo
14. Survey

Each module in the system is an integral structure within itself. Additionally, a module is also an integral relation scenario at the same time. So, there is only one module in a provided relation scenario.

Tables and Relation Scenarios

The first module of the developed model is named as the Application module. Users who want to benefit from the system (administrators, students or lecturers) take part in the database structure of this module. The Application module tables and relation scenarios are presented in Figure 1.

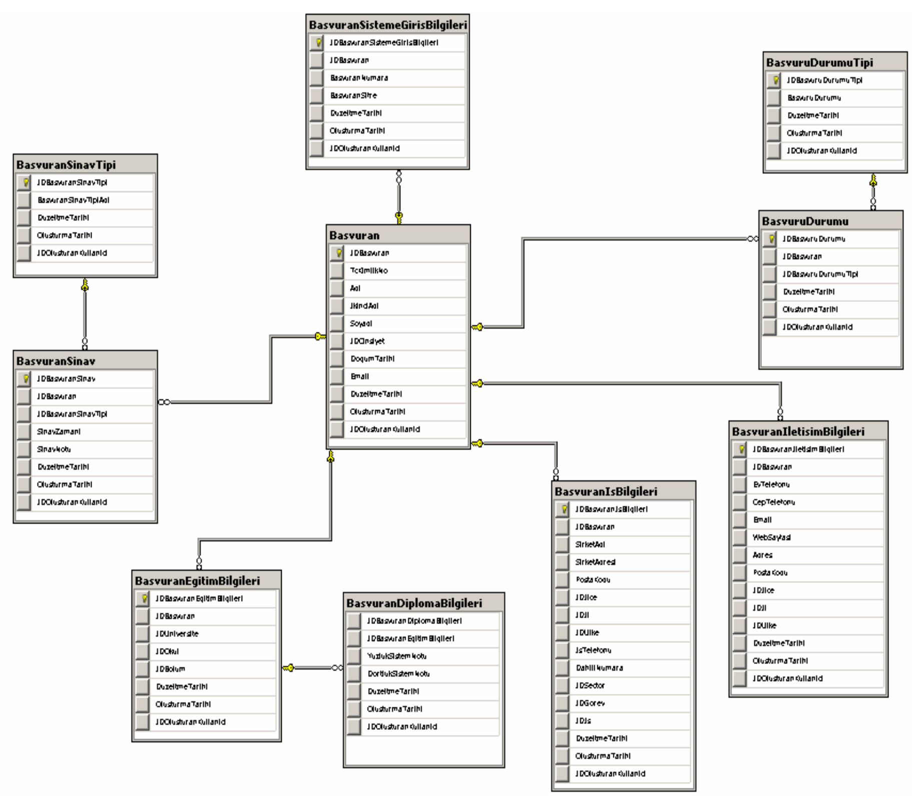

Figure 1. Application module tables and relation scenarios.

User tables relation scenarios are given in Figure 2. The user module is one of the most important modules of the LMS module. All necessary information about system users (from administrators to course students and lecturers) is stored in this module.
Financial transactions scenario and its LMS module are shown in Figure 3. In this module, students' registration fees, incomes from additional courses and basic expenses like financial transactions are tracked.

Workshop module was developed to be used for course activities, which can be performed by visitor users. With this module, special education sessions like training seminars can be performed easily. For instance, a general "Photoshop" training can be organized with the help of this module. Users, who participate in this module, are evaluated in similar conditions with other course students. Workshop module and relation scenarios are presented in Figure 4.

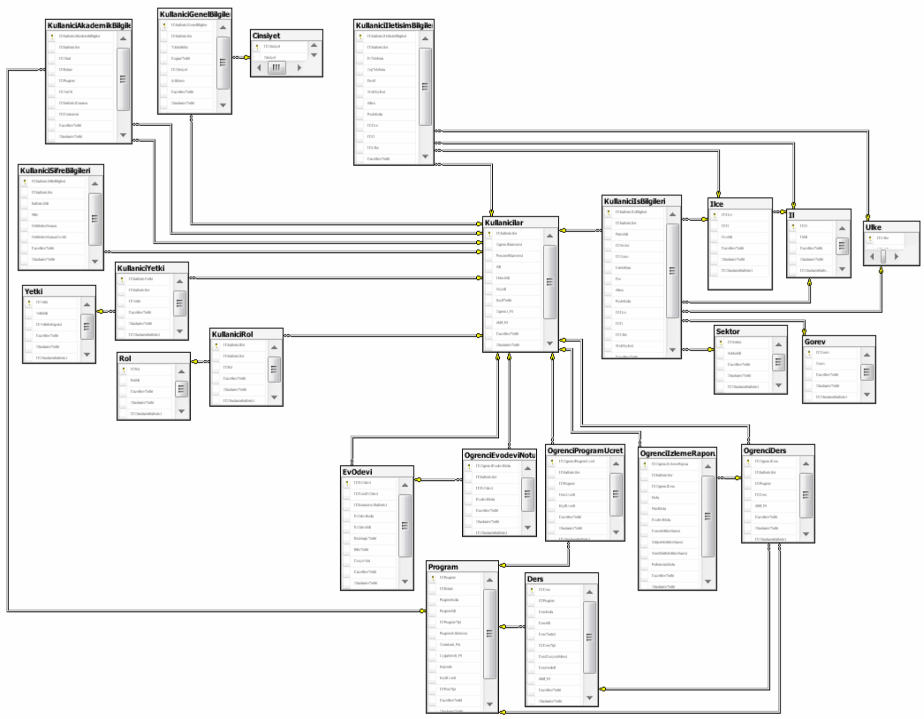

Figure 2. Users module tables and relation scenarios.

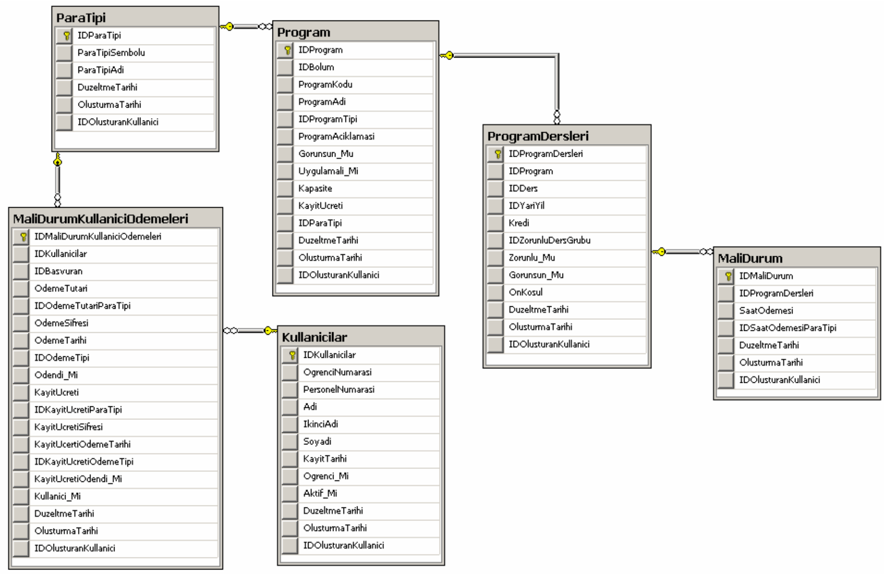

Figure 3. Financial services tables and relation scenarios.

Exam module and relation scenarios are shown in Figure 5. The developed module is suitable to be used for special exams like visa and final examinations. As it can be seen from the table structure, various information like examination branch or class, examination type, examination date, examination starting and ending time, examination questions and examinations results can be stored in the database.

Menu structures, which can be seen by administrators, students and lecturers, are organized by using the Menu module and its database features. At this point, features of provided menu interfaces are changed according to the user type as "student" or "lecturer". These menus are organized according to user roles and privileges. Menu tables and relation scenarios are presented in Figure 6.

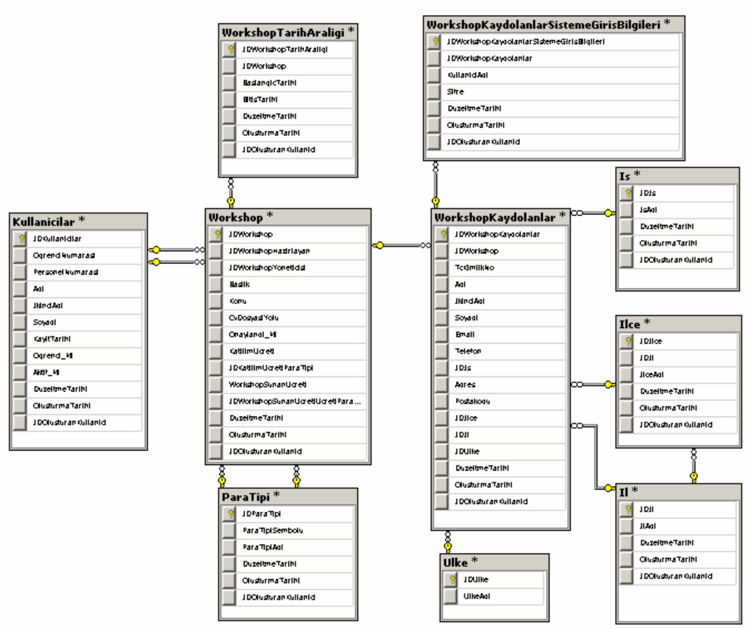

Figure 4. Workshop module tables and relation scenarios.

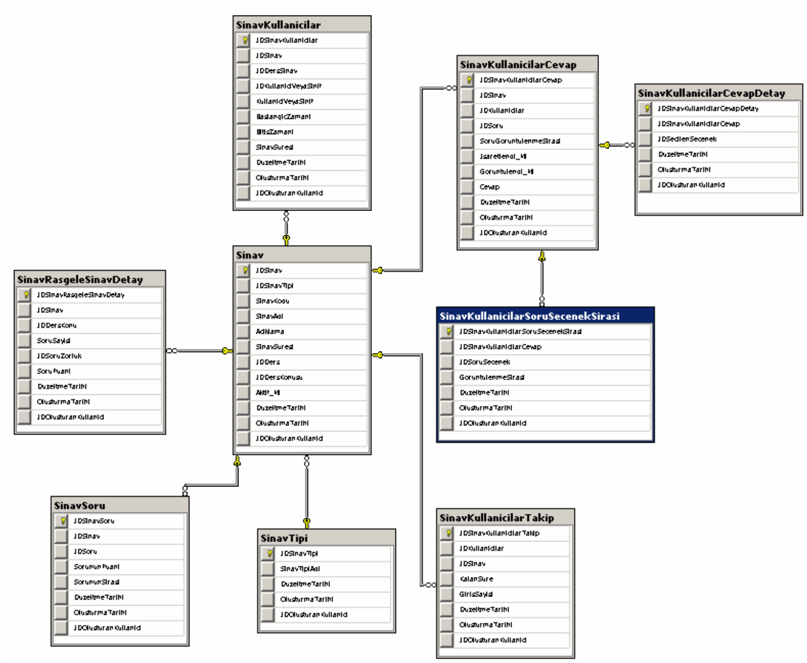

Figure 5. Test module tables relation scenarios.

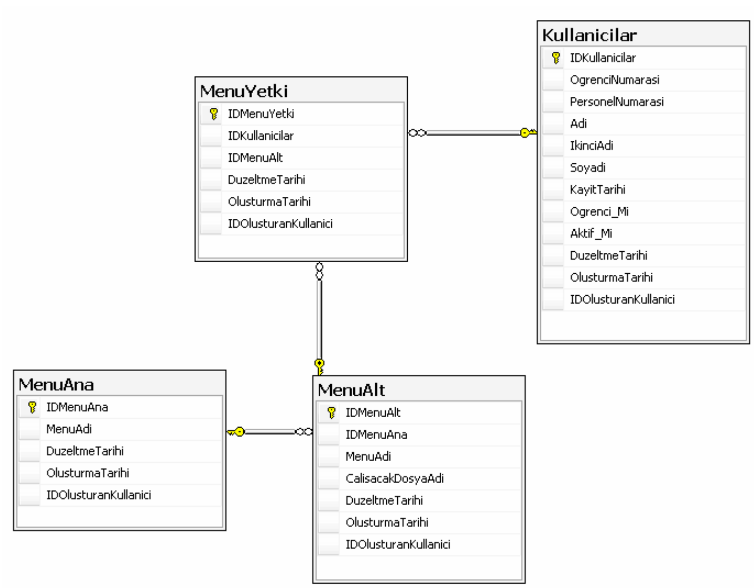

Figure 6. Menu tables and relation scenarios.

In Academic Information module, a structure, which can be used by each education institute to fulfill its academic functioning, has been formed. With this module, different information like students' personal information, registration details, system sections, branches, courses and payment information can be kept in a relational structure and many different actions associated with the mentioned information can be defined easily. Academic Information tables and relation scenarios are presented in Figure 7.

Chat module has been developed to ensure text-based and auditory conversation sessions among students and lecturers on specific dates and times.

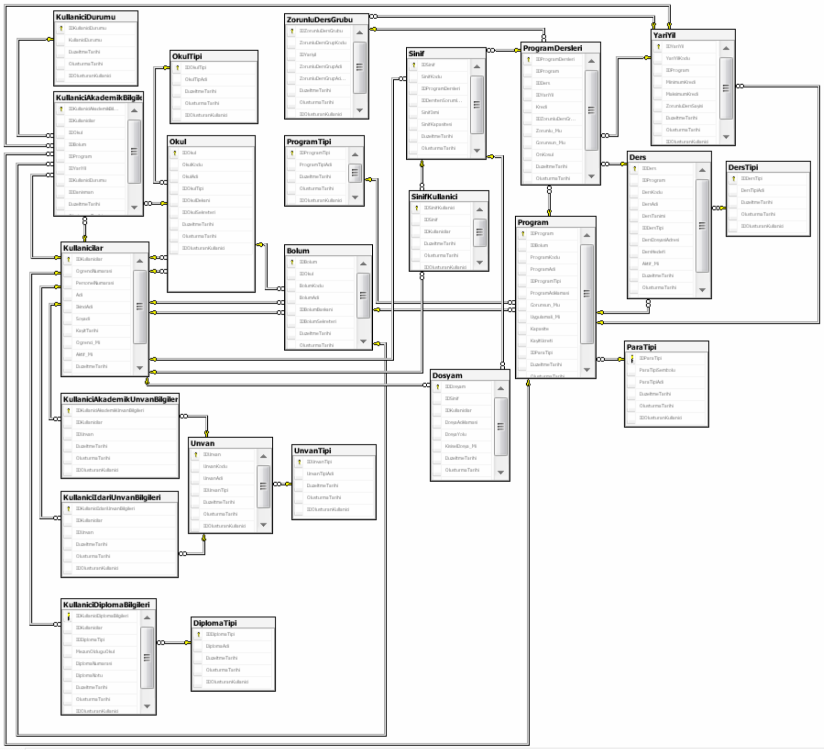

Figure 7. Academic Information tables and relation scenarios.

As it can be seen from Figure 8, only lecturers and students can perform chatting activities mutually.

In Group module, authorization descriptions and related functions are adjusted for the registered users. In this aim, new role or authority descriptions can be added to the system and authorization or role assignments can be performed easily for each registered user. It is also possible to define new user groups, which are allowed to access specific areas. Group module tables and relation scenarios are shown in Figure 9.

A discussion forum has been consisted in to ensure information sharing among lecturers and students. This module is associated with the user login system and so each user can participate in information sharing activities at the same time. Forum module tables and relation scenarios are shown in Figure 10.

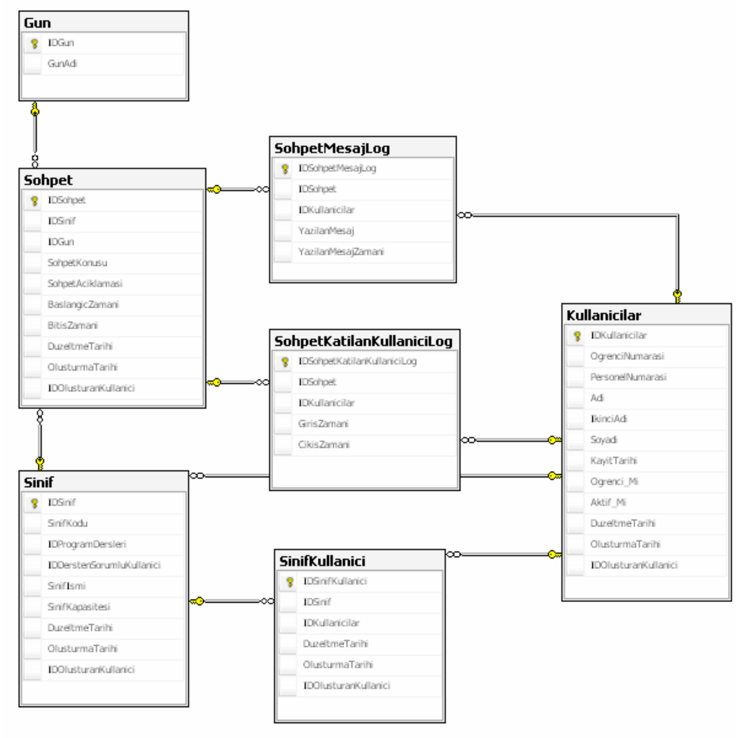

Figure 8. Chat module tables and relation scenarios.

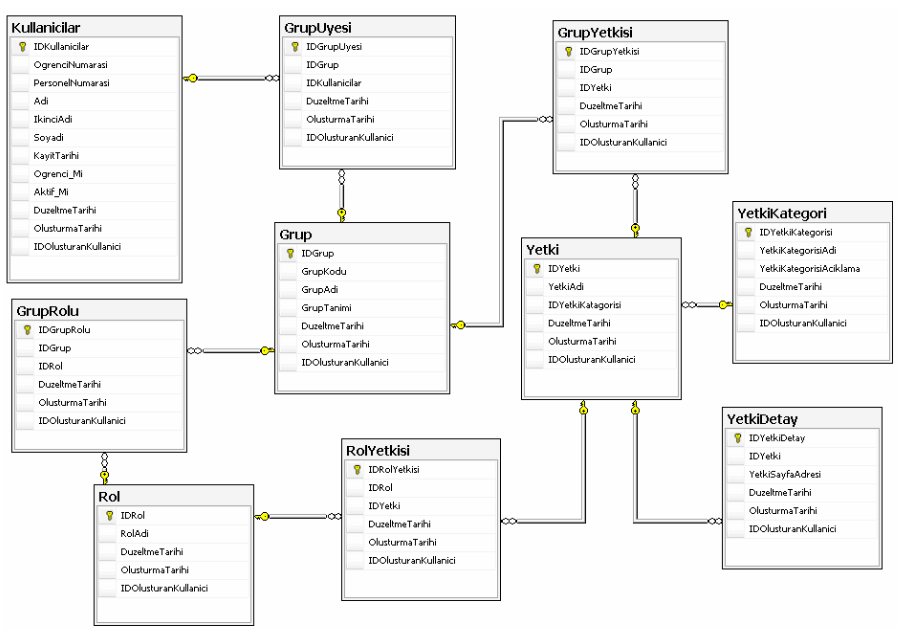

Figure 9. Group module tables and relation scenarios.

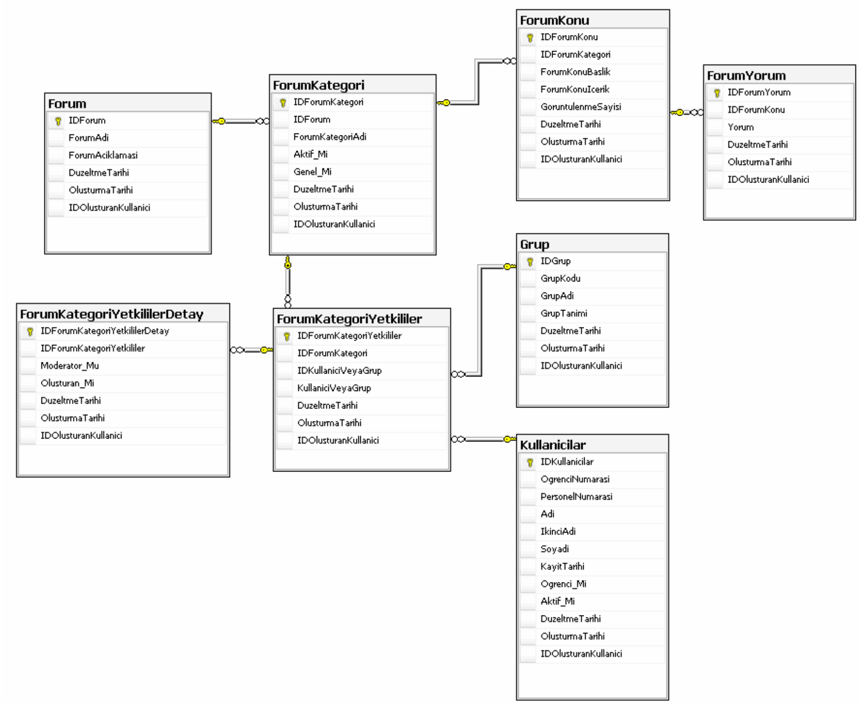

Figure 10. Forum module tables and relation scenarios.

LMS functions are not limited to only modules explained before. Many different modules are also combined under “Other Applications” tables and relation scenarios. Some of the related modules are: Personal Calendar, Academic Calendar, Transcript, Performance Tracking, News, Personal Notes, Dictionary, Virtual Classroom, FAQ, Private Message and Meeting modules. Other Applications tables and relation scenarios are presented in Figure 11.

Courses module is used for defining the courses, which will be provided in the system. In this module, some information about prepared courses (related course codes, descriptions for courses, course lesson contents…etc.) are defined easily. By using the Courses module, it is also possible to create different types of courses and define different features (course assignments, course examinations, descriptions for added course lesson contents…etc.) for the stored courses. Course module tables and relation scenarios are presented in Figure 12.

Demo module was developed to be used for showing system features and functions to the people who are not fully registered and want to review the whole system. With this module, user can only examine using features and can not make any changes in the system. Demo module tables and relation scenarios are shown in Figure 13.

Survey module was developed to be used for performing survey activities in the system. With this module, it is possible to define survey questions and show them to user via system interface. Added surveys can also be removed automatically at specific times. Additionally, statistical information about added surveys can also be shown to users or just kept as confidential. Survey module tables and relation scenarios are shown in Figure 14.

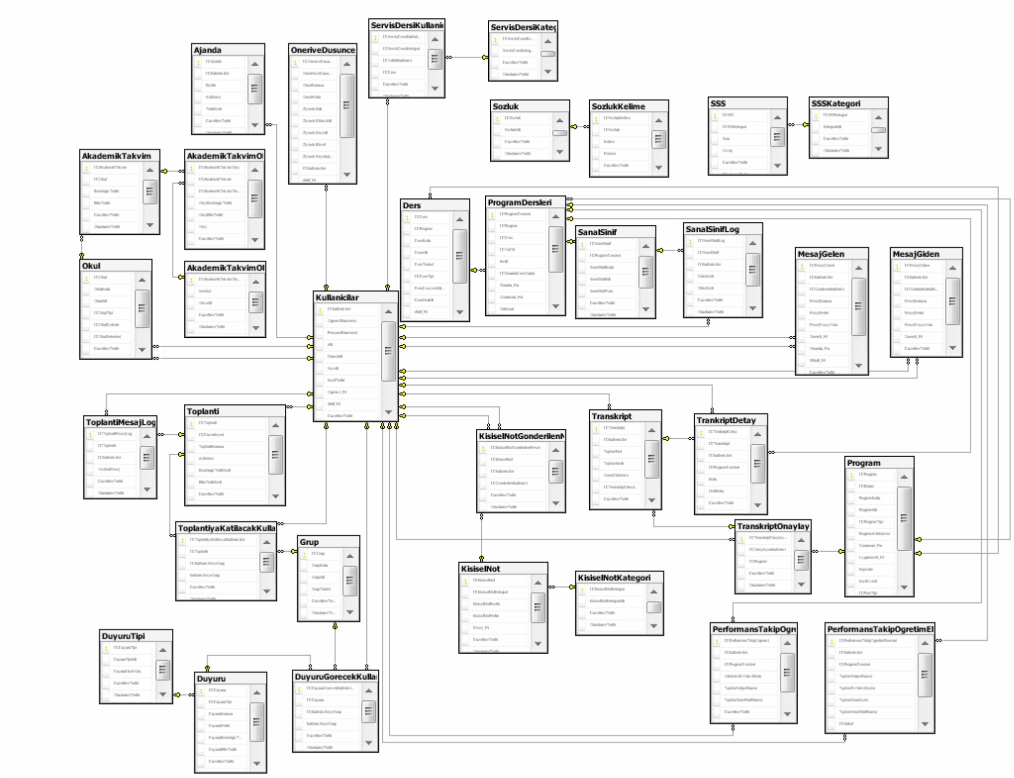

Figure 11. “Other Applications” tables and relation scenarios.

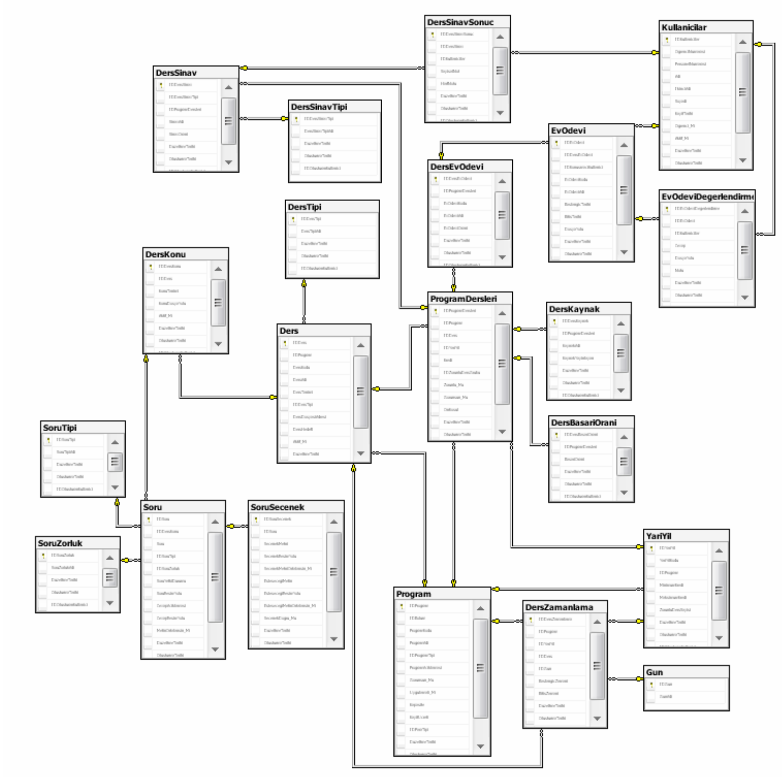

Figure 12. Course module tables and relation scenarios.

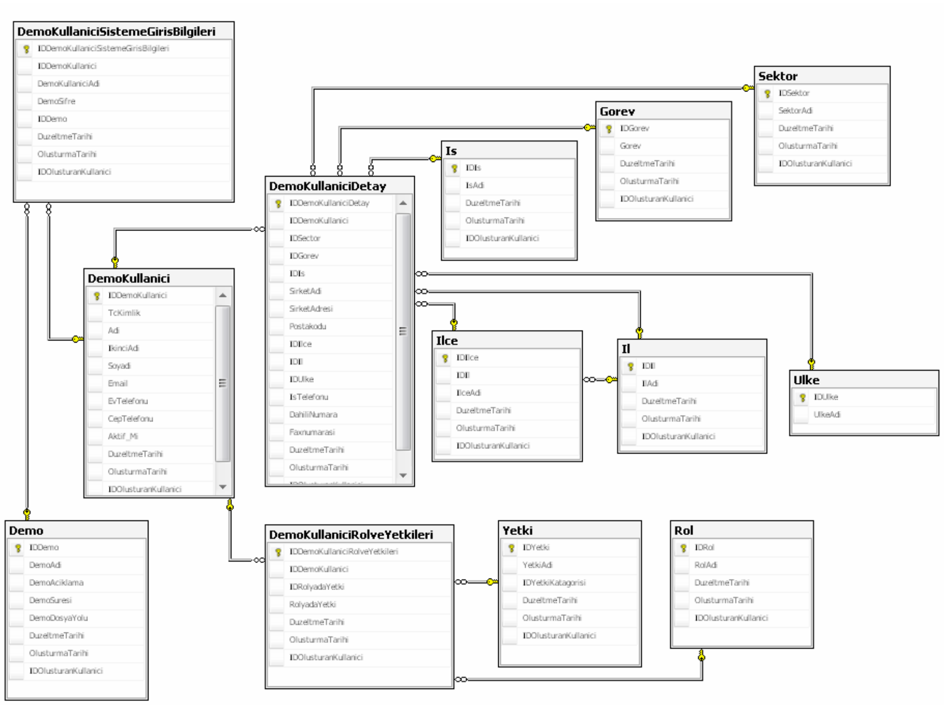

Figure 13. Demo module tables and relation scenarios

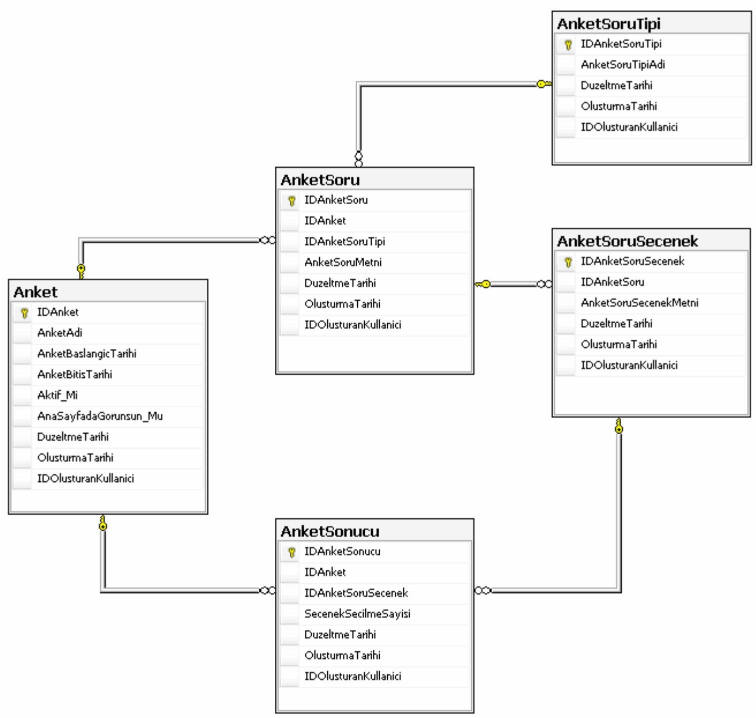

Figure 14. Survey module tables and relation scenarios.

The LMS Application

Designed database is currently used in a LMS developed at Afyon Kocatepe University. The LMS is named as Afyon Kocatepe University Distance Education Center (@KU-DEC). It runs efficiently on the web address: www.uzem.aku.edu.tr. It is not possible to explain the whole system features and functions here. So, it will be explained briefly.

Developed LMS has all the features that a typical LMS must employ. The system allows creating a virtual campus easily and provides different activity environments for administrators, students and lecturers. It has a modular structure and so system modules can be added, removed or updated by using the provided tools. Figure 15 shows the login page of the developed LMS. Each user has a username and user password to login to the system via login page. After logging in to the system, users can view Frequently Asked Questions (FAQ) section, explanations for using the LMS and an academic calendar provided on the homepage.

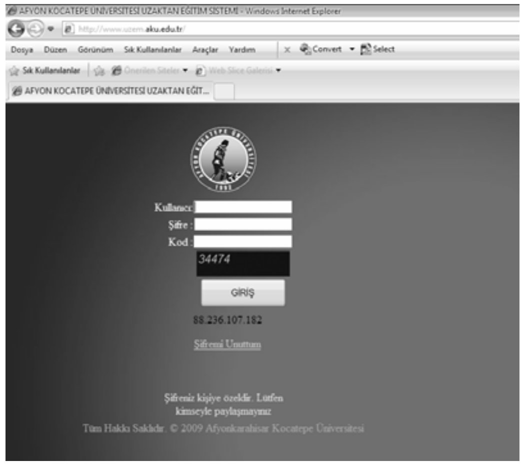

Figure 15. Login page for the LSM

Administrators have some authorities like creating entity, department or course and tracking both lecturers' and students' activities on the system. They also have authority to examine lecturers' and students' activity performances. Finally, administrators can also communicate with other users at any time as individually or collectively.

Lecturers can prepare weekly lesson contents and add new weeks by using the content preparation module provided in the system. Additionally, they can communicate with students via synchronous and asynchronous communication modules, which can be used as text based, verbal and visual. They can also prepare surveys with the present survey module to take students' opinions about lessons. By creating question banks over the system, assessments like quiz and homework can be prepared and provided to students as online. Figure 16 shows a screenshot from the lecturer homepage.

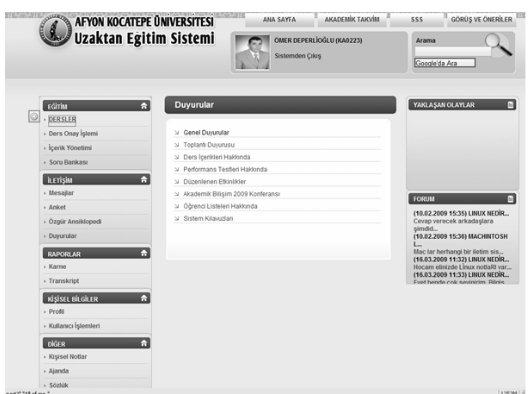

Figure 16. Homepage for lecturers

In the system, students can join a course lesson, track both synchronous and asynchronous lessons and perform all kinds of activities based on office operations (transcript, school report, student certificate or identity card request…etc.). They can also communicate with administrators, lecturers or other students by using e-mail, forum and petition functions. Figure 17 shows a screenshot from the student homepage.

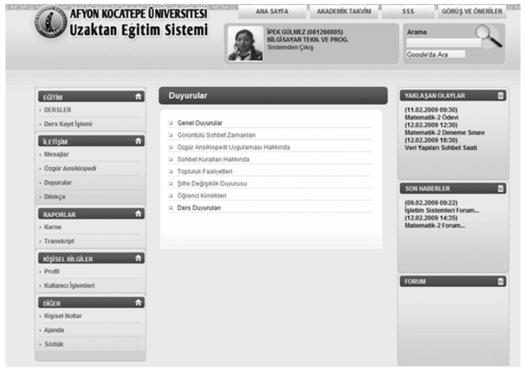

Figure 17. Homepage for students

CONCLUSIONS AND SUGGESTIONS

In this study, a relational database model, which can be used within web-based distance education systems, is described. The developed model provides fully relational design, data integrity and security for large-scale Learning Management Systems. Relation scenarios was arranged to be suitable for a Learning Management System and got ready for a management system interface. The system has also been prepared in compliance with SCORM standards. Prepared database model is used in a LMS, which was developed to be used as distance education infrastructure of Afyon Kocatepe University (@KU-DEC). The developed system has been tested since at the beginning of 2009. Up to now, no disruption has been observed in both system and the database. Any educational institution, which uses this database design, can be integrated to the developed system easily. This function is helpful for especially researchers who try to develop a new LMS. In this way, wasting time on database analysis and creating education scenarios can also be prevented.

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DOES A COMBINATION OF METAPHOR AND PAIRING ACTIVITY HELP PROGRAMMING PERFORMANCE OF STUDENTS WITH DIFFERENT SELF-REGULATED LEARNING LEVEL?

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ABSTRACT
This study aims to investigate the effects of metaphors and pairing activity on programming performance of students with different self-regulated-learning (SRL) level. A total of 84 computing students were involved in this seven-week study, and they were randomly assigned either to a group that received a combination of metaphor and pair programming (MPP) or to another group that received pair programming (PP) only. Students in both groups worked in pairs according to their SRL level (one high and one low) when solving programming problems in C++ language. The findings revealed that high SRL students in the MPP method performed significantly better in recall than their peers in the PP method, and similar result was observed among the low SRL students. However, no interaction effect was observed between the method and SRL level on programming performance, i.e., high SRL students always perform better either in the MPP or PP groups. Metaphors have assisted the learners to develop better conceptual understanding by linking the known to newly acquired abstracts; and pair programming does cultivate peer discussions. Also, instructor should assist students to improve their SRL to reinforce self learning.
Keywords: Metaphors, Self-Regulated Learning, Recall Performance, Pair Programming, Computer Programming

INTRODUCTION

Computer programming as part of the computing education is an essential skill that ought to be grasped by students in studying computer science. As programming demands complex cognitive skills, students find it difficult to understand, interpret and perform these complex cognitive tasks (Hawi, 2010; Mayer, 2003). Likewise, educators involved in teaching programming concepts to first year computing students are continually facing different challenges in cultivating the students' understanding in the fundamental area of semantics which is the programme comprehension. Miliszewska and Tan (2007) stated that complex cognitive skills such as planning, reasoning, problem solving and analytical thinking play their role in learning to programme. Problem solving skills which include reasoning and analytical thinking are required in analysing the given problem scenario. During the learning process, students are required to understand the given problem, design, code and perform maintenance that involve complex cognitive and social activity. To the first year computing students, majority of them believe that programming skill is complex and difficult to learn. However, those who are passionately interested in exploring the abstract problems find themselves motivated in acquiring the programming skill. Usually, these students are actively engaged in class activities and during lectures while the programming topics are covered. Somehow, they are able to seek help and discuss problems relating to programming. As such, effective learning takes place when students are learning through positive peer pressure in a fun and joyful environment as well as to reflect on self-learning outcomes by comparing them to the initial goals. Furthermore, higher thinking skill is needed in order for students to be the creators of new ideas, analyzers of information and generators of knowledge which seem lacking in these students (Butler & Morgan, 2007).

An earlier research on cultivating thinking and problem solving skills within students has been carried out when Pseudocode and program flowchart are mainly focused on the basic programming constructs (Tie, 2011). Besides teaching programming concepts, educators have tried in vain to cultivate the skills such as critical thinking, analytical and problem solving which are crucial to students who intent to take up programming career. Over emphasizing on the program syntax and semantics of individual statements will lead to the students' misunderstanding and inability to construct a complete working system which is the pragmatics. Despite the fact that students could recognise the syntax and semantics errors in the program flowchart or Pseudocode, they might not notice the logical errors. Foremost, these students find it a challenge when they were asked to convert the programming logic (in the program flowchart or Pseudocode) into executable programming codes in C++

language.

LITERATURE REVIEW

Metaphor is a high level abstract concept that involves the presentation of new idea in terms of relating it to the existing knowledge. American Heritage Dictionary Editors (2000) defined metaphor as a figure of speech in which the understanding of one thing is used to describe another. This is used to show that the two things are having the same qualities which making it an absolute comparison. It consists of two terminologies: the target and the source. As defined by Lakoff and Johnson (2003), the target is the subject to which attributes are assigned. The source is the subject from which attributes are borrowed, that is called to describe the target. Teaching approach attempted to cover numerous fundamental C++ concepts, for example variables declaration, data types, classes and control structure. Therefore, it is important that the technique focused on concepts which the students have seen before and build upon them. In this case, metaphor is used to communicate C++ concepts to students in a way that they could assimilate them and relate them to what they already know. With this, it is significant to assist the formation of interpretation and application of knowledge from the basic programming concepts acquired. Mastering the basic programming skills is fundamental for preparing learners to the next higher programming courses. Metaphors play a significant role in helping learners to develop mental images to reason abstract situations. They are being described as a real world system which the students are able to apply as a reference for linking existing ideas to the newly introduced concepts in programming system (Parker, 2009). The metaphor is expressed into either visual or textual representation in relating the abstract nature of the programming tasks to the fundamental of programming concepts. In learning programming syntax, educators use metaphor for communicating novel concepts. In turn, students identify the anomalies between their existing knowledge and the new information by the metaphor and develop new knowledge by connecting their existing knowledge to accommodate both sources (target and source). In this case, students are to transform these abstract concepts into logical flow by using designing tools such as program flowchart and Pseudocode before converting it into C++ programming codes. By connecting any concrete images with text information it will improve understanding in learning programming and increase the learners' recall (Flanik, 2008). Thus, metaphor as an instructional strategy used deliberately in communication to achieve specific effects that transform students' programming performance. It assists in enhancing programming comprehension and better academic performance. Three examples of conceptual metaphors (Figure 1, Figure 2 and Figure 3) are used to illustrate the C++ syntax in learning programming.

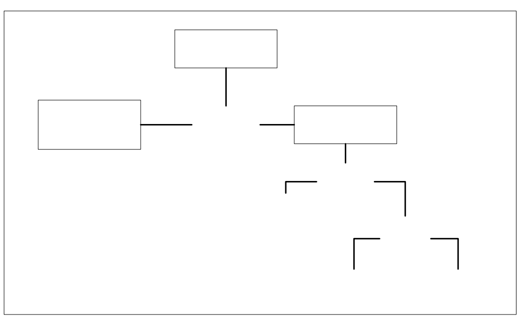

Figure 1: An Symbol Expression Tree Formed for Assignment (adopted from Merwe, 2008)

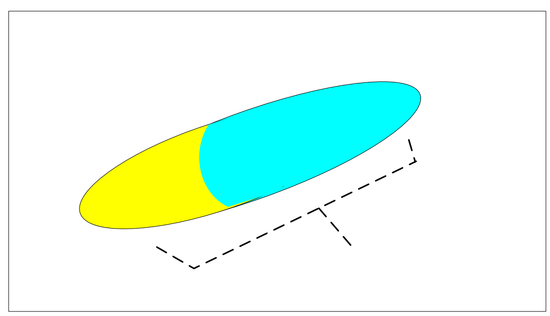

Figure 2: Medical Capsule Representing Classes

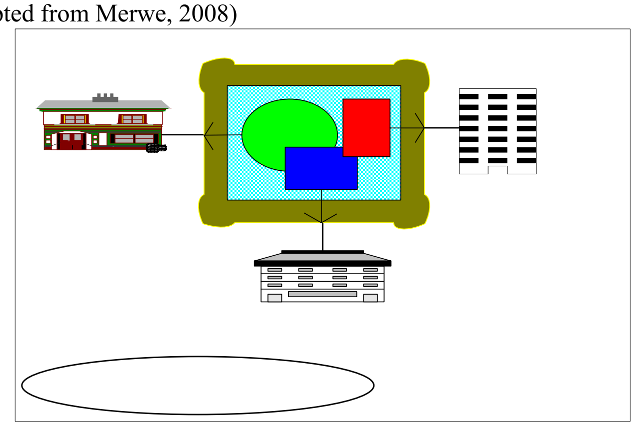

Figure 3: The Library Metaphor – explaining the "class" concept

Pair programming is a structural and systematic form of programming cooperation. It has been adopted in software industry to increase programmers' productivity and programming skills, where programmers work together in groups to complete the assigned tasks (Chung & Lo, 2006; Beck, 2000); and in education to increase learning. Research findings revealed that students perform better in terms of producing higher quality of codes, increasing retention rates, as well as improving problem solving skills and attitude towards programming when working in pairs (Bruce & McMahon, 2002).

Self-Regulated Learning (SRL) has been defined as a process in which the students set goals for their learning. It is a skill with the ability to regulate learning towards a desirable learning outcome. This includes planning and carrying out certain strategies for the achievement of the goals, and to independently manage time and effort, and evaluate the quality of their own learning environment (Jossberger, Brand-Gruwel & Boshuizen, 2006; Zimmerman, 2000). It also involves motivation, time management, behavior, physical and social environment regulation. Kerka (2005) indicated that the learning process of students and their performance are closely associated with the different levels of SRL abilities. He also revealed that SRL has positive effects on their learning abilities in terms of cognitive, attitudes, behaviours, emotional and psychological development, and personal empowerment. The students' level of SRL ability, high or low, is based on the group mean measured using the Motivated Strategies for Learning Questionnaire (MSLQ) instrument developed by Pintrich and DeGroot (1990). Studies have shown a significant correlation between an individual student with a high level programming performance and his high-quality involvement in SRL (Zimmerman, 2008; Lee, Shen & Tsai, 2008). In fact, the high SRL students are those who are highly involved in independent learning (Reyero & Touron, 2003). These students have the ability to regulate learning towards a desirable learning outcome and the skill to manage and organize their own learning needs, strategies and learning opportunities. The students with higher level of SRL ability are capable of building their own conceptual metaphors when new ideas are presented. By relating the existing knowledge and experiences to the newly introduced concepts, these highly self-regulated students are competent to set their learning goals based on own expected learning outcomes. When feedbacks and constructive criticisms are obtained from lectures, these learning strategies will be refined to ensure effective learning with positive outcomes.

RESEARCH QUESTIONS

In this study, three primary questions have been formulated to address the research outcomes:

- **RQ1:** Is there any significant difference in terms of recall performance for high SRL students who received a combination of metaphor and pair programming (MPP) treatment and those who received only the pair programming (PP) method?
- **RQ2:** Is there any significant difference in terms of recall performance for low SRL students who received MPP treatment and those who received only the PP method?
- **RQ3:** Is there any interaction effect between instructional methods and self-regulated learning level?

RESEARCH METHODOLOGY

The purpose of this study is to investigate the effects of blending the metaphor with pair programming strategy on the programming recall performance among high and low SRL computing students in learning programming constructs through C++. It aims to examine whether the different levels of SRL could be the moderating factors when an instructional strategy such as (i) metaphors as visualisation technique, and (ii) pair programming as cooperative learning, are used in both classroom and practical sessions during course delivery.

Research Design

A 2 x 2 factorial design was applied to examine the effects of MPP and PP instructional methods on the students' recall performance. This quasi-experimental study applied pre and post-test control group design as illustrated in Figure 4. In this case, the self-regulated learning level (high and low) was used as the moderating variable. The students' recall performances were measured based on the immediate post-test scores obtained from the Computer Programming Performance Test (CPPT). All the 84 students (n = 84) from the first year semester one undergraduate computing course were involved in this study. These two classes, all intact groups, were randomly assigned to the two treatment groups. The experimental group (n= 42) received the MPP treatment while the control group (n= 42) was treated with the PP method. For this study, the course comprised lectures and practical / tutorial sessions. During the lecture session, the students were given the explanation on some programming concepts using tools such as flowcharts and Pseudocode, while during the tutorial or practical session, the students used the C++ language for coding. This was carried out for seven weeks on the two treatment groups in the classrooms with practical session where the pre-test was conducted before the treatment and the immediate post-test was conducted immediately after the treatment.

O_1 - - - - - - - - - X_1 - - - - - - - - - O_4 - - - - - - - - - -
O_2 X_2 O_5

Where,
O_1 , O_2 — Pre-test
X_1 , X2 — Treatment (MPP, PP)
O_4 , O_5 — Recall test (immediate post-test)

Figure 4: The Overall Research Design

Research Instruments
Prior to the study, the Motivated Strategies for Learning Questionnaire (MSLQ) was used to identify the students' self-regulated learning level. It consists of 23 items that requires 20 minutes to complete. In this study, the MSLQ mean score of the sample was 3.50. Students who scored 3.50 and above the group mean were categorized as high SRL and those who scored below 3.50 were classified as low SRL. A CPPT pre-test which consists of ten items used in section A of the immediate post-test was administered to the participants prior to the treatment. The purpose of conducting the pre-test was to obtain baseline data and to measure the initial differences in terms of programming knowledge between the two treatment groups before the treatment. An immediate post-test of CPPT, covering both theory and practical knowledge was conducted immediately after the treatment to gauge the students' programming recall performance. Prior to it, a set of reliability tests were conducted on the two instruments (pre-test and immediate post-test of CPPT) used in order to determine the Cronbach's Alpha reliability coefficients. The inter-rater reliability test was conducted on the CPPT pre-test and immediate post-test because these CPPT tests consist of open-ended questions. The scores from the first examiner and second examiner were then compared to determine the consistency of the rates estimated in the Cronbach's Alpha reliability coefficients. The reliability values for:- (i) the pre-test is 0.915 and (ii) the immediate post-test is 0.954.

Data Collection Procedures
The first year semester one computing students in the two intact classes were involved in the seven-week experimental study. They were randomly assigned to the two treatment groups. The students in the first treatment group (MPP) received the combination of metaphors and pair programming instructional strategy in learning the basic programming concepts. In the control group (PP), the students were exposed to PP as the cooperative learning instructional strategy in solving the programming problems. Topics related to basic C++ concepts such as variable declaration, assignments, three types of control construct and object oriented concepts were covered in the class sessions. To understand the abstract concepts, the students in both groups were taught using programme flowchart and Pseudocode. In the practical session, the students were given weekly tutorial tasks that were assessed on the programming syntax, semantics and pragmatics knowledge of the C++ logic. These tasks required the students to work in pairs to write a working C++ codes based on the given problem scenarios. Thus, they were to apply C++ programming language in converting these logical concepts into working programme codes. On the other hand, they were to derive the logical solution using program flowchart or Pseudocode before converting these logical flows into C++ codes. In each group, the lecturer acted as a facilitator. The explanation on the workable solution and the methods of deriving it were presented by each pair. The purpose of the presentation was to ensure that the students understand the logical flow of the solution generated. The tutorial tasks were designed based on the level of the conceptual and syntactical understanding as highlighted in the McGill and Volet's (1997) programming conceptual framework. Working on the program logic design, the students used either program flowchart, Pseudocode or both. During the practical session, they were required to write part of the programme segment or a complete programme in C++ language based on the logical design (program flowchart and Pseudocode) created.

The students in both the experimental and control groups were paired and each member of the pair was randomly assigned with a role, either as a driver or a navigator. The explanation regarding the roles (driver or navigator) of each member in the pair was given to both the MPP and PP groups. On every programming problem, they were persistently required to cooperate on the same design, algorithm, coding and testing. The role between the driver and the navigator was switched periodically. The experiment was carried out for seven weeks. The immediate post-test was administered to both groups immediately after the treatment. The CPPT instrument was used to measure the students' recall performance of the computer programming knowledge.

Research Findings

In this study, SPSS 17.0 for Windows was used to analyse the scores collected from the two CPPT namely the pre-test and immediate post-test. The ANCOVA statistical technique was applied in order to determine any significant difference between the students with different self-regulated learning level on their programming recall performance. In this study, there were only (i) one independent variable with two methods (MPP and PP), (ii) one dependent variable – recall performance, and (iii) one moderating variable – the level of SRL (high or low). Thus, ANCOVA was used to examine the initial differences between the two groups before the treatment. In order to determine the differences, pre-test score was used as the covariate. This was to ensure that the participants were homogenous in their performance prior to the treatment.

The analysis results are shown in Table 1 and Table 2. Table 1 reveals the ANCOVA findings, while Table 2 shows the descriptive analysis and Table 3 indicates the post-hoc results. The interaction effect between the treatment groups and SRL is shown in Figure 5.

Table 1: ANCOVA Results for the Recall Scores of the Two Treatment Groups

Dependent variable	df	Mean square	F	Sig.
Recall (immediate post-test)	3	1102.28	37.96	0.00*
Group * SRL	1	68.20	2.24	0.14

*significant at 0.05 level

Table 2: Descriptive Statistics for the Recall Performances of the Two Groups with Different SRL Levels

	Groups	SRL	N	Mean	SD
Recall (immediate post-test)	MPP	High	24	74.17	4.08
		Low	18	62.80	4.72
	PP	High	27	69.52	6.94
		Low	15	55.11	6.22

ANCOVA results in Table 1 clearly indicate a statistical significant difference in recall performance between the high SRL and the low SRL students who received different treatment methods (F = 37.96; p = 0.00). Thus, these findings have rejected both the first and second hypothesis. The post-hoc test was conducted to further investigate the differences (Table 3). However, the graph in Figure 5 reveals no significant interaction effect between high and low SRL students taught in the MPP and PP groups.

Table 3: Summary of Post-Hoc Test for Recall Performance between the High and Low SRL Students in the Two Treatment Groups

Level of SRL	Groups	Mean Difference	p-value	Results
High	MPP vs PP	4.65	0.03	Sig.
Low	MPP vs PP	7.68	0.00	Sig.

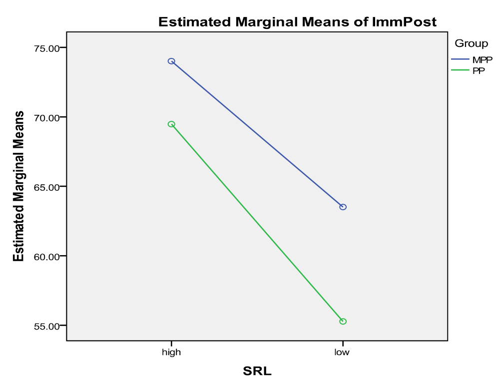

Figure 5: Interaction Effect between the Instructional Methods and SRL

Hypothesis 1: There was no significant difference in recall performance between the high students taught in the MPP and PP groups

The post-hoc test result (Table 3) indicated a significant difference in recall between the MPP and PP groups for the high SRL students, with the former performed significantly better than the latter ($\overline{X}_{\text{highMPP}} = 74.17$; $\overline{X}_{\text{highPP}} = 69.52$; Mean diff = 4.65; p = 0.03). Thus, the first hypothesis was rejected.

Hypothesis 2: There was no significant difference in recall performance between the low SRL students taught in the MPP and PP groups

The post-hoc result in Table 3 revealed a significant difference in recall performance between the low SRL students in MPP group and those of the PP group (Mean diff = 7.68; p = 0.00), with the MPP group performing significantly better than those of the PP group ($\overline{X}_{\text{LowMPP}} = 62.80$; $\overline{X}_{\text{LowPP}} = 55.11$). Thus, the second hypothesis was also rejected.

Hypothesis 3: There was no interaction effect between instructional methods and self-regulated learning level

Figure 5 shows that there is no interaction effect between instructional methods and the students' SRL level on programming performance between the MPP and PP groups (F = 2.24; p = 0.14). This would mean that regardless of SRL level, MPP method is much better than PP. Also, high SRL students outperformed the low SRL students in each method Therefore, the third hypothesis was accepted.

DISCUSSIONS

This study aims to investigate the impact of different SRL levels on the students' recall performance on the instructional methods used in learning C++ programming language. These students from the two intact groups were randomly assigned to two different instructional methods (MPP and PP). One group received the MPP treatment and the other was treated with the PP method. The research findings indicated that the difference in the recall performance for high and low SRL students between the two instructional methods were significant. However, no significant interaction effect between instructional methods and SRL was shown. Further analysis revealed that the high SRL students in the MPP group performed significantly better than their peers in the PP group for the programming recall performance. Similarly, the low SRL students taught in the MPP group significantly outperformed those in the PP group. As such, the MPP instructional method significantly influenced on immediate recall for both high SRL and low SRL students.

The metaphors with pair programming instructional method significantly aid both high and low SRL students in visualizing the abstract concepts – either in pictorial or textual forms, thus creating higher mental models for reasoning and engaging in interactive discussion. Therefore, this finding demonstrated that metaphors facilitated and improved learning towards information recall (Flanik, 2008). The use of metaphor supported the formation of memory images of the new programming concepts being introduced and positively influenced on memory recall for both the high and low SRL students taught in the MPP group as compared to the PP group. These high and low SRL students in the MPP group applied metaphorical concepts to connect their current knowledge with the new knowledge that accommodate both sources (target and source) in resolving programming problems, enhancing their understanding and programming comprehension towards recall performance. The metaphorical theory generated the link between the target and source dealing with the transfer of procedural knowledge from one domain to another within the McGill and Volet's (1997) conceptual framework. By progressing from one domain knowledge level to another within the conceptual framework, it gave the students an opportunity to improve their programming performance by enhancing their ability to design, code and test a programme to solve novel problems. The high SRL students are those who set goals for their learning, and independently manage time and effort spend on learning C++ concepts. They are highly motivated and capable of establishing relations between the target and source. With the interaction between current knowledge and novel concepts, it allows the students to build clearer mental images during the mental processes. As they progress through programming tasks, they plan and carry out the learning activities towards the desirable achievement. In line with Wolters, Pintrich and Karabenick's (2003) findings, high SRL students taught in MPP group achieved better understanding and overall recall performance in relation to learning C++ language that those in the PP group; whereby the SRL learning activities cultivate the MPP students to learn the basic C++ concepts in more tacit ways and organize their thinking in an explicit manner. Through classroom and practical learning, metaphors allowed the students to connect their current knowledge and experiences with novel problems; and thus assist the development of a self understandable neural network in their memory. This network of information stored is easily retrieved as ideas amassed from building clearer mental schemas. Likewise, metaphors assisted both the high and low SRL students taught in the MPP group to view the abstract concepts from across the programming spectrum (problem, design, coding and maintenance) and see visual presentation cues to identify the important target and source, in order to construct a solution based on the given problem scenarios without looking at the individual programming syntax and line. Through this technique, the students in the MPP group were to build on their existing knowledge foundation by mapping current understanding to abstract concepts and then enabled them to recognize the interactions amongst the programming lines. Subsequently, it fostered positive improvement in programming comprehension and recall performance.

For the low SRL students, metaphors assisted those taught in the MPP group to set relationship between the unknown and the known knowledge that linked the two conceptual domains together. This further promoted meaningful learning and enhanced memory recall as they were able to link what they know to the newly introduced concept. As such, the students in the MPP group had better understand and enhanced their programming skills in solving programming as compared to those of the PP group. The rapid assimilation of new ideas by associating new novel concepts with the existing knowledge fostered the development of the mental schemas during the process of leaning programming. Subsequently, it increased the low SRL students' programming comprehension and developed higher logical thinking skill.

The use of pair programming as cooperative learning approach provides the opportunity for the students worked in pairs to discuss, brainstorm ideas and cross check programming codes. For the low SRL students, effective learning takes place when they learn through positive peer pressure in a fun and joyful environment. Since these students in the MPP and PP groups had to work in pairs, they were able to discuss, find solutions for specific problems, form ideas and opinions with their partners (high SRL), and thus helped to cultivate problem solving skills, higher order thinking skills and improved their attitude towards programming (Hawi, 2010). Working in pairs enhances the low SRL students' understanding of the programming concepts expression as these students taught in both the MPP and PP groups are encouraged to interact. The approach of learning that allows them to discuss and self-explain has somehow facilitated their problem solving processes. By making arguments and accepting constructive criticisms from their peers, it does develop higher thinking skills. This type of verbalization approach has resulted in achieving greater level of understanding and did develop clearer "mental model" of the abstract concepts which are crucially important for problem solving (Goel & Kathuria, 2010). In other words, the low SRL students participated in the discussions by explaining each other's approaches to problem solving thereby creating a higher level of conceptual understanding and promoting critical thinking skills that subsequently improved their recall performance (Flanik, 2008; Felder, 1996). Likewise, these students benefited the most from participating in heterogeneous pairs, specifically by offering further explanations to their peers. Similar results were also reported by Meseka, Nafziger and Meseka (2010) as well as by Ballantine and Larres (2007).

This finding revealed no interaction effect between instructional method and the students' SRL level on programming recall performance between the MPP and PP groups. In other words, regardless of SRL level, MPP method is much better than PP. Also, high SRL students significantly outperformed the low SRL students in each method. To enforce effective learning, lecturers should consider the combination of metaphor and pair programming to be adopted in class lectures and during practical session (where the conversation of programming logic into C++ application) as well as to take note of the students' SRL levels in order to have significant influence on their programming performance.

LIMITATIONS AND RECOMMENDATION

This study used a population sample as the number of students registered for that semester was 84. The scope was confined to students of first year computing course at one selected private college in the Northern Region of Malaysia. Therefore, the study cannot be generalised to all Introduction to Programming with C++ students. The students' attitude towards the instructional methods may reflect and influence the overall programming comprehension process. Limited training duration on metaphors and pair programming was also the constraint of this study. It does not permit extensive, detailed and longer training sessions on pedagogy used. The level of problem solving ability and logical reasoning as well as the prior knowledge on programming languages were unknown. Therefore, some of the students had difficulties understanding and comprehending the C++ programming course during the lectures and others found the explanations too simple. Future research could be generalised to local public and private educational institutions in the country. An investigation into the degree to which the characteristics of the participating students influence their attitude towards instruction methods should be considered. For future studies, the duration for the training sessions on metaphors and pair programming should be taken to consideration in order to improve and enhance the learning experience. As critical thinking skill includes problem solving and logical reasoning required in learning programming, it is recommended for the lecturers to incorporate critical thinking skill and also to encourage the students to apply SRL in learning programming.

CONCLUSION

The findings revealed that metaphor when combined with pair programming has significantly helped students' learning, both for the low and high SRL students. This study has also emphasised the importance of considering SRL components in learning the basic programming concepts through C++ language for classroom academic performance. The importance of adopting metaphor in learning C++ concepts for solving novel problems has been revealed in this finding. Metaphors have performed an essential role in helping the students to create clearer mental images in solving abstract concepts. For problem solving, metaphors develop better conceptual understanding by linking the known to newly acquired abstracts; and pair programming does cultivate peer discussions. Pair programming as cooperative learning strategy has been applied in software engineering industry to increase productivity. When used effectively, pairing activity did further enrich programming knowledge and enhance performances. The combination of metaphor with pair programming is effective in supporting students recall performance. Deeper understanding in applying self-regulation will allow the lecturers to encourage self centered learning activities that will generate positive learning outcomes in terms of program solving skills and programming performance. It encourages the students to identify their strength, weaknesses and to have better understanding of their learning abilities. By applying SRL strategy, it helps the students to determine own learning pace and cycle, which subsequently trigger positive accomplishment in programming recall performance. As such, lecturers should assist students to form conceptual visualisation in their working memory during their teaching in order to reinforce self learning. Self-regulation is the predictor of programming performance which used the self-regulating strategies, for example, the gold setting, planning, time management, self monitoring and evaluation for strengthening the programming knowledge of students and improving their programming performance. As such, the students' programming performance is correlated with the application of instructional methods in course delivery and the different level of SRL of students. When used effectively, these self-regulatory strategies could stimulate students' recall performance. It is suggested the lecturers should encourage their students to apply SRL in programming contexts in order to reinforce self learning. In turn, it promotes the development of knowledge and competency within self through life-long learning process.

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DOES COLLABORATION OCCUR WHEN CHILDREN ARE LEARNING WITH THE SUPPORT OF A WIKI?

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ABSTRACT
This paper reports on the outcomes of a mini-research project about visible forms of collaboration when children are learning with the support of Wikis-online editable websites. The findings were based on observing the children using the Wiki, analysis of the video recording of the task and the survey that was completed by the children using the Wiki as a tool for a task. Qualitative research methodology became a primary technique for the data collection and content analysis approach used to explore the children's behaviour when investigating the use of the wiki and video recording of the sessions. Various types of behaviour associated with collaboration, were observed when the children were working on Wiki pages with their peers.
Keywords: Wiki, collaboration, behaviour, cooperation.

INTRODUCTION

The latest innovations in technology over the last decade have had a dramatic impact on the use of technology as a learning tool in classrooms. Educational professionals have adopted the world of collaborative opportunities that the Internet has offered. Tools such as email, blogs and chat are acquainted by many teachers. Recent developments such as Wikis and RSS feeds may not be as well known, but offer wide opportunities for online collaboration for learners. They afford many unique and powerful information sharing and collaboration features. A wiki is a website where users can modify any page, by adding content or editing that which already exists.

The focus of this essay is to investigate the visible forms of collaboration when children are learning with the support of Wikis-online editable websites. A mini-research project was undertaken by a team which consisted of three researchers to find out the answers to two valuable questions;
Does collaboration occur when children are learning with the support of a wiki?
How can collaboration be interpreted in a group activity with children?

The aim of this paper is to give a critical account of the process of completing the mini-research project. After giving a brief description of what a Wiki is, the reasons for choosing the use of Wikis and its links with collaboration as a topic is discussed. Additionally, methods of data gathering, obstacles to using specific methods and any ethical issues are addressed. Finally, a sample data is presented and a relationship between the data and literature is explored to support the research findings.

It is very hard to give a simple definition of a Wiki, but it can be described as a combination of a web site and a word document that allows users to add, modify and update its pages. Wiki's have many different features but commonly they allow their users the ability to compare previous versions of a page, track who edited what and when. Each time someone makes a change on a Wiki page, it gets updated automatically and an older version is stored. The ease of working on a content collaboratively as a group using just a web browser can be seen as the most important element of a Wiki. The name "Wiki" was inspired by the Hawaiian word wiki or wiki-wiki, which means "quick".

Désilets and Paquet (2005) describe wikis as "simple to use Web-based collaborative hypertext authoring systems". Wiki's seen as "valuable tools for successful collaborative knowledge building" (Harrer et al 2008) and widely used by educators because of its suitibality to be used as part of computer-supported collaborative learning (CSCL) (Désilets and Paquet 2005).

Wiki's have been used for many different purposes by different groups. In education Wiki's are mainly used for group writing projects, where groups of students are responsible for creating their own content and learning from each other in the process of collaborative working. The collaborative features of wikis make them particularly well suited for cooperative learning environments (Schaffert, Bischof, et al., 2006). Wikis can also be seen as easy-to-use collaborative technologies. They can support knowledge creation and sharing (Lamb, 2004; Leuf & Cunningham, 2001; Wagner, 2004) between students.

In many ways Wikis are similar to traditional approaches of standard group work such as access restrictions, defined workflows, and structures. What makes wikis different is that user deciding for themselves how they

process and groups will develop, usually by making things up as they go along. Jimmy Wales, founder of most well known example of a public Wiki 'Wikipedia' states that Wikis helps young people develop writing skills and social skills by learning about group consensus and compromise all the virtues you need to be a reasonable and productive member of society.
The research questions have arisen when we discussed the use of Wiki's in education for a group activity about how collaboration occurs and which behaviour can be identified as a sign of collaboration.

RESEARCH APPROACH

The aim of this research is to find out more about Wikis and their use in Primary schools. As a starting point collaboration and cooperation terms are defined in a context of teaching and learning.

The research involved different steps; finding literature, practical research in a primary classroom, analysing the data as an outcome of the practical research to find answers to focus questions. The team looked at the meaning of collaboration and cooperation in educational contexts, then, discussed how Wikis can be used to allow children to work in these forms. As a result collaboration is defined as process of participating in knowledge communities (Lipponen, 2002) and cooperation as the act of doing something together or of working together towards a shared aim. Scanlon (2000) suggests that co-operation usually means either splitting up the work or solving subtasks individually and combining the results into a final product. In adversity, collaboration can be seen as a coordinated attempt to solve a problem together.

Both these terms are explored further by Foot, H. C., Morgan, M.J. and Shute, R.H (eds) (1990) in their book Children helping Children. In this book collaboration was seen as an unstructured activity where participants don't have a specific role and don't work under the authority of an adult towards a reward. Interestingly, they control the learning and sharing process themselves and it may take place when a child turns to another to seek help. On the other hand, cooperative learning was referred to as 'highly structured where the aim of the learning and specific roles of the participants had been identified at the beginning and was controlled by the authority of an adult.

There have been various studies about the use of wikis to support collaborative learning. According to Chong et al.(2006), wikis, when supported with suitable communication tools, promote the active participation of, and higher level discussions amongst students. One of the case studies the research team looked into which had some vital links to this research question was about using 'A Wiki as a Tool for Web-based Collaborative Story Telling in Primary Schools (Désilets, A., and Paquet, S., 2005). The children were asked to design a story on paper and then write it up using Wiki. As an outcome of their study they came up with different collaboration modes for the different types of media that were being used for the task given. When the children designed their story they all worked at the same time, so the mode of collaboration was called Co-located synchronous. When they were writing their stories using a Wiki, team members worked in parallel on different parts, side by side. There were feedback, coordination and information sharing; this mode of collaboration was called Co-located semi-asynchronous. Random walk, splitting page between the team members, sharing tasks such as writing, uploading images were the visible forms of collaboration they could see. According to Désilets, A., and Paquet, S; pair editing on story writing phase did not work well in this case. So this outcome created a question in our mind, is pair editing appropriate in primary level?

METHODOLOGY

Data Collection- Ethical Issues

For the case study the team decided to have a class wiki which would be active during the current academic year. As an ICT coordinator in a primary school one of the team members took the role of creating a wiki called 'Planet 5J' for a year 5 class of children aged 9-10 years old. As the researcher had regular access to this class, she had a discussion with the class teacher about the Wiki project. It was suggested by the class teacher that creating a 'wow' words dictionary which contained interesting and complex vocabulary would be very useful for their writing skill. This usage of 'Wow words' was also to be part of the whole schools target.

A team meeting was held to talk about how to introduce the Wiki to the children, monitoring the usage of the wiki, sampling data and gaining permission for using the data as part of our case study. It was agreed to introduce the Wiki as part of an ICT lesson, so that the children could have time to practice using it. After introducing the Wiki to the children, it was explained to them that their use will be monitored and analyzed by a team from the university as part of a study project and that the results of this project will be put onto the Fronter MLE ICT room to share with other teachers, parents and children. The team know that in qualitative research informed consent needs to be sought and may be withdrawn at any time, and additionally to include direct talk regarding the continued willingness to participate (Cassell, 1982). A generic permission letter was prepared by the school office regarding using children's photos, videos and work on school websites or publications. This letter also included a line in which it states that educators can study their work to improve standards in school. All of the children's parents signed these letters at the beginning of the year. The children were reminded that they could withdraw from the activity at anytime they liked. In case this happened extra adults were included who would work with these children undertaking different activities on the same topic as developing 'wow' word vocabulary. At the end of the study the students were given information about the findings of the research and the video and questionnaire results were placed in the schools managed learning area.

Due to the limited time scale involved, interviews with some of the children were not sought in this research as a data collecting method. The findings were based on observing children using the Wiki, analysis of the video recording of the task and a survey that was completed by the children on using wiki as a tool for collaboration.

Working with such a young group of children as part of this study, understanding the ethical principals for conducting a research was extremely important to the team. The team spent a considerable amount of time completing the 'Ethics Review Form' thoroughly as suggested by Bera (2004). According to Bibby (1997) it is important that researchers consider different moral arguments as part of their training and reflect on what is acceptable behaviour before beginning their research. It is extremely difficult to determine main moral principals which should guide researchers to deal with the ethical issues that can arise when attempting to interpret individual realities. Ethical codes can only operate as a guide. The best solution is for researchers to regularly reflect on their work to develop their understanding of the ethical concerns associated with their research (Burgess, 1989). During this research project the research team members had continuous dialogue among the researches regarding the ethical implications of our research project.

After introducing the 'Planet 5J' wiki to the children, they were allowed regular access to the wikispace; once a week for six weeks initially. They were also allowed to access the wikispace from home. After six weeks they were still allowed to access the wikispace, but sampling the data from the wiki itself was limited to these six weeks. The children were given tuition about how to edit pages, create links and make changes to previous work. They were not guided about how to collaborate as we wanted to observe the forms of collaboration that may occur naturally whilst they were editing the wiki.

Once the 'Planet 5J' class wiki was up and running, all the research team members were allowed to access the wiki so that they could all observe and monitor the activities that took place. The data collection was administered at two levels. Firstly the team conducted unstructured observations where each researcher read through the entries of 'Planet 5J's wiki and took notes that were vital to share with the rest of the team. Because of the version control tools of wikis, we were able to track the history of the specific pages and entries. Having in mind the research question 'Does collaboration occur when children are learning with the support of a wiki?' the team was not very clear about the relationship between the wiki entries and our question. Articulating children's entries and actions on wiki in the context of collaborative working appeared to be chaotic. In order to tackle with this ambiguity it has been decided to derive coding from the text entries on the wiki to interpret the boundaries between children's entries and the research question.

The same approach was followed to investigate the video recording. The video recording of the wiki task completed by the children was watched many times and notes were taken by the research team to form an initial explanation of data. Then codes were collected from the video recording data to study deeper to find out more about the visual forms of collaboration the children were using when editing the wiki. In order to investigate the children's attitude to this experiment, a questionnaire was designed and made available online. After the wiki based learning, children were asked to complete the questionnaire.

Reflecting on the project so far, the team decided that although this is a small scale research project, it is important to use more than one method to gather data to support our findings. However when it comes to interpreting the data and constructing meaning, each member analyzed their own data followed by group discussion and analysis of the same data.

Case Study

Sample

A considerably larger than the average primary school in London agreed to host the study. The school serves an ethnically diverse community. 29 pupils from a Year 5 (age 9-10, 13 male and 16 female) class took part in the project.

Software

Wikispaces was chosen to use for this case study. The reasons for choosing Wikispaces are; it is easy to use, secure and free.

Implementation
The project ran for six weeks at the end of the autumn term in 2010. The students were asked to use a Wiki to create a whole class 'WOW' words dictionary. This is to help them to broaden their vocabulary so that they can write imaginative stories using complex sentences. By using 'Wiki's' for this task, they have an opportunity to engage in self-coordinated, collaborative work. The team wanted to see if and how young children would be able to use the 'Wiki' in collaboration.

This case study is based upon a survey that was completed by the children, including analysis of the use of Planet 5J's 'Wikispace' and a video recording of the children during their use of the 'Wikispace'. Through the study of the data collected, the team gained an understanding of; how the children used the Wiki tool to collaborate and the effects of gender in their Wiki activities. In this case the focus was the issue of collaboration. The video recordings of the sessions where children used the 'Wiki' to create a dictionary of "WOW" words.

In order to gain a better understanding about the forms of collaboration visible when children are using a wiki, qualitative research methodology became a primary technique for data collection. A content analysis approach was used to explore the children's behaviour when investigating the use of the wiki and video recording of the sessions. Furthermore, survey questions derived students' perceptions of using the wiki in the classroom. In addition, a comparison of the results from the three sources yielded reliable evidence of the particulars of the wiki use. By using triangulation research methodology the team aimed to produce reliable results which would then improve the validity of this research. According to Cohen, Manion et al (2007, p. 141), A triangulation in social sciences attempt to explore "the richness and complexity of human behaviour by studying it from more than one standpoint", and in the opinion of this author, "the more methods contrast with each other, the greater the researchers confidence".

According to Ole Holsti (1969) content analysis is a technique for making inferences by objectively and systematically identifying specified characteristics of messages. Weber (1990, p.9) suggests that content analysis is a research method which uses a set of procedures to make valid inferences. Content analysis can involve any kind of analysis where communication content such as speech, written text, interviews, images etc. is categorized. By using content analysis as a method; it endorsed our team to observe and analyze the whole content of the 'Planet 5J'. It also allowed us to sequence the communication took place and therefore made the unobserved content of wiki data clearer. Because of the changing status of the wiki, data analysis was carried out as an iterative process where data was continuously collected and new conclusions drawn (Miles & Huberman, 1994).

The team found it very difficult to obtain coding from the theories and case studies that looked at prior to this research. Coding was mainly acquired from the conventional content analysis of the wiki entries and study of the video recordings of children working on the task. Basically the team adopted a traditional approach to analyze the findings from the video recordings drawing on Strauss's (1987) "coding from the data" method where data were analyzed as they were collected. As the team continued to analyse the data, any word, text or behaviour that represents collaboration was identified and written down. When we looked at the video we identified some behaviour that can be seen as collaboration such as; pointing at the screen, talking, critiquing, advising and suggesting. As mentioned above the team found it hard to create a code table, so we decided to have a list of mode of collaboration that was evident from the data derived through the analysis of video recording, wiki pages and survey. The research team also compared the modes of collaboration that we found with Désilets, A., and Paquet,' findings from their study. The modes of collaboration found will be discussed on the finding section of this essay.

Findings-connection with Literature and Research background
Due to the limits of space in this essay data analysis of the video recording and the children's wiki entries will be used to explain the collaboration modes that occur when children are learning with the support of wikis.

The team studied two main scenarios to identify the visual forms of collaboration in this video.

Scenario 1
Boy A made a suggestion to Boy B who was sitting next to him. Boy A did not touch the mouse or lean over Boy B. Boy A kept his distance from Boy B. Boy A pointed at the word on the screen and told Boy B what he

thinks the meaning of the word is. Boy B looked at boy A's face and asked him to explain what he meant. They had eye contact during their conversation. Boy B controlled the mouse until the end of the session.

Boy A and boy B each had a PC to work on Planet 5J's 'Wikispace'. Boy A did not use his PC; he moved his chair next to Boy B and worked with him on Boy B's PC.

Scenario 2
During 'Wikispace' work in the ICT suite Girl D saw that Girl E had spelt the word incorrectly. Girl D left her chair and came over to speak to Girl E. Girl D stood behind girl E. She moved her hand over Girl E and pointed on the computer screen to the word that she had written. She then took control of the mouse and corrected Girl E's mistake. After this she explained to her what she needed to do. Girl D returned to her seat. Girl E subsequently turned to another girl F who was sitting next to her and took the control of her mouse and showed her what to do.

Content analysis of the video has shown that the children worked collaboratively in many ways while they were working on the Wiki task. Jonassen et al states that 'mind tools' helped users express what they know and construct knowledge through critical thinking and higher order learning. In our video recording we could see that using Wikis as a mind tool motivated students to learn, and having a shared learning space improved collaboration between learners. The children were actively involved in designing their own knowledge and helping their peers to learn. While they were typing their wow words onto the wiki, when they saw some entries that were not describing the word correctly or when they found the description not detailed enough, they stood up and lead discussion on how to improve it. This helped them to construct a new knowledge through collaborative working. These student centred collaborative learning activities enabled the learners to take control and responsibility of gaining new knowledge (Myers, 1991).

Another important finding from this video was the improved communication that led to collaboration within the group. Whilst the children were editing their pages, they realized that many others were editing the same page. They could not see their entries directly. They saw this as a problem as they wanted to see their entries directly. Some of the children suggested that either they should ask if someone else was editing the same page and waited until they had finished or go and sit next to that person and work together. Instead of sitting and waiting for a solution or asking the teacher for help they decided to communicate directly with their peers in order to resolve the issue. In other words using wikis improved communication between learners; they can be characterized as enablers of socio-constructivist learning (Schneider et al., 2002). There were also many scenes where they were modifying entries, asking for help from others with explaining their words, suggesting, discussing, questioning and analysing not only their peers but also their own entries. The evident of this can be seen on the wiki pages. Figure 1 shows that a child spelt the word 'Amazing' wrong. Another child made a suggestion for correcting spelling underneath it. We can also see similar action when a child tried to describe the word 'disgusting', where description of the word was re-written by another child.

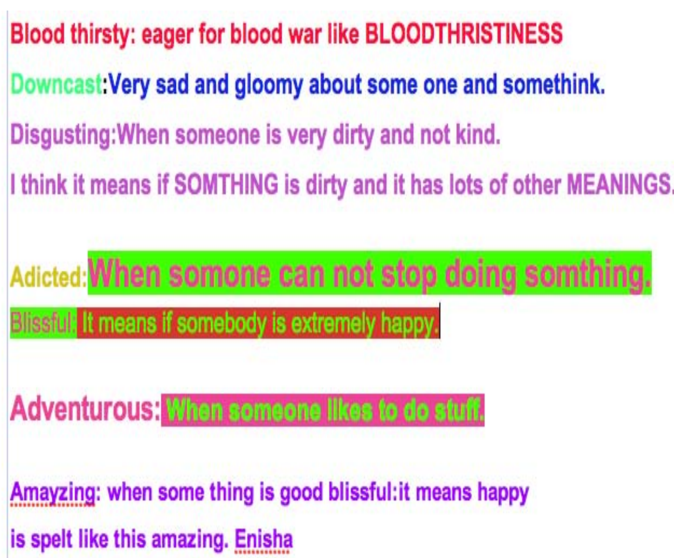
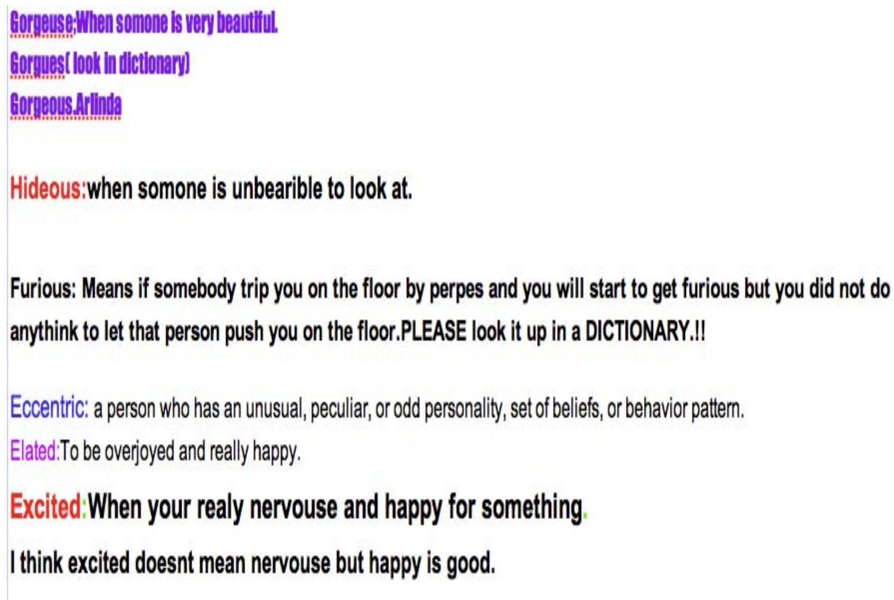


Figure 1

Again figure 2 shows children suggesting the correct spelling of the word or asking their friends to use a dictionary if necessary. We can also see that a child describing the word ‘excited’ and another child giving their own opinion of the meaning of the word.


Gorgeuse;When somone is very beautiful.
Gorgues(look in dictionary)
Gorgeous.Arlinda

Hideous:when somone is unbearible to look at.

Furious: Means if somebody trip you on the floor by perpes and you will start to get furious but you did not do anythink to let that person push you on the floor.PLEASE look it up in a DICTIONARY.!!

Eccentric: a person who has an unusual, peculiar, or odd personality, set of beliefs, or behavior pattern.
Elated:To be overjoyed and really happy.
Excited:When your realy nervouse and happy for something.
I think excited doesnt mean nervouse but happy is good.

Figure 2

According to Lipponen (2002), computer supported collaborative learning such as Wikis promotes peer interaction and allows the sharing of knowledge within a group of learners. In scenario 1 above boy A asked boy B for his opinion about the meaning of a word; in scenario 2 girl D correcting girl E’s mistake, girl E passing on her new knowledge to girl F. After analysing these scenarios closer the team found that children are not just learning to write collaboratively; they are also developing many collaborative skills, negotiating with others to agree on correctness, meaning relevance and more(Fuchs-Kittowsk & Köhler, 2005; Godwin-Jones, 2003; Wang& Turner, 2004).

As explained in the previous section of this essay we came up with a list of modes of collaboration linked to the special areas it occurred.

Content-related: Where children helped each other to write and explain the meaning of the ‘wow’ words; one child suggesting another one which word can be classified as a ’wow’ word.
Technology-related: Children explaining each other how to use the functions of wiki software.
Random help skills: Where children showing interest and willingness to help their peers sitting next to them or leaving their chair to go and help others when they needed help.

Comparing the research findings with Désilets and Paquet’s research
According to Désilets and Paquet’s study (2005) collaboration had two modes; co-located synchronous and co-located semi synchronous. In the Co-located synchronous mode of collaboration; children were observed working side by side on the same task which was designing a story. The activity was paper based. In the co-located semi synchronous mode of collaboration, children were noticed working on parallel tasks, sitting side by side. They were working in a coordinated way and were sharing information. They were also giving feedback. The team hasn’t used a paper based activity, nevertheless observed children using similar co-located synchronous and co-located semi-synchronous strategies. In some instances children were working independently on different parts of the “WOW” words dictionary, either in parallel or at different times and in some instances they were working on the same page. Désilets and Paquet (2005) stated that pair-editing mode of collaboration did not happen during their study. In this case study the use of a pair-editing strategy was detected where one child was the driver who typed the words and other was the navigator who helped driver.

The mini-research project produced some important results regarding the modes of collaboration drawn from the wiki based learning experiment. From the analysis of the data we saw children working collaboratively in many ways. They observed their friends' mistakes on Wikispaces, and then they left their chair and went to speak to the person who had made the mistake. The children worked in pairs, randomly walked around and helped their peers. They made suggestions and criticized others work by pointing at the computer screen or taking control of the mouse and keyboard to model what they thought was the correct answer. The use of a video as a data gathering method was extremely useful as all the members of the research team had an opportunity to see the children working on the task. Although the video recording gave some important data for this research, the team also had difficulties analyzing it fully as it was sometimes very difficult to see exactly what the children were doing when they were editing the wiki pages. Were they modifying, deleting, or suggesting?

Because of the noise level in the classroom, it wasn't always easy to hear their dialogue with their peers. When it comes to using the data analysis of the wiki entries itself, although we can see some changes and suggestions made by the children, the volume of this data is not very high. Giving the children more time to work on the wiki pages or using the wiki with more classes may have given us more information about the relationship between wikis and collaboration. Also having a clear idea about the coding of collaborative behaviour would also help with conceptualize the data from the video and the wiki pages.

CONCLUSION

The purpose of this study was to investigate the visible modes of collaboration when children are using a wiki as a learning tool. Based upon research findings it can be suggested that children are collaborative when learning with the support of wikis. Therefore, wikis could be seen as an effective tool to support collaborative learning and knowledge sharing in education and facilitates group learning where students can learn and share knowledge. Various type of behaviour associated with collaboration, were observed when the children were helping each other with their tasks.

This case study has shown that using a wiki brought the group members together to edit the Planet 5J wiki pages which allowed children with similar ideas to collaboratively build on each other's work. It also gave the children equal access to the most recent version of the wiki.

This research project gave the team an understanding of how collaboration emerged when the children were using wiki as a learning tool. It also gave an insight of how knowledge was built socially. For the future research, it will be worth to try providing children with more structured tasks, where children have an opportunity to work as a team and are given a longer time to complete the task. The children could also be given information about types of roles they could foster in group work. This may help them with understanding of how a group functions when they are working together.

The data collection methods used for this mini-project were appropriate for showing the modes of collaboration that occurred however, the scale of the research was not large enough to draw general conclusions. Further research is recommended to confirm the findings of this research, and decide the magnitude to which modes of collaboration can be associated with wikis.

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EFFECT OF COMPUTER-AIDED PERSPECTIVE DRAWINGS ON SPATIAL ORIENTATION AND PERSPECTIVE DRAWING ACHIEVEMENT

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ABSTRACT
The aim of this study is to investigate the effect of computer-aided Perspective Drawings on eighth grade primary school students' achievement in Spatial Orientation and Perspective Drawing. The study made use of pre-test post-test control group experimental design. The study was conducted with thirty 8th grade students attending a primary school in Turkey in 2009-2010 school year. The lessons of the control group students (n=15) were performed in an activity based way by using the board and paper for two weeks (8 class hours). In the lessons of the experimental group students (n=15), on the other hand, Perspective Drawing applications were carried out using computer-aided teaching method for two and a half weeks (10 class hours). A Spatial Orientation test was used to monitor the students' achievement in Spatial Orientation and a Perspective Drawing test was used to examine their achievement in Perspective Drawing. According to the results from the analyses, both Spatial Orientation and Perspective Drawing achievement levels of the subjects increased significantly in both the experimental group and the control group. However, it was determined that there was a statistically significant difference between the Spatial Orientation test rank-score means and the Perspective Drawing test rank-score means of the experimental group students and the control group students. It was concluded in light of these findings that computer-aided Perspective Drawings increased student achievement in Spatial Orientation and perspectivity.

INTRODUCTION
McGee (1979) describes spatial ability as "mentally moving, rotating or reversing the visual stimuli." Spatial ability is used in our everyday life (driving, taking photos, playing computer games, etc.), in many professions (architecture, engineering, music, piloting, etc.) and in scientific branches (mathematics, chemistry, biology, physics, etc.). The connection of spatial ability with geometry gains more significance when we consider the fact that two- and three-dimensional objects are studied in geometry. Assuming that spatial visualization and Spatial Orientation are two components of spatial ability, McGee (1979) states that what distinguishes spatial visualization from Spatial Orientation is motion of the object. If there is process of mentally moving all the parts of an object that is seen and touched, that involves spatial visualization. Spatial Orientation does not involve the movement of the object in the mind. It is the activity of visualizing an image resulting from the change in perspective/point of view of the person looking at the object. Spatial Orientation, in short, involves looking at a motionless object from a different perspective . Strong and Smith (2002), mentions swimmers' knowing about their position while changing direction or turning in water and pilots' awareness of the position of the land while maneuvering among the examples of Spatial Orientation. They state that we can understand Spatial Orientation by working on the relations among different positions in comparison with our position. Clements (1999), on the other hand, defines Spatial Orientation ability as being able to comprehend and use the interrelations of the objects located in various positions around the individual. He also emphasizes that the investigative individual's ability to comprehend and use these relations should be evaluated according to his or her own position in particular.

The size effect of any object on the eye depends on the distance between that object and the eye. In fact, of two identical objects, the one closer to the eye (in comparison with the one further from the eye) seems bigger. Having different images of identical objects at different distances from the eye is also the case for the closer and further points of a single object. Therefore, in addition to the actual shape and size, every object has an image that emerges based on the distance and perspective of the person seeing the object. Picturing an object in the way it is perceived by the eye in certain conditions is called "Perspective" (Onat, 1975). Perspective Drawing is a technique used to represent three-dimensional images on a two-dimensional picture plane. Perspective Drawings typically have a horizon line. This line, directly opposite the viewer's eye, represents objects infinitely far away. They have shrunk, in the distance, to the infinitesimal thickness of a line. Any perspective representation of a scene that includes parallel lines has one or more vanishing points in a Perspective Drawing. A one-point Perspective Drawing means that the drawing has a single vanishing point, usually directly opposite the viewer's eye and usually on the horizon line. All lines parallel with the viewer's line of sight recede to the horizon towards this vanishing point. This is the standard "receding railroad tracks" phenomenon. A two-point drawing would have lines parallel to two different angles. Any numbers of vanishing points are possible in a drawing, one for each set of parallel lines that are at an angle relative to the plane of the drawing. Perspectives consisting of many parallel lines are observed most often when drawing architecture (architecture frequently uses lines parallel to the x, y, and z axes). Because it is rare to have a scene consisting solely of lines parallel to the three Cartesian axes (x, y, and z), it is rare to see perspectives in practice with only one, two, or three vanishing points; even a simple house frequently has a peaked roof which results in a minimum of six sets of parallel lines, in turn corresponding to up to six vanishing points. Since this study was conducted with 8th grade students, the scope of the study was limited to one-point and two-point Perspective Drawing subjects.

The basics of drawing forms in one-point perspective;
- One face of the object is shown as the front view,
- Lines parallel to the front view remain parallel,
- Lines that are perpendicular to the front view converge at a single vanishing point.

Figure 1 shows a sample technical one point perspective drawing.

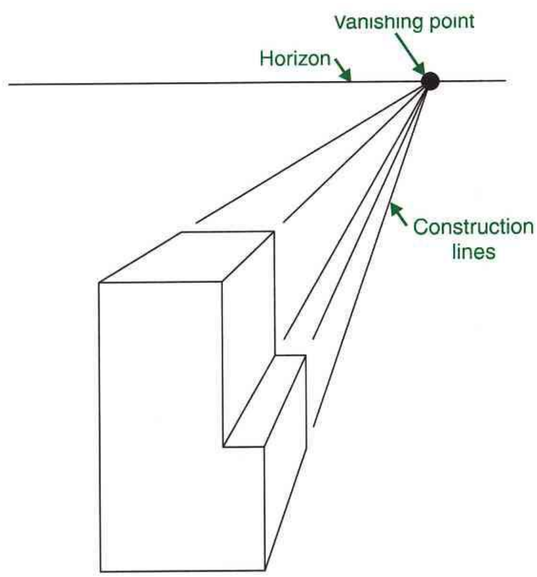

Figure 1: One point Perspective Drawing

The basics of drawing forms in two-point perspective;
- One edge of the object is place in front,
- The two faces that meet at this edge recede to two different vanishing points,
- All lines parallel to each face go to the different vanishing points

Figure 2 shows a sample technical two point perspective drawing.

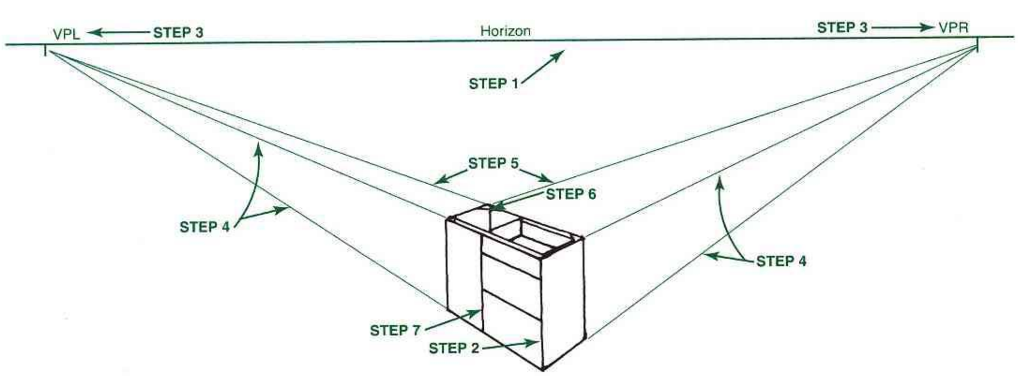

Figure2: Two point Perspective Drawing

It is difficult to teach space geometry with tools like paper and pencil in the traditional classroom environment. For this reason, this kind of teaching lacks drawings of a three-dimensional object on a plain paper and this situation leads to optical illusions and different perceptions. Moreover, no matter how perfect these drawings are, seeing the images of shapes from different perspectives in a single drawing is not possible due to the static nature of the environment. In order to develop students' skills of imagining three-dimensional objects in their mind and processing them mentally, dynamic geometry software should be used in lessons instead of static diagrams (Baki, Kösa & Karakuş, 2008).

Dynamic geometry programs allow students to reach assumptions and inferences on geometric shapes with drag-and-drop processor by means of several constructive activities and guiding questions in learning environments (Bintaş& Akıllı, 2008). The student gets to discover unchanging relations while changing the properties of a shape by means of dragging shapes. This discovery gives the student the opportunity to make a very strong assumption. Then the student can support this assumption with a number of examples or can refuse it (Karataş &Güven, 2008).

Dynamic geometry software applications allow the student to create various geometric shapes in virtual environment, to establish relations among these shapes, to establish a geometric port capable of proving a theorem with these relations and to alter this port as he or she wishes (Bintaş & Akıllı, 2008). Some studies conducted by using GSP software (July, 2001; Boyraz, 2008) report that GSP software is useful for developing spatial ability. GSP was also used in this study because it was assumed that by means of the dynamism of the GSP software perspective students would be able grasp the concepts in drawing better and their Spatial Orientation would be improved.

Recently, the Turkish Ministry of National Education has sought support to increase compulsory education to 12 years, as in many European and developed countries all over the world. On the other hand, initiated in 2003 by the Turkish Board of Education (TTKB, 2008) and implemented gradually, the renovation of elementary and secondary education curriculums was a huge leap in terms of raising the quality of education in Turkey. For example, renovated programs in elementary mathematics for grades 6–8 were implemented gradually (starting from the 6th grade) beginning from 2006 to 2007 academic year with ongoing changes since then. In the new elementary mathematics curriculum, some subjects are added as well as some of them are extracted. For instance, Perspective Drawing, patterns, tessellations, transformational geometry, fractals are added to the new curriculum for grades 6-8 (MEB, 2006). Perspective Drawing subject is given through the acquisition stated as "[the student] performs the Perspective Drawing of the image of a cube or a prism at a certain distance" under projection learning domain in 8th grade mathematics curriculum. The new curriculum, on the other hand, holds that the 8th grade student is able to perform of one-point and two-point Perspective Drawing of an object. In addition to changes in content, the new elementary mathematics curriculum emphasized new approaches like new skills, teacher students roles, instructional methods, and alternative assessment tools. The new curriculum aims to raise individuals who: have independent thinking, decision-making and self-regulation competencies and skills; can solve mathematical problems and use mathematical ideas to solve real-life problems; communicate about and with mathematics; make connections among mathematical ideas and apply them in contexts outside of mathematics; reason within and with mathematics. There are emphases on an equal balance of conceptual and computational understanding in mathematics, using alternative assessment techniques and technology to teach and learn mathematics. This shows that the new curriculum in Turkey promotes the use of technology in education.

The primary objective of this research is to investigate how computer-aided Perspective Drawings affect primary school 8th graders' achievement in perspectivity and Spatial Orientation within the framework of the acquisitions covered in the primary education mathematics. To this end, the study tried to find answers for the questions below.

1. Is there a significant difference between the experimental group students' pre-test and post-test rank-scores of Spatial Orientation test and Perspective Drawing?
2. Is there a significant difference between the control group students' pre-test and post-test rank-scores of Spatial Orientation test and Perspective Drawing?
3. Is there a significant difference between the Spatial Orientation post-test rank-scores of the experimental group students and the control group students?
4. Is there a significant difference between the Perspective Drawing post-test rank-scores of the experimental group students and the control group students?

METHODOLOGY
Pre-test/post-test control group experimental design was used in the study.

Participants
The research was conducted with a total of 30 students in two classes of a primary school in Kütahya, Turkey in 2009-2010 school years. One of these classes was randomly chosen as the control group and the other one as the experimental group. Also, the results from Mann Whitney U Test analysis, which was carried out in order to determine whether there was a significant difference between the Spatial Orientation and perspective questions pre-test rank-scores of the experimental group students and the control group students, were represented in Table 1 and Table 2.

Tablo 1. The Spatial Orientation pre-test scores of the experimental group and the control group

Measurement test	Groups	N	Mean	p-value
Spatial Orientation	Experimental Group	15	18,1	0,106
Spatial Orientation	Control Group	15	12,9	

Tablo 2. The Perspective Drawing pre-test scores of the experimental group and the control group

Measurement test	Groups	N	Mean	p-value
Perspective Drawing	Experimental Group	15	16	0,775
Perspective Drawing	Control Group	15	15	

The analysis came up with no significant difference between the pre-test rank-scores means of Spatial Orientation and Perspective Drawing tests (p>0,05). This meant that there was no significant difference between the experimental group students and the control group students in terms of achievement in spatial ability and perspectivity. It could therefore be suggested that these groups were equal according to the two variables.

The lessons of the experimental group students (n=15) were performed with computer-aided teaching method. The experimental group students were given the opportunity to produce Perspective Drawings by using Geometer's Sketchpad dynamic geometry software program because it was assumed that the software would help improve students' skills of processing three-dimensional objects by visualizing them mentally. The control group students (n=15), however, were taught in an activity-based way on paper. Perspective Drawing test and Spatial Orientation test were used as data collection instruments.

Data Collection Tools
One test was administered for measuring students' ability to perform egocentric perspective transformations. The Spatial Orientation test (The Perspective-taking Test) (Kozhevnikov& Hegarty, 2001) presents participants with a Picture of an array of objects. With the array in view, they are asked to imagine themselves standing at one object, facing a second one, and they had to indicate the angle to a third object by drawing an X. Each item consists of a circle with a line drawn from the center to the top of the circle. The center is marked with the object they are to imagine themselves standing at, the top is marked with the name of the object they are to imagine themselves facing, and the participant is asked to indicate the angle to the third object by drawing another line from the center of the circle. This test explicitly asks participants to imagine an egocentric perspective transformation.

To measure students' performance in mathematical tasks of Perspective Drawings, a test was designed fort he purposes of this study. It included four tasks: 1) state whether each object is in one or two point perspective, 2)sketch a cube in one point perspective, 3) sketsc a cube in two points perspective, 4) use your ruler to help you locate the vanishing point (points) for each figure. Participants were given 20 minutes to complete all tasks. This test was given to the students separately and approximately a week apart from the perspective-taking test. Each correct response to an item of each of the tasks were assigned a positive point. The total score fort his test was the sum of positive points. The maximum of points a student could achieve was 15 points.

Procedure
The new mathematics curriculum suggests that teachers should follow five steps during planning and implementing mathematics lessons. These steps are: (1) introduction, (2) observation/ investigation, (3) explanation, (4) progress and, (5) assessment (MEB, 2007). After the pre-tests were conducted on the control

group students, the lessons were designed using these five steps that were recommended, but the students were asked to produce Perspective Drawings in an activity-based way by using the board and paper in the classroom environment for two class-hours. Following the teacher's presentation of one-point and two-point Perspective Drawings on the board, students completed one-point and two-point Perspective Drawing activities using a pencil on paper. Some of the one-point and two-point Perspective Drawings performed by the test and control group students on dot paper were presented in Figure 3 and Figure 4.

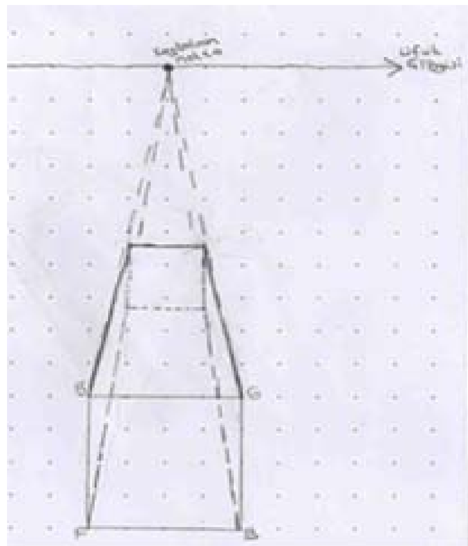

Figure 3. One point perspective drawing

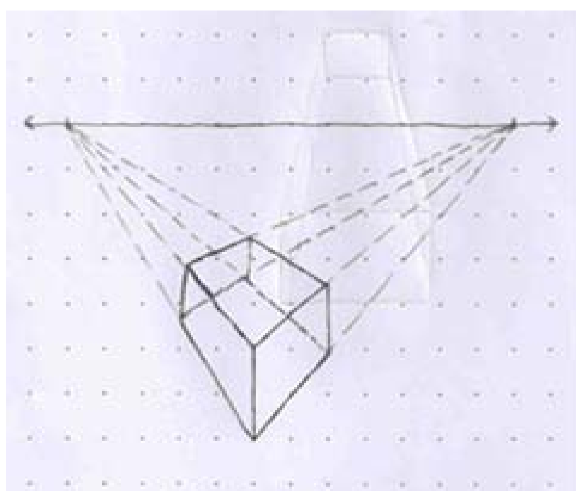

Figure 4. Two point perspective drawing

However, the experimental group students, in addition to what was performed with the control group students, were delivered activity sheets which described program menus and process steps so that they could use the program more conveniently following GSP orientation in the computer lab. Since there were 30 computers in the lab, each student had the opportunity to experience computer application separately. After the GSP orientation, the students were asked to produce one-point and two-point Perspective Drawings with GSP. Examples of the one-point and two-point perspectivity produced by students were represented respectively in Figure 5 and Figure 6.

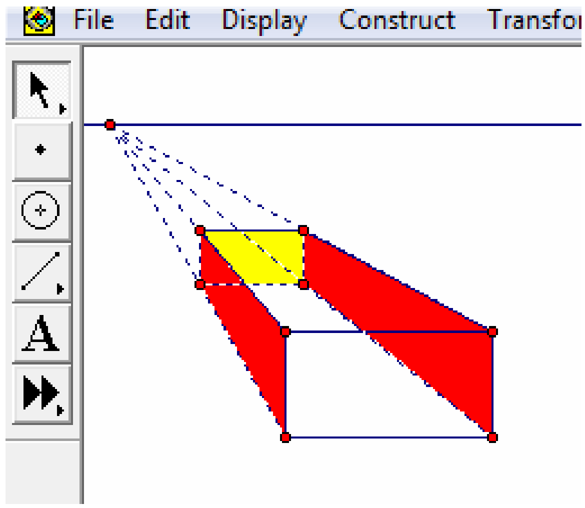

Figure 5: One point Perspective Drawing using GSP

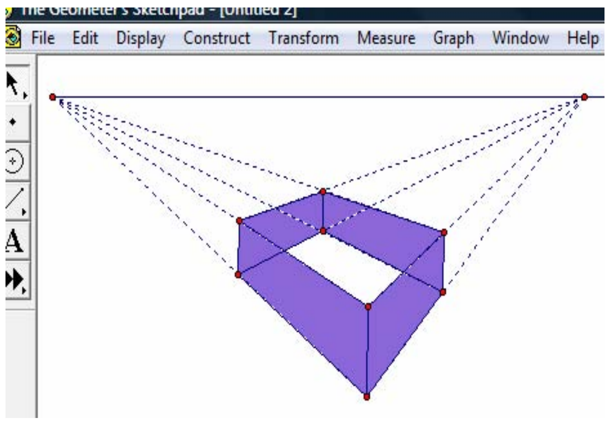

Figure 6: Two point Perspective Drawing using GSP

Students then animated and colored their drawings produced with GSP and added animations to their drawings. The test and control groups finally took the post-tests and the practical phase came to an end.

Data Analysis

Data obtained in the research were analyzed by means of SPSS program. Non-parametric tests, independent from normal distribution assumption and applicable in small populations, were used in order to examine the relations between the pre-test and post-test scores of the test and control groups (n=30). The Spatial Orientation pre-test/post-test scores of the test and control groups were analyzed conducting Wilcoxon Two-Related Samples Test. Then the post-test rank-scores received by the test and control groups in Spatial Orientation and perspectivity assessment questions were analyzed using Mann-Whitney U Test.

Findings

Table 3 and Table 4 represent the results from Wilcoxon Two-Related Samples Test carried out in order to determine whether there was a significant difference between the pre-test/post-test rank-scores of the experimental group and the control group for the Spatial Orientation test and Perspective Drawing test.

Tablo 3. The pre-test/post-test scores of the experimental group for the Spatial Orientation and Perspective Drawing tests.

Measurement tests		N	Mean	p-value
Spatial Orientation	Post-Pre tests	15	7,32	0,014
Perspective Drawing tests	After-Pre tests	15	8	0,001

It was determined as a result of the analysis that there was a significant difference between the pre-test/post-test rank-score means of the experimental group students for both the Spatial Orientation and Perspective Drawing tests. It could therefore be suggested that producing Perspective Drawings with GSP increases students' achievement in Spatial Orientation and perspectivity. The increase in Spatial Orientation achievement could be attributed to the fact that students can come up with Perspective Drawings of any given object in a fixed position and, by means of this dynamism of GSP program, they can manipulate these drawings and see possible images to emerge with a perspective change by the person looking at the object.

Tablo 4. The pre-test/post-test scores of the control group for the Spatial Orientation and Perspective Drawing tests.

Measurement tests		N	Mean	p-value
Spatial Orientation	After-Pre tests	15	6,77	0,005
Perspective Drawing tests	After-Pre tests	15	8	0,001

The analysis found a significant difference between the pre-test/post-test rank-score means of the control group students for both the Spatial Orientation and Perspective Drawing tests. According to this finding, it could be suggested that Perspective Drawings presented to the control group students increase their achievement in Spatial Orientation. It also means that Perspective Drawings increase spatial orientation ability without computer aid, too. Then although Perspective Drawings are actually two-dimensional drawings of three-dimensional objects, students make use of Spatial Orientation while producing one-point and two-point Perspective Drawings. As a consequence, teaching this subject increases achievement in Perspective Drawing as well as Spatial Orientation ability.

The results from Mann Whitney U Test analysis, which was carried out in order to determine whether there was a significant difference between the Spatial Orientation and perspective questions post-test rank-scores of the experimental group students and the control group students, were represented in Table 5 and Table 6.

Tablo 5. The Spatial Orientation post-test scores of the experimental group and the control group

Measurement test	Groups	N	Mean	p-value
Spatial Orientation	Experimental Group	15	18,93	0,033
Spatial Orientation	Control Group	15	12,07	

The analysis identified a significant difference between the Spatial Orientation post-test rank-score means ($p < 0,05$). Based on this finding, it could be suggested that computer-aided Perspective Drawings presented to the test students increase achievement in Spatial Orientation more in comparison with the Perspective Drawings performed on the board and paper. The difference in Spatial Orientation achievement could be attributed to the fact that by means of the dynamism of GSP program, students can manipulate Perspective Drawings and see possible images to emerge with a perspective change by the person looking at the object.

Tablo 6. The Perspective Drawing tests post-test scores of the experimental group and the control group

Measurement test	Groups	N	Mean	p-value
Perspective Drawing tests	Experimental Group	15	19,73	0,008
Perspective Drawing tests	Control Group	15	11,27	

The analysis also found a significant difference between the Perspective Drawing post-test rank-score means ($p < 0,05$). This finding shows that computer-aided Perspective Drawings presented to the test students increase achievement in Perspective Drawing more in comparison with the Perspective Drawings performed on the board and paper. The difference in Perspective Drawing achievement could be attributed to the fact that students cannot see enough samples in planes like board or paper but they can examine both more samples and different positioning variations of drawings through added animations by means of GSP. By means of the dynamism of the program, the experimental group students can see the properties of the horizon line and vanishing points better than the group working on paper.

CONCLUSION AND DISCUSSION

Perspective drawings are used to illustrate the appearance of three-dimensional objects on paper. According to primary school mathematics curriculum, among basic perspective drawing skills, one-point perspective and two-point perspective drawings and concepts are supposed to be taught in 8th grade mathematics course. Teaching perspective drawing aims to have students understand the relationship between objects and space. In this study, perspective drawing tasks helped the students learn the concepts and techniques of perspective drawing and acquire drawing skills in both the experimental group and the control group. In addition, they improved the students' spatial orientation ability.

The research findings revealed that the Perspective Drawings produced with both computer-aided teaching method and the activities on paper increased 8th grade students' achievement in Spatial Orientation and Perspective Drawing. On the other hand, while there was no statistically significant difference between the pre-test rank-scores of the experimental group and the control group for Perspective Drawing, a statistically significant difference was identified between the post-test rank-scores. Then it could be concluded that when the students, who had met Perspective Drawing for the first time in Mathematics course in their school life, learnt techniques of these drawings, an increase was identified in the achievement level of both of the groups, but the experimental group students' achievement in Perspective Drawing increased a lot more due to the drawings produced with the dynamic computer program. Similarly, although there was no statistically significant difference between the pre-test scores of the experimental group and the control group for Spatial Orientation, a statistically significant difference was found between the post-test scores. In light of this finding, it could be recommended that computer-aided teaching should be applied in teaching Perspective Drawing in order to increase student achievement in Spatial Orientation and Perspective Drawing.

The complexity of steps and methods in the static perspective drawings performed on the board and paper led to a teaching and learning problem in the control group whereas the computer aided teaching program applied in the experimental group helped solve this problem. It was observed that in classes where one-point and two-point perspective drawings were performed, the students recalled the perspective process steps which they were taught in class before and easily accomplished the tasks by means of their teacher's guidance and the activity handouts. Also, it was determined that since the computer program made it possible to move and color the drawings as well as producing clearer drawings than board or paper plane, the students better understood the depth of the perspective drawings and the students found these lessons more enjoyable than those in traditional classroom environment. By providing the students with an opportunity to check and revise any stage of the students' perspective drawings, the dynamic computer program helped them to learn perspective drawing step by step.

The restrictions which are inherent in the current course materials inevitably bring about some teaching and learning problems in the control group. For example, the teacher often has to spend too much time on the board for drawings because of the multiplicity of consecutive lines and steps in completed drawings (see Figure 1 and Figure 2). However, students still have difficulty in determining what comes first and what comes next in sequential drawings. On the other hand, chalks in many different colors are needed in order to distinguish between perspective lines and construction lines and horizon lines because construction lines and horizon lines are used to complete perspective drawing. In addition, perspective drawing can be made larger than normal size for clarity. The larger the size of a drawing is, the more effort it requires. Also, removing errors requires greater effort. Nevertheless, perspective drawings can still seem so messy on the board or in students' notebooks even if errors are corrected. Such restrictions hinder the success of students' perspective drawings and improvement of spatial orientation achievement.

While computer environment promotes a practical and concrete approach, students' reasoning about the concepts which they study in this environment requires cognitive perception and interpretation. In general, the interaction between the physical actions which students perform by means of dynamism and the theoretical meanings of concepts is very important (Flanagan, 2001). In other words, although students seem to be exhibiting certain experimental skills in dynamic software environment, they get to understand the theoretical structure of concepts better as they are made to think about these actions (Faydacı, 2008). In this study, the students were able to manipulate the positions and values of the perspective drawing components in order to visualize the cube's change. The dynamic program also offers an automatic drawing function which saves time in sequential drawings. This means that the procedure's steps can be monitored separately or continuously. Students can follow the automatic drawing on computer screen step by step and perform their own drawing on paper. By means of this feature, the students in this study were able to perform perspective drawings easily by distinguishing between construction lines and horizon line and without forgetting any steps and lines. Making it possible to change any drawing component without a limit, this feature allows for producing new samples of a perspective drawing and leads to more efficient learning.

In this study, both the experimental and control group students performed one-point and two-point drawings of a fixed-positioned object. While the students in the control group produced new perspective drawings on paper by repeating the same steps over and over in order to observe the changes caused by a change in the viewer's perspective, the experimental group students were able to see the image changes caused by a change in the viewer's perspective on more samples by making manipulations on these drawings thanks to the dynamism of GSP. These activities can be regarded to have a positive influence on improving spatial orientation ability because spatial orientation is defined as one's ability to mentally visualize the new image of an object that emerges as a result of change in the viewer's perspective. On the other hand, in comparison with the control group students, theexperimental group students' spatial orientation ability might have been improved more thanks to the preciseness of the drawings produced in computer and the presentation of a three-dimensional reality as a result of coloring and animation features. Also, the control group students had to produce new drawings in order to observe the changes caused by perspective changes for a model whereas the experimental groups students were able to move perspective drawings of an object easily as a whole body or part by part with GSP. This advantage could have added to the improvement of these students' spatial orientation ability.

Performing perspective drawings with tools such as paper and pen and improving spatial orientation ability have always been limited in traditional classroom environments in comparison with computer-aided teaching environments. There are always missing points in the pictorial representations of a three-dimensional object and this leads to optical illusions and different perceptions. Moreover, no matter how perfect these shapes are, it is impossible to see different perspective images of objects in a single drawing due to the static nature of this environment. Using dynamic geometry software together with static diagrams in lessons promotes primary school students' learning perspective drawings and improves their ability to mentally visualize and manipulate three-dimensional objects. While dragging objects, students both change some of their properties and discover their unchanging relationships through observation. This discovery provides students with an opportunity to make assumptions. Then they support their assumptions with many examples and therefore become involved in a sense of discovery learning.

In primary schools, perspective drawing achievement and spatial ability can be improved by increasing the number of computer-aided activities that are designed to supplement perspective drawings and monitor the perspective changes in perspective drawings after teaching the concepts and methods of one-point perspective drawing and two-point perspective drawing in traditional classroom environment. Considering the fact that Perspective Drawings produced by the control and experimental group students by means of the computer program increase their Spatial Orientation ability, designing new Perspective Drawing activities aimed at improving other components of spatial ability seems to be a good idea. An additional recommendation could be making use of the computer program in Perspective Drawings because, in comparison with the dynamic computer software, in drawings on the board or paper plane students cannot efficiently recognize the vanishing points or the changes occurring due to the movement of object components. Since manipulation, coloring and animations are possible with the drawings produced by using GSP; it could be used in presenting primary school geometry subjects.

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EFFECTS OF GUIDED WRITING STRATEGIES ON STUDENTS' WRITING ATTITUDES BASED ON MEDIA RICHNESS THEORY

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ABSTRACT
The purpose of this paper is to develop different guided writing strategies based on media richness theory and further evaluate the effects of these writing strategies on younger students' writing attitudes in terms of motivation, enjoyment and anxiety. A total of 66 sixth-grade elementary students with an average age of twelve were invited to join the experiment for a period of twelve weeks. A repeated-measure one-way ANOVA analysis was utilized to examine the differences among the three strategies including a rich media guided writing strategy, lean media guided writing strategy, and pen-and-paper guided writing strategy. The findings of this study showed the rich media guided writing strategy had higher significant differences than the pen-and-paper guided writing strategy in terms of writing attitudes toward motivation, enjoyment and anxiety. However, there were no significant differences between the rich media guided writing strategy and lean media guided writing strategy in terms of motivation and anxiety. The findings imply that providing a web-based learning environment with high richness media could guide students to write and achieve more positive writing attitudes in terms of motivation, enjoyment and anxiety.

INTRODUCTION
The development of language skills affects a person's productive ability. Several researchers have demonstrated personal success in disciplines is strongly related to a person's writing ability (Lerstrom, 1990) and depends on good writing skills (Cho & Schunn, 2007). Specifically, good writing skills are required training since prior research has proven writing is an important part of the elementary school curriculum (Lidvall, 2008). However, most students are usually apprehensive toward writing activities, and writing instruction remains an area of low interest for those students (Lidvall, 2008; Clark, 2004). Besides, the lack of suitable learning strategies in writing results in low motivation for students (Yang & Chung, 2005; Lo & Hyland, 2007). To solve these problems, Lipstein and Renninger (2007) suggested students who are interested are more likely to develop a better understanding of writing, set writing goals, make use of various strategies, and seek feedback on their writing. Therefore, a better understanding of how to develop a suitable learning strategy or authoring tool to enhance students' writing interest and motivation is worth examining.

Many studies have been conducted on the relevant factors related to writing attitudes in terms of pedagogy and learning strategy. For instance, Brindley and Schneider (2002) pointed out writing instruction should evolve into a more effective set of techniques and strategies that include modeling, shared writing, guided writing, and interactive writing (Pinnell & Fountas, 1998; Routman, 1991). Regarding the learning strategy to improve writing, Lee (1994) showed how pictures can be used as an effective guided writing strategy to facilitate students' writing process and improve writing proficiency. More specifically, such instruction using pictures in a guided writing environment can assist beginning foreign language students to develop and improve their writing skills as well as lower their anxiety in terms of expressing themselves in the target language.

Additionally, several studies have examined the effects of technology on writing instruction (Yang & Chung, 2005; Ulusoy, 2006; Yeh & Lo, 2009). For instance, Yeh and Lo (2009) used online annotation services to support error correction and corrective feedback in the writing activity. Also, Yang and Chung (2005) developed and evaluated a web-based writing environment to encourage elementary students' writing. Their results showed, in such a writing environment, students who previously thought writing was difficult came to feel writing was much easier than before. Moreover, Drexler, Dawson, and Ferdig (2007) utilized blogging to develop elementary expository writing skills. Their results indicated blogging can improve students' writing attitudes in terms of motivation. In sum, a web-based learning environment can provide learners with instructional materials and valuable knowledge free from the restrictions of time and space (Sun et al., 2008). The research mentioned above confirmed these benefits.

However, to the best of our knowledge, there is no study that has developed a web-based guided writing environment for elementary students. The present study attempted to combine a guided writing strategy and web-based learning environment to improve the writing environment for enhancing elementary students' writing attitudes. A major feature of the environment is web-based learning can integrate different media, such as text, picture, audio, animation and video to create various multimedia instructional materials and promote the writing interest and willingness of the learner (Gillani & Relan, 1997; Vichuda, Ramamurthy, & Haseman, 2001; Kuzu, Akbulut, & Şahin, 2007; Özdilek, & Özkan, 2009; Dalacosta, Kamariotaki-Paparrigopoulou, Palyvos, & Spyrellis, 2010). Moreover, many studies have claimed educational websites providing multimedia materials offer several instructional benefits (Neo & Neo, 2004; Liaw, Huang, & Chen, 2007; Chen & Liu, 2008).

Nevertheless, regarding the design of digital learning materials, Chang and Yang (2010) argued it sometimes too easy to assume multimedia provides a better learning environment, without considering the organization and distribution of the multimedia components. Therefore, the question of how to develop suitable instructional materials according to the unique characteristics of the subject matter is emerging as an important issue in web-based learning (Sun & Cheng, 2007).

The purpose of this study was to develop guided writing strategies in a web-based environment based on media richness theory and further to compare the effects of these guided writing strategies on students' writing attitudes. Our evaluation focused on answering the following question:

According to the proposed guided writing strategies, which strategy is more suitable for enhancing students' writing attitudes?

THEORETICAL FRAMEWORK

Some theoretical perspectives and related work indicating why this study would be beneficial and improve learning activities are briefly described with regard to guided writing strategies and media richness theory.

- **Guided writing strategy**

Kellogg (1988) pointed out proper writing strategies can enhance writing performance and reduce attentional overload. However, several researchers indicated, since writing is a complex task requiring the organization of several abstract ideas, instructors usually face tremendous challenges in developing a suitable writing strategy to assist students (Kieft, Rijlaarsdam, & Van den Bergh, 2008). Besides, to promote writing performance, the teacher plays an important role in helping students develop viable strategies for getting started, drafting, revising and editing (Silva, 1990).

According to prior research, Galbraith and Torrance (2004, p. 64) described two important views in terms of the practical implications of writing strategies as follows: (1) *Planning strategy*, in which writers "concentrate on working out what they want to say before setting pen to paper, and only start to produce full text once they have worked out what they want to say". Based on the planning strategy, the teacher could use available media (such as pictures, animations, and video) or instruments to assist writing and guide students who have some ideas to express before actually beginning writing. (2) *Revising strategy*, in which writers "work out what they want to say in the course of writing and content evolves over a series of drafts". According to this strategy, students can think of what they want to write by observing the media content and simultaneously revising their drafts.

As mentioned above, writing strategies on how to develop and formulate abstract ideas as well as use proper media or tools to assist pre-writing and successive tasks are critical issues. Guided writing is the most important factor in these strategies. Guided writing is an instructional writing context chiefly teaching the writing process through modeling, support, and practice (Tyner, 2004). Holdich and Chung (2003) indicated guided writing offers greater opportunities for young writers to make valuable connections between text, sentence and word level decisions and help children shape and redraft texts with particular criteria in mind. Most importantly, with such a writing strategy, the instructor should think how to guide young students into independent writing and help them discover their own abilities by providing opportunities for choice, peer response and further scaffolding (Oczkus, 2007).

In sum, the principle of the guided writing strategy is to provide instructional materials or relevant media to help students write. For example, in traditional writing instruction, the instructor generally guides student to express ideas by providing paper-based text, pictures or video media related to the writing subject. However, these media have many shortcomings in terms of flexibility, accessibility, interoperability, reusability, and convenience. In contrast, the web-based learning environment could be more helpful in assisting instruction through providing greater functions and more recent content.

Therefore, based on the principle of the guided writing strategy and the benefit of web-based learning environment, this study adopted the advantages of both the web-based environment and multimedia technology to present these ideas. It is expected learners could obtain better learning performance through such a writing way.

- **Media Richness Theory**

According to prior research, media richness theory (MRT) is defined as "the capacity to process rich information" (Daft & Lengel, 1986, p. 560). The level of media richness might enhance user concentration. Media richness has been argued to play an important role in shared meaning and understanding (Daft & Lengel, 1984). Kishi (2008) defined media richness as the capacity of media to develop shared meaning, overcome different frames of reference, and clarify ambiguous issues in a timely manner. Daft, Lengel, and Trevino, (1987) indicated the richness of a media is based on the following four criteria:

(1) Capacity for immediate feedback: This refers to the speed and quality of common interpretation transmitted through the medium. Generally, if a media could effectively facilitate interactions among the users and the system, the media has a higher level of feedback.
(2) Capacity to transmit multiple cues: An array of cues, including physical presence, voice inflections, body gestures, words, and numbers, even graphic symbols, facilitate the conveyance of interpretation information. According to this criterion, multimedia content is superior to the text in expressing certain concepts and meanings.
(3) Language variety: The means the level of concept convection. For example, numbers and formulas could provide greater precision; but natural language conveys a broader set of concepts and ideas. Also, compared with text-based content, multimedia content can play a vital role in helping students understand many difficult and abstract concepts. (Su, 2008).
(4) Capacity of the medium to have a personal focus: This refers to either the conveying of emotions and feelings, or the ability of the medium to be tailored to the specific needs and perspectives of the receiver. According to this view, information has its value when it satisfies a person's needs. In other words, if a user is familiar with a specific media content (especially in the context of schooling or the daily life of the user), he or she will have more feelings while observing such content.

In recent years, several studies proved media richness positively influences e-learning. Shaw et al. (2009) explored the effects of hypermedia, multimedia and hypertext to increase information security awareness among the three awareness levels of perception, comprehension and projection in an on-line training environment. Their results demonstrated the degree of media richness and the improvement of security awareness levels were positively correlated. Liu, Liao and Pratt (2009) presented a framework to study users' acceptance of streaming media for e-learning. Their results indicated the concentration of the users was stimulated by the course materials developed using rich media. Moreover, based on MRT, Sun and Cheng (2007) examined the effectiveness of multimedia instructional material design, as well as media on a learner's performance and satisfaction. They suggested the use of rich media (high richness media or rich information) should suit the characteristics of the course unit under consideration in e-learning.

In sum, each media has some outstanding characteristics and the developer and designer of an e-learning environment should adopt a suitable medium to support the corresponding learning activities in e-learning. Therefore, the above view motivated the authors to evaluate the effect of different guided writing strategies on writing attitudes. According to MRT, this study designed three strategies, including a rich media guided writing strategy (RM-GWS), lean media guided writing strategy (LM-GWS), and pen-and-paper guided writing strategy (PP-GWS), and compared their effect on writing attitudes.

RESEARCH VARIABLES AND MODEL

To compare the effects of the proposed guided writing strategies on students' writing attitudes, three major factors are proposed as follows.

- **Motivation**

Ryan and Deci (2000, p. 69) indicated "Motivation has been a central and perennial issue in the field of psychology, for it is at the core of biological, cognitive and social regulation". Motivation can be thought of as the needs, wants, interests and desires propelling individuals in a particular direction (Jeffrey, 2009). It is a psychological attribute enticing students to learn as well as to complete learning activities (Green & Sulbaran, 2006). For the educational field, motivation has been identified as a critical factor affecting learning (Lim, 2004). Lack of motivation can be a major obstacle preventing learners from concentrating on the given instruction (Jeamu, Kim, & Lee, 2008).

In previous research, many studies have been conducted on the influential factors related to learning performance such as motivation. For example, Lo and Hyland (2007) looked at young ESL writers in Hong Kong and implemented a new ESL writing programme designed to enhance students' motivation. The programme aimed at making the writing tasks more relevant to students by introducing topics related to their lives and social world and by providing a real audience and a real purpose for writing. The findings indicated the new programme enhanced students' engagement and motivation. Most importantly, Neo and Neo (2009) indicated students could improve their critical-thinking, creativity and presentation, as well as heighten their motivation when engaged in a multimedia-mediated learning environment. Based on the above evidence, the present study expected a guided writing strategy with rich media will more positively affect motivation. Therefore, the following hypothesis is proposed.

H1: The RM-GWS writing environment can enhance learners' motivation more than the LM-GWS and PP-GWS writing environments.

- **Enjoyment**

Davis, Bagozzi, and Warshaw (1992) explained enjoyment refers to the extent to which the activity of using a computer system is perceived to be personally enjoyable in its own right aside from the instrumental value of the technology. Enjoyment was also proved to induce perceptions of ease of use with subjects, thus enhancing technology adoption (Venkatesh, 2000). Thong, Hong, and Tam (2006) indicated perceived enjoyment is another important user belief that can lead to successful information technology usage. Prior studies have also confirmed the importance of perceived enjoyment in explaining information technology acceptance (Thong, Hong, & Tam, 2006).

Additionally, Fu, Wu, and Ho (2009) explored the development of a productive learning atmosphere in the context of web-based learning. As a result, they suggested teachers must create a classroom atmosphere to encourage learner engagement in collaborative learning, which will in turn enhance students' enjoyment of learning. Besides, Chatzoglou et al. (2009) dealt with the prognosis of employees' intention to use a web-based training process by extending the technology acceptance model using enjoyment. The structural equation modeling indicated enjoyment directly affects employees' intention to use web-based training. Specifically, Liaw, Huang, and Chen (2007) examined both instructors' and learners' attitudes toward e-learning usage. The above results indicate multimedia instruction can significantly affect the enjoyment of e-learning.

Therefore, this study attempted to use perceived enjoyment as an influential factor for writing activity. Further, this study considered a writing strategy with rich media will more positively impact the perceived enjoyment of a writing activity. Thus, the following hypothesis is proposed.

H2: The RM-GWS writing environment can enhance learners' enjoyment more than the LM-GWS and PP-GWS writing environments.

- **Anxiety**

Writing anxiety can be defined as the following "fear of the writing process that outweighs the projected gain from the ability to write" (Thompson, 1980, p.121). Writing anxiety has also been termed composition anxiety. Students with less writing ability may feel uncomfortable, gradually creating a sense of anxiety. In general, the students often feel apprehension in composition class, which often interferes with their ability to learn how to write effectively (Clark, 2004). Besides, students with high writing anxiety also considered writing unrewarding or punishing and approached it with negative attitudes (Daly & Shamo, 1978).

According to past research on writing anxiety, the following common characteristics of writing anxiety have been identified (Daly & Miller, 1975; Daly & Shamo, 1978):

(1) Learners are frightened by the demand for writing competency.
(2) Learners fear negative evaluation of their writing.
(3) Learners avoid writing whenever possible.
(4) When learners are forced to write they behave destructively.

The above points show why students feel apprehension toward writing. To deal with these problems, a few studies have proposed relevant learning strategies to reduce writing anxiety. For example, Öztürk and Çeçen (2007) examined the effects of portfolio keeping on the writing anxiety of students. The results showed using a portfolio in instructional practice could enhance the collection of students' work, demonstrating their efforts, progress, and learning achievements. Besides, for such learning strategies, teacher-student and peer collaboration could reduce writing anxiety and trigger communication by giving more opportunities to share reflections. Atay and Kurt (2007) examined the effects of peer feedback on the writing anxiety of Turkish prospective teachers of English. Their results at the end of the study showed the peer feedback group experienced significantly less writing anxiety than the teacher feedback group. Overall, to the best of our knowledge, little research has been conducted on developing learning strategies to reduce writing anxiety.

Therefore, a better understanding of how to develop a suitable learning strategy or authoring tool to reduce students' writing anxiety is worth investigating. To this end, this study considered a writing strategy with rich media would reduce writing anxiety. The following hypothesis is proposed.

H3: The RM-GWS writing environment can reduce learners' writing anxiety more than the LM-GWS and PP-GWS writing environments.

Based on the above analyses, this study proposed a research model and three major hypotheses related to the effects of different guided writing strategies on students' writing attitudes in terms of motivation, enjoyment and anxiety. Here, the research model is described in Figure 1.

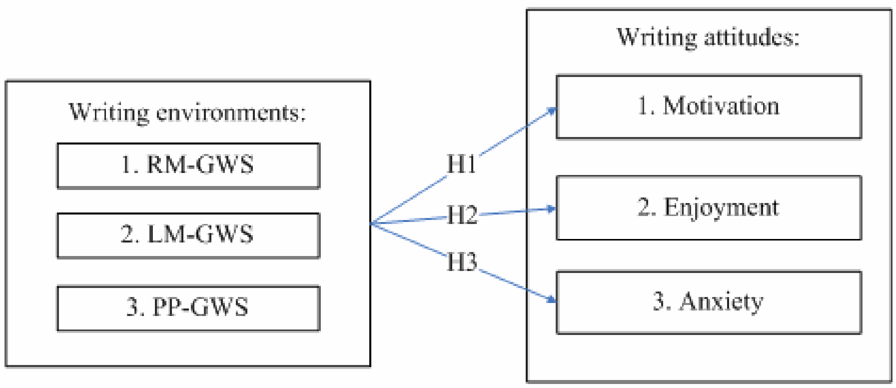


Figure 1: Research model.

IMPLEMENTATION OF WRITING ENVIRONMENTS

Regarding the proposed writing environments of this study, the development software included Adobe Flash CS3 and Photoshop CS3 to create animations and images, respectively. The Flash ActionScript 3.0 and ASP.NET 3.5 were selected as the client and server writing environment development language, respectively. Additionally, IIS 6.0 was used as the Web Server, and Microsoft SQL Server 2005 was used as the system database. The platform was a web-based environment for personal computers, in which learners could access the platform resource through the relevant browser software, for example IE (Internet Explorer), through the Internet. All students had their own username and password. They could login in to the writing environment system with their username and password.

According to our proposed guided writing strategies, this study examines three different writing environments. Specifically, RM-GWS and LM-GWS belong to a web-based writing environment; however, PP-GWS is a conventional writing environment. The implementation of the three writing environments is described in the following subsections.

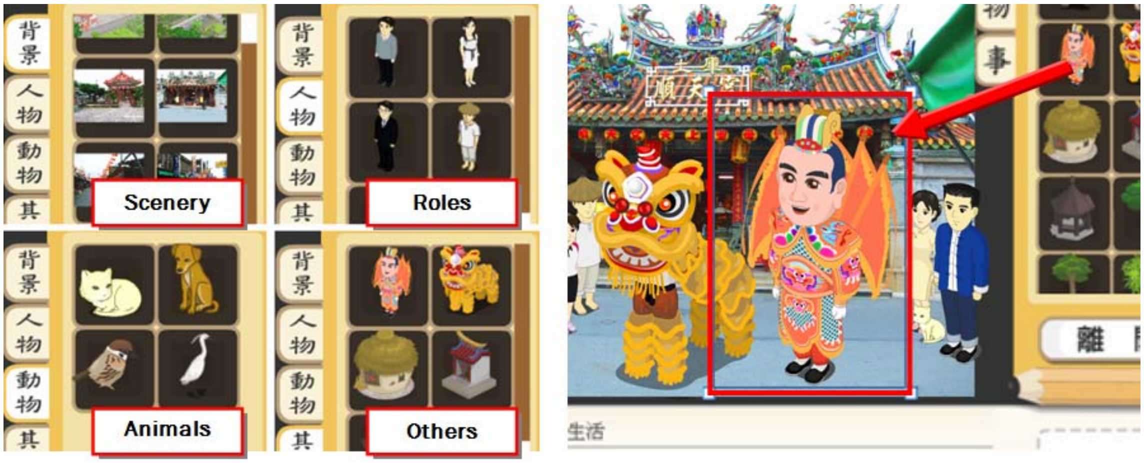
- **RM-GWS writing environment**

According to the criteria of MRT, this study attempted to develop a writing environment with RM-GWS. In this environment multimedia technology is mainly used to convey a rich media message. The main advantage of rich media learning experiences for the learners includes the potential to provide better simulations of real-life contexts for connecting their experiences to more deeply enhance conceptual thinking for writing. To achieve the above advantages, the teacher has to think how to provide suitable materials related to learning the subject as a medium of guided writing based on the principle of the guided writing strategy.

Moreover, this writing environment also provides a personalized user interface for enhancing the flexibility, usability, and power of human-computer interaction for elementary students. After logging in to the system, learners can freely integrate various media content, and further plan the overall structure of their articles.

Figure 2 shows the RM-GWS writing environment. Regarding the user interface of the main screen, several multimedia components such as animation, images, and sound are provided to guide writing. Different object types are available through clicking "Object type selection buttons". The multimedia object types include scenery, roles, animals, and others arranged in the media bank, as shown in Figure 3(a). The learner can choose any multimedia objects by clicking the small pattern in the grid of the right menu (media bank) as well as dragging and putting the object into the design area, as shown in Figure 3(b). Meanwhile, the learner can freely move, resize, rotate, duplicate, and delete any multimedia objects in the design area of the main screen. Basically, there are four pages in the main screen to show the learner's ideas. During the writing activity, the learner can type text into the writing area located in the lower part of the main screen. Note, these multimedia objects contain images and animations embedded with sound effects. Besides, the content of these objects was created from learners' real-life surroundings.

Figure 2: The RM-GWS writing environment.



(a) (b)

Figure 3: The user interface of the operating multimedia objects.

- **LM-GWS writing environment**

In contrast to the RM-GWS writing environment, the LM-GWS writing environment mainly provides text-based learning materials related to the learning subject for learners' writing. In this environment learners can observe specific words or sentences regarding real-life contexts and concepts to acquire inspiration and proceed with their writing. It is predicted learners are able to write more vivid, original and connotative articles through prompting from realistic situations.

Besides, from another writing perspective, forming abstract ideas from the learning experience can be satisfying for learners but some learners may find it difficult to form abstract concepts, and would therefore require various supports, for example, specific keywords, idioms, phrases and sentence examples. According to the above view, the text-based content could help learners to form these abstract ideas.

Figure 4 shows the LM-GWS writing environment. Several words such as roles, animals, events, scenery, Chinese idioms, and other phrases describing the scenery are provided to help students construct their ideas and guide writing by the instructor. Learners not only can use these provided materials to link their real-life experiences, but also can be engaged in forming their own ideas and creativity regarding the article. Similar to the RM-GWS writing environment, the learner can type content into the writing area located in the lower part of the main screen.

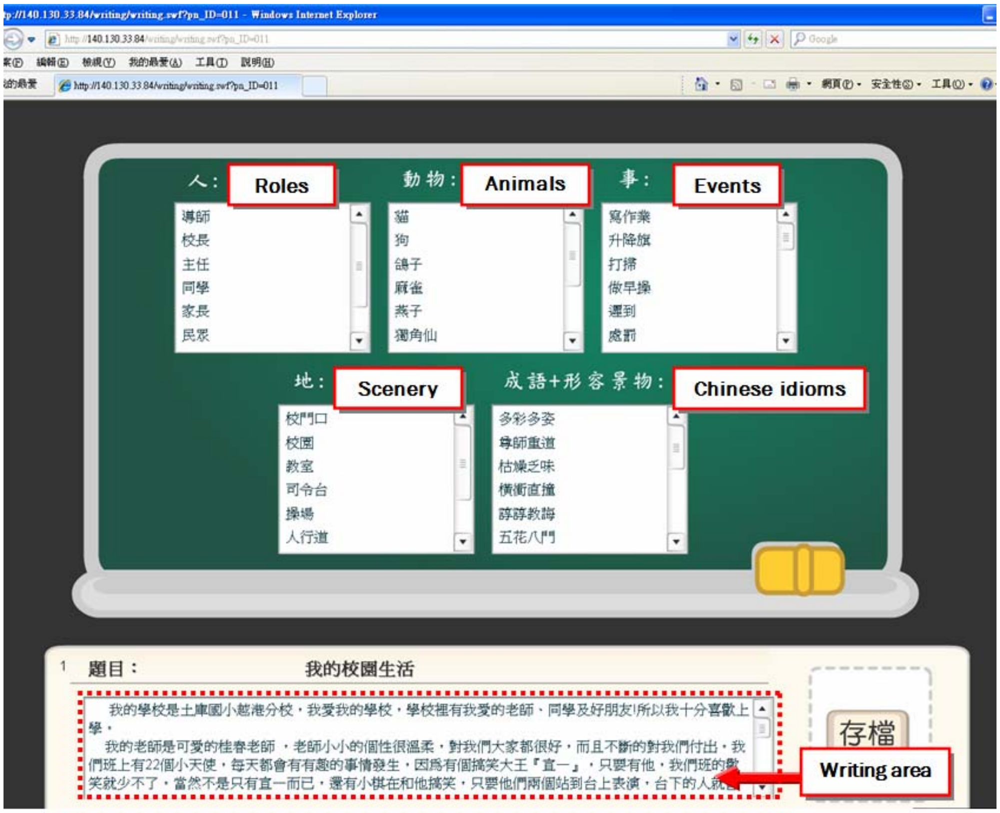


Figure 4: The LM-GWS writing environment.

- **PP-GWS writing environment**

Essentially, the PP-GWS writing environment is similar to a conventional classroom writing environment, where the instructor could guide learners to write in various ways such as writing or drawing on the blackboard, verbal prompts, using a textbook, pictures or video. Generally, verbal prompts are mainly adopted in this environment to guide learners' writing by the instructor.

As mentioned above, the common purpose of these three writing environments is to adopt relevant media presentations and prompt ways to enhance writing performance. The main differences between RM-GWS, LM-GWS and PP-GWS writing environments are summarized in Table 1. Besides, among these writing environments, the instructor still has to prepare suitable learning materials such as multimedia objects, keywords, and verbal prompts for supporting the learning activity before class.

Table 1: The main differences between RM-GWS, LM-GWS and PP-GWS writing environments

Writing environment	Characteristics
RM-GWS	1. Several multimedia components such as animation, images, and sound are provided to guide writing. 2. The content provides better simulations of real-life contexts for connecting learners' experiences to more deeply enhance conceptual thinking for writing. 3. Learners can freely integrate various media content and further plan the overall structure of their articles. 4. The environment allows multi-users operation simultaneously and facilitates interactions among the users and the system.
LM-GWS	1. The environment mainly provides text-based learning materials related to the learning subject for learners' writing. 2. Several words such as roles, animals, events, scenery, Chinese idioms, and other phrases describing the scenery are provided to help students construct their ideas. 3. Learners can only browse suggestive words and sentences regarding real-life contexts and concepts to acquire inspiration and proceed with their writing.

	4.	The environment also supports multi-users operation mechanism.
PP-GWS	1.	The instructor guides learners to write in traditional ways such as writing or drawing on the blackboard, verbal prompts, using a textbook, pictures or video.
	2.	All learners share a common learning material provided by the instructor.
	3.	Verbal prompts are mainly adopted in this environment to guide learners' writing by the instructor.
	4.	The environment does not support multi-users operation mechanism.

METHODOLOGY
Before the experiment, to understand how familiar students are with computers and basic computer interaction, a student's prior experiences survey was used to assess the level of experience. According to the results, most learners have a computer at home with the Internet and more than 90% of learners have experience with web-based learning.

Besides, to explore the proposed research problem, this study analyzed which guided writing strategy is more suitable to enhance students' writing attitudes in the RM-GWS, LM-GWS and PP-GWS writing environments. In the following, the experiment was designed to answer the research question.

- **Participants**

A total of 66 sixth-grade students, with an average age of 12 from an elementary school in Taiwan, were invited to join the experiment. All participants had similar educational backgrounds. Random sampling was used to assign the students to three groups: Group 1 (15 males and 9 females), Group 2 (9 males and 12 females), and Group 3 (12 males and 9 females).

- **Procedure and the design of learning activity**

The experiment was conducted with repeated-measures design and completed in twelve weeks. The RM-GWS and LM-GWS writing environments were conducted in a computer room and the PP-GWS writing environment was conducted in a conventional classroom. Before the experiment, for the writing environment with the RM-GWS and LM-GWS, participants were taught how to use the assigned writing environment and given practical guidance for 20 minutes.

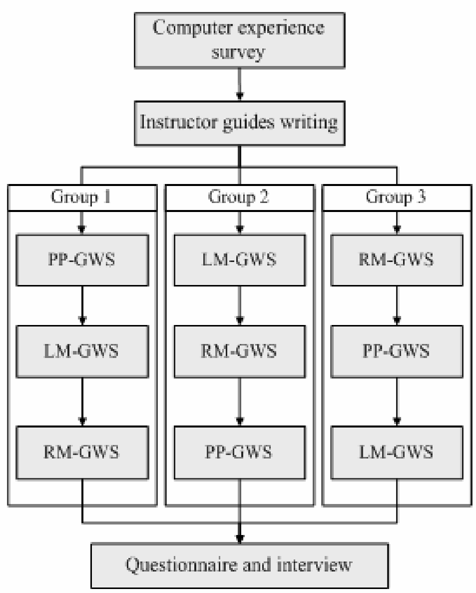


Figure 5: Experimental procedure.

Figure 5 shows the experimental procedure. The principle of this experiment design adopts a counterbalance of the order of treatments to avoid progressive errors. The order of treatments used the Latin Square mechanism. That is, the adopted guided writing strategy differed among the groups. Group 1 used the writing procedure in the sequence PP-GWS, LM-GWS and RM-GWS. Group 2 used the writing procedure in the sequence LM-GWS, RM-GWS and PP-GWS. Group 3 used the writing procedure in the sequence RM-GWS, PP-GWS and LM-GWS. Additionally, sufficient time was considered to minimize carryover effects among treatments. Each group used a specific guided writing strategy for four weeks. Within these four weeks, the instructor guided learners to complete the learning task according to the assigned writing strategy. With this in mind, the objective of this experiment was to evaluate different guided writing strategies in terms of writing attitudes; therefore, all participants had the same treatments except for the order of using each guided writing strategy.

Regarding the writing task for each week, writing subject was proposed by the instructor. Three groups were conducted to write their corresponding writing task. During the writing activity, the instructor used the corresponding guided writing environment to help students to construct their ideas. For example, the instructor uses familiar pictures and multimedia objects from daily life to capture the students' attention and, then to develop their imagination. According to the guided writing activity, students can construct different ideas using multimedia objects, keywords and pictures and connect the relationships between these ideas. The reason is that the presentation of ideas in visual form has been proven to be particularly important as it helps the educational process in a critical way.

After finishing the experiment, all participants had to fill out a questionnaire. In addition, a brief interview was conducted to obtain further explanation of some parts of learners' thinking that were unclear in the questionnaire responses. The content of the questionnaire was related to the writing attitudes reported in the Appendix. Each item was evaluated on a five-point Likert scale (one was strongly disagree and five was strongly agree). Then, a repeated-measures one-way ANOVA analysis was utilized to explain the differences among the RM-GWS, LM-GWS, and PP-GWS writing environments in this experiment.

- **Measurements**

The independent variable was the use of the guided writing strategy, including RM-GWS, LM-GWS and PP-GWS, in the proposed writing environment. The dependent variables were related to the writing attitudes toward motivation, enjoyment and anxiety. To understand the effects of the guided writing strategies on students' writing attitudes, the present study developed a questionnaire to estimate these effects. Besides, the questionnaire items were designed based on the previous literature and adapted instruments of motivation (Duncan & McKeachie, 2005), enjoyment (Laros & Steenkamp, 2005) and anxiety (Clark, 2004). Specifically, this study used three 14-item scales as measures of motivation (4 items), enjoyment (5 items) and anxiety (5 items). For the factor reliabilities, the resulting Cronbach's alpha reliability coefficient was between 0.84 and 0.89 for each factor and total reliability was 0.808. Analysis of the herein-considered sample showed a reasonable level of reliability (alpha > 0.70). Factor analysis also confirmed the construct validity of the scales could be carried out adequately. Using the principal component method with varimax rotation, the construct validity was examined. Table 2 reports the factor loadings and explains the variance for each of the factors. The factor loadings for all items exceeded 0.72, indicating the individual items also had discriminant validity.

Table 2: Scale reliabilities and factor loadings for measures of constructs

Scale	Motivation	Enjoyment	Anxiety
Cronbach's alpha = 0.840			
M Q1	0.850		
M Q4	0.822		
M Q3	0.814		
M Q2	0.802		
Cronbach's alpha = 0.898			
E Q2		0.918	
E Q3		0.890	
E Q5		0.847	
E Q1		0.838	
E Q4		0.722	
Cronbach's alpha = 0.852			
A Q2			0.859

A Q1	0.827
A Q4	0.780
A Q5	0.768
A Q3	0.732

Note: M, Motivation; E, Enjoyment; A, Anxiety.

Data analysis and results

To evaluate which guided writing strategy is most suitable to support writing activity among RM-GWS, LM-GWS and PP-GWS, this research had all participants test all three writing environments. After the experiment, all participants had to fill out a questionnaire. To test the hypothesis H1~H3 regarding the effects of the guided writing strategy on writing attitudes toward motivation, enjoyment and anxiety, this study conducted three repeated-measures one-way analyses of variance. After the experiment, Table 3 presents the relevant descriptive statistics for RM-GWS, LM-GWS and PP-GWS regarding motivation, enjoyment and anxiety. The results indicated RM-GWS had the highest mean among the groups in terms of motivation (M = 4.03) and enjoyment (M = 4.26); besides, RM-GWS had the lowest mean among the groups in terms of anxiety (M = 2.85).

Table 3: The descriptive statistics on analysis of writing attitudes among RM-GWS, PP-GWS and PP-GWS

Research variable	RM-GWS		LM-GWS		PP-GWS	
	Mean	SD	Mean	SD	Mean	SD
Motivation	4.03	0.731	3.91	0.507	3.26	0.873
Enjoyment	4.26	0.766	3.64	0.632	3.39	0.896
Anxiety	2.85	0.771	2.99	0.797	3.26	0.928

Additionally, an analysis of ANOVA was summarized in Table 4. The results revealed there were significant differences among the guided writing strategies, regarding motivation (*F*-value = 23.739, *P* = 0.000), enjoyment (*F*-value = 21.400, *P* = 0.000) and anxiety (*F*-value = 11.285, *P* = 0.000). This implies the use of different guided writing strategies significantly affects the writing attitudes. Further, regarding students' writing attitudes, to evaluate which guided writing strategy is an appropriate way to support writing activities among RM-GWS, LM-GWS and PP-GWS, a post hoc multiple comparisons with LSD method analysis was conducted and the results were summarized in Table 5.

Table 4: The ANOVA analysis of writing attitudes among RM-GWS, PP-GWS and PP-GWS

Research variable	Source	SS	df	MS	F-value
Motivation	Between subject	38.913	65	0.599	
	Within subject (Error)	84.667	132		
	Effect	22.65	2	11.325	23.739*
	Error	62.017	130	0.477	
	Total	123.58	197		
Enjoyment	Between subject	35.286	65	0.543	
	Within subject (Error)	106.746	132		
	Effect	26.439	2	13.220	21.400*
	Error	80.307	130	0.618	
	Total	142.032	197		

	Between subject	64.990	65	1.000	
	Within subject (Error)	76.613	132		
Anxiety	Effect	5.709	2	2.855	11.285*
	Error	70.904	130	0.545	
	Total	141.603	197		

According to the result of the post hoc comparisons, for motivation, both RM-GWS and LM-GWS had a higher value than PP-GWS. However, there was no significant difference between RM-GWS and LM-GWS. On the other hand, regarding anxiety, RM-GWS had a lower value than PP-GWS. In terms of enjoyment, the result showed RM-GWS had the highest rating.

As a result, hypothesis H2 was supported; however, hypotheses H1 and H3 were partially supported. That is, RM-GWS is a better way to support learners' writing activities than LM-GWS and PP-GWS with respect to enhancing enjoyment. Moreover, while the result of this experiment does not completely support hypotheses H1 and H3, RM-GWS is still a suitable way to support learners' writing activities in terms of enhancing motivation and reducing anxiety.

Table 5: Post hoc multiple comparisons (LSD method)

Dependent variable	(I) Strategy	(J) Strategy	Mean Difference (I - J)	Std. Error	Sig.	95% Confidence Interval		Post Hoc analysis
						Lower bound	Upper bound	
Motivation	RM-GWS	LM-GWS	0.117	0.075	0.121	-0.32	0.266	RM-GWS
		PP-GWS	0.769*	0.137	0.000	0.495	1.043	>PP-GWS
	LM-GWS	RM-GWS	-0.117	0.075	0.121	-0.266	0.032	
		PP-GWS	0.652*	0.138	0.000	0.376	0.927	LM-GWS
	PP-GWS	RM-GWS	-0.769*	0.137	0.000	-1.043	-0.495	>PP-GWS
		LM-GWS	-0.652*	0.138	0.000	-0.927	-0.376	
Enjoyment	RM-GWS	LM-GWS	0.618*	0.094	0.000	0.430	0.806	RM-GWS
		PP-GWS	0.870*	0.157	0.000	0.556	1.184	>LM-GWS
	LM-GWS	RM-GWS	-0.618*	0.094	0.000	-1.806	-0.430	
		PP-GWS	0.252	0.150	0.099	-0.049	0.552	RM-GWS
	PP-GWS	RM-GWS	-0.870*	0.157	0.000	-1.184	-0.556	>PP-GWS
		LM-GWS	-0.252	0.150	0.099	-0.552	0.049	
Anxiety	RM-GWS	LM-GWS	-0.139	0.076	0.072	-1.292	0.013	RM-GWS
		PP -GWS	-0.409*	0.153	0.009	-0.715	-0.104	<PP-GWS
	LM-GWS	RM-GWS	0.139	0.076	0.072	-0.013	0.292	
		PP-GWS	-0.270	0.143	0.063	-0.555	0.015	
	PP -GWS	RM-GWS	0.409*	0.153	0.009	0.104	0.715	

LM-GWS	0.270	0.143	0.063	-0.015	0.555

* The mean difference is significant at the 0.05 level.

DISCUSSION

According to the experiment results, overall this study found RM-GWS had a more positive influence on enhancing writing attitudes than the other proposed strategies. Table 5 shows RM-GWS had higher significant differences than the PP-GWS in terms of writing attitudes toward motivation, enjoyment and anxiety. However, there were no significant differences between the RM-GWS and LM-GWS in terms of motivation and anxiety. In other words, a web-based learning environment with multimedia learning materials could provide various interactions and presentations of media types (such as picture, animation and audio) as a guided writing strategy to enhance students' motivation and enjoyment and further reduce their writing anxiety. More detailed descriptions are discussed as follows.

For enhancing motivation, RM-GWS and LM-GWS were both significantly superior to PP-GWS, but no significant differences were found between them. This implies a web-based learning environment providing multimedia- or text-based digital materials could better enhance students' learning motivation compared with the traditional learning environment. This experimental result is the same as Kose (2009) who suggested computer-aided education can facilitate learning and enhance students' motivation. Therefore, this study shows both RM-GWS and LM-GWS might be suitable writing strategies to enhance learners' motivation.

In terms of enhancing learners' enjoyment, RM-GWS was better than the other strategies. The findings in this research are also similar to those in the Chen, Ghinea, and Macredie (2006) study, revealing multimedia content significantly influenced users' levels of understanding and enjoyment. More specifically, using a web-based learning environment with high richness media as a writing strategy could enhance learners' adoption and enjoyment.

With respect to reducing writing anxiety, there was no significant difference between LM-GWS and PP-GWS. Only RM-GWS was significantly lower than PP-GWS. This finding indicates learners' writing anxiety was below expectation. It is possible to conclude writing anxiety may be affected by learners' level of writing skill. In the experimental class, the instructor indicated learners' writing skills were generally good. This may imply learners' writing anxiety is affected by their writing skills. Overall, RM-GWS is the best strategy to reduce learners' writing anxiety.

Apart from the questionnaire analysis, an interview was also conducted to understand learners' perceptions of the learning activity and their attitudes toward the usage of guided writing environments. Most students indicated they felt writing is a difficult task and usually did not know how to generate, organize and formulate their abstract ideas. Fortunately, by using the proposed writing environments, they expressed the environments not only did arouse their interest, happiness and motivation, but also increase the fun of learning; they also thought the environments were useful and easy to use and did improve interaction between learner and content of materials, especially by using the RM-GWS and LM-GWS writing environments. Compared with the conventional approach (PP-GWS writing environment), learners indicated that they have more opportunities to interact with the provided system and further stimulate the self-initiated motivation to learn. This feature is very important for learners to improve writing.

Still, there are cautions that instructors should take while conducting a guided writing environment. For example, during the learning activity, because the multimedia presentation could lead to greater student motivation in learning, students were sometimes distracted by such high richness media. Accordingly, when students write with computers, they need to be advised to regard computers as a partner to help them construct a sketch instead of regarding it as a playable toy. Besides, among these writing environments, the instructor has to design and develop suitable learning materials such as multimedia objects, keywords, and verbal prompts for supporting the learning activity before class. This may lead instructor to spend more time preparing the lesson, especially in the RM-GWS writing environment.

Generally, the results of interview are consistent with those discussed in the questionnaire analysis of this study. This leads us to conclude that the RM-GWS writing environment can guide students to have better writing attitudes than other strategies. The results support previous studies (Chen & Liu, 2008; Sun & Cheng, 2007) which found multimedia is usually used as assisting materials for providing more information and knowledge to arouse learners' attention and interests in learning.

CONCLUSIONS

The purpose of this study is to develop different guided writing strategies and further evaluate these strategies to enhance students' writing attitudes. Guided writing strategy plays a very important role in writing process and is beneficial for improving writing performance, especially in elementary writing activities. The advent of web-based learning and multimedia technologies not only provides potential for applying innovative teaching and learning strategies, but also increases the fun of learning. We believe that more positive writing attitudes can be achieved by using proper support of the guided writing strategy and technology. Accordingly, to investigate the effects of different guided writing strategies on students' writing attitudes, in this study three guided writing strategies based on media richness theory were developed for teaching implementation, two belonging to a web-based writing environment (i.e., RM-GWS and LM-GWS writing environment) and the other belonging to a traditional writing environment (i.e., PP-GWS writing environment). There were 66 sixth-grade students participating in the experiment and they were randomly assigned into three groups. A repeated-measures one-way ANOVA analysis was utilized to test the research hypotheses. The results showed that the RM-GWS environment can help learners to have better writing attitudes in terms of motivation, enjoyment and anxiety.

This has important implications for pedagogies. It implies that providing a web-based learning environment with high richness media can guide students to write and achieve more positive writing attitudes in terms of motivation, enjoyment and anxiety. Instructors who intend to enhance students' writing attitudes can use the findings as a guide to help them in writing activity.

Although the findings are encouraging and useful, the present study has certain limitations that necessitate future research. First, learners' learning style and self-efficacy were not measured; however, these limitations may lead to different degrees of their participation and perception towards the learning activity. This issue is unclear and it might be another direction for future work. Second, this study mainly focused on examining students' writing attitudes; however, students' products were not analyzed. Future research needs to focus more on evaluating the content of students' learning outcomes, which may help teachers better understand how the effectiveness of the used strategies.

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Appendix: Questionnaire items and sources

The research variables were related to the writing attitudes.

Research variable	Item	Source
Motivation	1. I think this class is interesting, even if it is more difficult. 2. I feel that the writing activity is practical and is worth the effort to learn. 3. I believe I can learn all the concepts in class. 4. I am actively engaged in the learning activities.	Duncan and McKeachie (2005)
Enjoyment	1. I feel unhappy to learn. (R) 2. I enjoy the learning activity. 3. I feel enthusiastic about the learning activity. 4. I like the competitive task assignments. 5. I feel relaxed and comfortable during the learning activity.	Laros and Steenkamp (2005)
Anxiety	1. I worry about the writing grade. 2. I feel a lack of belief to complete the writing task. 3. I feel writing is hard work. 4. I have a negative attitude toward writing. 5. I feel comfortable. (R)	Clark (2004)

Note: (R) reverse coded.

ELAMEER-IDRUS ORBITAL E-EDUCATION FRAMEWORK FOR THE UNIVERSITY OF MUSTANSIRIYAH (UOMUST)

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ABSTRACT
The study of the university of Mustansiriyah case show us very clear that university suffers from a lot of problems start from the security , technology , management , pedagogical and ethical. Based on a pre-questionnaire survey about e-learning results, interviews and studies show us the need to the complete e-education system. Continuous scrutiny and study of the Iraqi higher education showed us very clearly there was something missing and need to be more reinforced in our modified Khan framework especially with the revolution of the wireless technologies. A framework was designed with many added dimensions like stability, time, learner, content control, standardization, scalability and modularization. As a result, a new framework, is an *ELAMEER-IDRUS* orbit e-education framework with a good acceptance at the post evaluation process that was achieved from a group of 231 senior academics.
Keywords: University of Mustansiriyah (UoMust), e-Education , Khan e-Learning framework , Modified Khan e-learning framework ,

INTRODUCTION
There are no doubts about the benefits of educational technologies to higher education and the impact on the learning process; in Iraq it demands for a change in the mindset of the students, lecturers, administrators of the universities, learning leaders, and the decision makers(Harb, 2008; Husain, 2004). Nowadays, the linear learning methods are obsolete and replaced by a cyclical new modern methods. Students now can start with study, go to work and come back to study again. This cyclic pattern will be the future feature of higher education, and technology will be the catalyst in realizing the flexibility, simplicity, durability, standard ability, scalability and mobility. E-learning could also easily customize the academic programs based on the demands and the geographical, culture, technological constraints of the students.

Iraqi universities are in urgent need for e-education systems and also the ministry need for the e-ministry, since the e-education are the focus on the learning and pedagogical factors. E-education can be defined as the learning process that involves e-learning with the different administrative and strategic measures needed to support the learning in an Internet environment, and it will incorporate a local, regional, national and international view of education. Most of the lecturers found them self without any instructional aides or educational technologies to use it because of lowest governmental budgets, especially in education systems with monitored increasing in the students' numbers.

Previously like all the education systems in the world the learning concept in Iraq was teacher-centered, and when the world start to change this concept and start making the learner as the core. The Iraqi education system starts to concrete the lecturer role as the core and center of the learning process. The reason for that was :

1-Difficult economic living condition in all of Iraq, missing the required concentration for the students and learner.
2-Government focusing on the quantity not quality of the graduates.
3-Learner core concept starts at the end of the eighteen decades when the Iraqi economy starts to fall down pursuant to the first gulf war.

As a result of complications and the circumstances that have passed on Iraq and the characteristics of the universities educational environment, it has been found that the adoption of any educational e-learning model or framework will not be useful for UoMust or the Iraqi universities because of the many factors that will play a big role in affecting e-education in Iraq's universities, and it was necessary to build a special e-education framework which considers all the education dimensions into consideration in Iraq to reach the best of the quality teaching.

After scrutinizing the e-learning framework from past researchers, it was found that each designer put their own ideas in the framework but most of them stated some factors that could influence an electronic learning system. Some variables in this research were selected from literature that was reviewed and others were from interviews with experts in the field of e- learning in different science sectors. Many studies have identified important variables dealing with an electronic learning system.

METHODOLOGY
The ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) was utilized in the study. Our framework is a result coming from :

1-Searching for the best e-education and e-learning frameworks in the previous studies and literatures.
2- An exploratory research of the state-of-the-e-learning and e-education and their future perspectives in our research context about Iraqi higher education.

A specially formulated questionnaire was designed and distributed between a group of Iraqi Mustansiriyah University staff to investigate the direction towards the e-learning elements, management & institutional problems, which are the basic elements of the proposed strategy and that could face the implementing e-education projects, the benefits that will be gained to the higher education sector, and the technology problems.

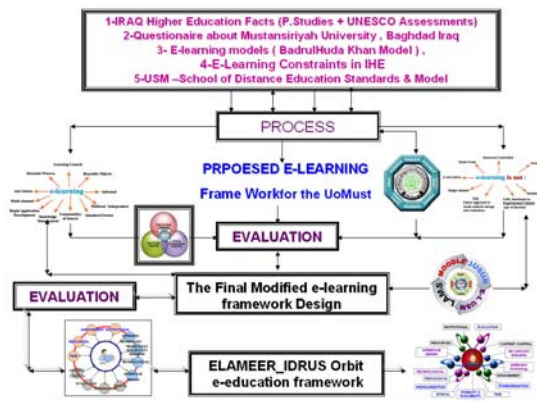

Figure 1: The research methodology framework

The Instrument
The Statistical procedure and the data analysis is one of the most important parts of the research work, and according to (Marczyk et al. 2005) “in most types of research studies. The process of data analysis involves the following three steps: (1) preparing the data for analysis, (2) analyzing the data, and (3) interpreting the data”. At the preliminary stage, a survey technique was used to collect the data and prepare it for the analyzing through a questionnaire of 44 statements for the e-learning and ICT skills in the UoMust. Preparation of the data for analysis was collected from the questionnaire which was divided into two parts. The first was the general and personal information the second included the targeted questions that as divided into five categories of management, institutional, technology, human resources and general.

The questionnaire was distributed between the academicians and after completing the framework design and at the final stage a post evaluation was achieved by a questionnaire of 50 statements about the design and all its elements and components.

All the statements and feedback were analyzed and computerized using the statically package for social science (SPSS) to obtain the mean (M), standard deviation (St.D), percentages (%). A Likert scale of six points was used (Gelin 2003), and they are: strongly agree (SA)-6, agree (A)-5, neutral (N)-4, disagree (DA)-3, strongly disagree (SDA)-2, don’t know-(DK)-1 (Kaghed & Dezaye, 2009);(Mohammad, 2008).

The Orbit Framework
The power and effectiveness of these new tools and methods are always being associated with the electronic learning methods, pedagogy, technology, institutionally, managerially, equity, ethically, interface designs and the way to access and any other variables could play a role in the learning process. To change this situation, we need to build a complete education system its core or center is the student or the learner since the researches and all the up to date educational theories prove that and encourage to design the learning environments centralizing the student or learner for an e-Education framework for the University of Mustansiriyah.

The Khan framework portrays a comprehensive theoretical e-learning model. E-Learning can be defined now as Badrul H. Khan stated: An innovative approach for delivering well designed, learner-centered, interactive, and facilitated learning environment to anyone, anyplace, anytime, by utilizing the attributes and resources of various digital technologies along with other forms of learning materials suited for open and distributed learning environment. The emergence of this frame work made the greatest impact in the revolution of e-learning that take place in the all of the learning sectors since this framework, for the last 16 years, described all the education and learning process. Further, the framework also offered the logical base for all the e-learning instructional designers on how to design and implement effective learning environment in the e-learning process using the interactions afforded via computers and the internet, considering and stating all the factors that could affect the proposed designs. The Khan framework is still widely utilized until today (Khan, 2004, 2009; Khan & Granato, 2007).

And according to the results that we obtain it from a UoMust surveys and studying the Iraqi higher education status we find that the elements that to be considered in any framework design are:
1-Pedagaogical, 2-Ethical, 3-Evaluation, 4-Technological, 5-Interface Design, 6-Institutional, 7-Management, 8-Wireless Technologies, 9-Time, 10-Content Control, 11-Human Resources Capacity Building, 12-Evaluation , 13-Learner. as shown in figure .2.

The Khan framework was modified and a new e-learning framework was built for the UoMust with 12 dimensions as shown in figure .3.

The e-learning elements was divided into three main trajectories, and they are, 1- Technological, 2-Organizational, 3-Educational, and each trajectory has its own elements that related to its functionality and Characterize by its main mark.

We believe that learning is completely systematically operation because it's dealing with the humans whatever its type was, and any systematic operation needed to be stable from the beginning and starting to its final goal or end, and learning must be stable operation in all its steps or phases.

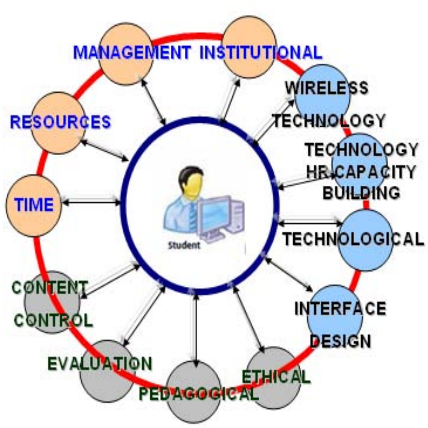

Figure 2: All e-learning dimensions and elements

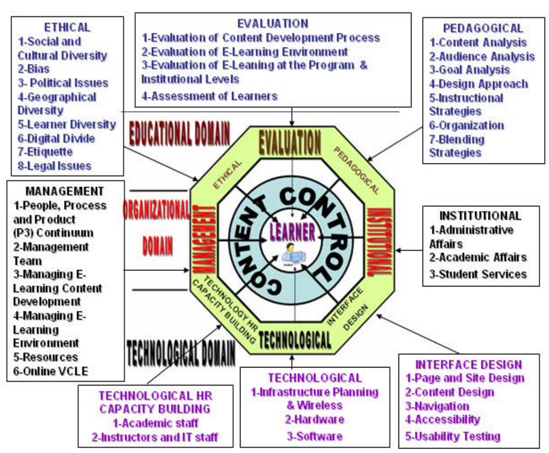

Figure 3: Modified Khan e-learning framework

In all the investigated models, we never found any model deal with this element that could effect and destroyed all the learning process because most of the designers are backgrounds are stable and consistent. In Iraq, it is a completely different case, and nothing is stable at all and small examples for that in Iraqi higher education undergraduate studies, they invent the third trial exams for whom that fail to reach the exam's rooms in the fixed time and date.

This is in the face to face traditional learning process, and more stability is needed in an electronic learning process. From that point of stand stability become a very important element if we are designing or trying to design e-learning or e-education activities in un stable countries where everything is not stable or going to be stable in the near future, and we also believe adopting such a stable framework could push strongly towards the stability of the learning process. We believe that the technological is the base and the foundation for our framework and for that we give this trajectory the main position inside the design and build all other elements according to its up to date new technological shapes after the ICT revolution which changes all old standards and concepts. These trajectory's elements are:

Technological Trajectory

The e-learning elements here must be scalable and stable and the elements are: Technology, Wireless technology, interface design, and technological human resources capacity building.

One computer to one learner is a very difficult formula to reach in any learning institution, especially with the same specifications.((Bielefeldt, 2006). Internet speed, or bandwidth, was a crucial issue for performance in large e-education networks. Studies have shown that the introduction of high-access computing can change the nature of instruction , and the strategies learned with technology may not be the same ones required for standard assessments of learning (Means & Olson, 1995).

"E-learning should ensure sufficient bandwidth is available to support the type of online learning applications being used and to ensure e learners have opportunities for face to face experiences in conjunction with their e-learning."(Ismail, Idrus, Ziden, & Fook, 2009).

ICT technology is the base for our framework, and it is the main trajectory that we build our system on it and without it, there is no e-education. In the Technological trajectory, we have four dimensions, and they are**:**

Technology

The technological dimension of e-learning examines issues of technology infrastructure in e-learning environments. This includes infrastructure planning, hardware, and software and according to that the changes in the education system in Iraq will be completely 180 degree turn, and everything will up to date and new. With considering that most emergent technologies are not widely having an adopted standard (hardware or software).

Human Resources Capacity Building

(MacDonald, Stodel, Hall, & Weaver, 2009) stated that if people did not have positive attitude, knowledge and skills of ICT, the e- learning program fails. Knowledge and skills have a direct impact on using e-learning. Since most of Iraqi universities suffers from the luck of required skills, (Elameer & Idrus, 2010), and we think Iraq needs to increase the believing in ICT which we think it will re shaped the education system completely.

Interface Design

The interface design refers to the overall look and feel of e-learning programs. The interface design dimension encompasses page and site design, content design, navigation, accessibility, and usability testing (((Khan, 2005; Rosenberg et al., 2007) and it is a very important element because it could be the way to the success, or they fail of any frame wok.

Wireless Technology

The growing development and application of wireless Information and Communication Technologies (WICT) opens new windows and opportunities for education improvement and redesigns the organizational and educational settings and shapes

To increase process polychromic, i.e., the possibility to deal with several tasks simultaneously. There is also a social context that includes different cultural formations, situations and moods, degrees of proximity and mutual recognition among people, etiquette and other elements that define what is or is not allowed in certain situations.

Organizational Trajectory

The e-learning elements here must be standardized according to the progressed university standardization and the elements are: Institutional, Management, Resources, and the Time. Furthermore, the organizational standard must be stable, and do not influence by the country or society changing winds only if it is to the better. The Stability of the universities is one of its basic academic characteristics, and we can find very clearly how the rules and regulations of the big names' universities like Cambridge, Oxford, UCL ,..etc. still same from long years ago and this a big indication for these universities organizational stability.

In Iraq the case is completely different and nothing is stable at all, and this comes from the changing of the regime in Iraq and missing universities stability come as a result for the country transform to the democracy. In the Organizational trajectory, we have four dimensions, and they are:

Institutional

The institutional dimension is concerned with issues of administrative affairs, academic affairs, and student services related to e-learning.

Resources

The resource support dimension of e-learning examines the online support and resources required to foster meaningful learning

Management
The management of e-learning refers to the maintenance of the learning environment and distribution of information and lack of ongoing support from management, failure to perform meaningful reviews to ensure an environment of continuous process improvement, etc.(Idrus, 2008).

Time
Time is considered a very important dimension in any innovative implementation of e-learning framework with considering the differences between the student achievement capabilities and the individualized differences, but we can keep time open without any upper limits or an end.
Availability of time must be adequate time and compensated time for users to become educated and skilled in how to use an innovation. This condition refers not only to the organization's willingness to provide time (such as paid time or release time) but the users' willingness to devote learning time to use the innovation.(Idrus 2008)

Educational Trajectory
The e-learning elements here must be modularized according to the Iraqi student's characteristics, and the elements are: Pedagogical, Evaluation, Ethical and the Content control.

In IT and in general Modularity definition is the property of the software (computer programs) that measures the extent to which programs or software have been composed out of separate parts called modules.
Modularity in learning is the same concept, and it is defined as the property of allowing to encapsulate, expose and separately reuse parts of a learning resource.
The framework has been designed to modularized the digital learning content, and it has been addressed as a part of the concept of learning objects.

The framework presented in this research can be used as the basis for a good foundation for modularization of the VLE. By modularizing the VLE, new functional components can be easily added in a way that makes them work as an integrated part of the overall learning environment.(Paulsson & Berglund, 2006).

In the Educational trajectory, we have four dimensions and as a word of the truth Khan 2009 framework had covered three dimensions completely, and we cannot find any missing element in his work in the field of pedagogical, ethical and evaluation as educational dimensions, but we also believe that content control should be added here as a new dimension to the educational trajectory.
With any technology, the effects on teaching and learning to depend on integration with curriculum and instruction (Bielefeldt, 2006).

Pedagogical
The pedagogical dimension of e-learning refers to teach and learning. This dimension addresses issues concerning content analysis, audience analysis, goal analysis, media analysis; design Approach, organization, and learning strategies.

Ethical
The ethical considerations of e-learning relate to social and political influence, cultural diversity, bias, geographical diversity, learner diversity, the digital divide, etiquette, and legal issues.

Evaluation
The evaluation of e-learning includes both the assessment of learners and the evaluation of the instruction and learning environment.

Content Control
The central ideology of learning theories is that learning occurs inside a person. Learning theories are concerned with the actual process of learning, not with the value of what is being learned.

In general content must be cooperative, collaborative and each learner has a learning path that caters for learners learning needs and interests in a productive. Students learn in differing ways and the manner in which information is presented to them affects their ability to learn (Kahiigi, Ekenberg, Hansson, Tusubira, &

Danielson, 2008). Students need to utilize the different learning styles interchangeably during the learning process in order for them to have an effective learning experience.

"Technology-enhanced student-centered learning environments organize interrelated learning themes into meaningful contexts"(Muniandy, Mohamad, Fook, & Idrus, 2009).
In order to achieve that (Moodle 1999) can help us and it are developed to facilitate the collaborative creation of content, organization, control and to manage the publication of documents in a centralized learner learning environment.As a final result the e-Learning context, advancement in network technologies, e-Learning technologies, and content development has facilitated multiple content presentations, personalization and ubiquitous learning. After studying each element and its direct effect to the student in the e-learning process, the framework was akin to the mechanics of orbital motion of the electrons that is moving in circular orbits at the constant speed around a nucleus, and when we finally understand the electron movement, we discover that each electron actually moves in a "wave pattern" where bodies (learning elements) with a slight difference en masse orbiting around a common barycentric (student as the core of the learning process). As such, the framework was reshaped into an orbit shape with the three trajectories and the design as orbital e- education framework.

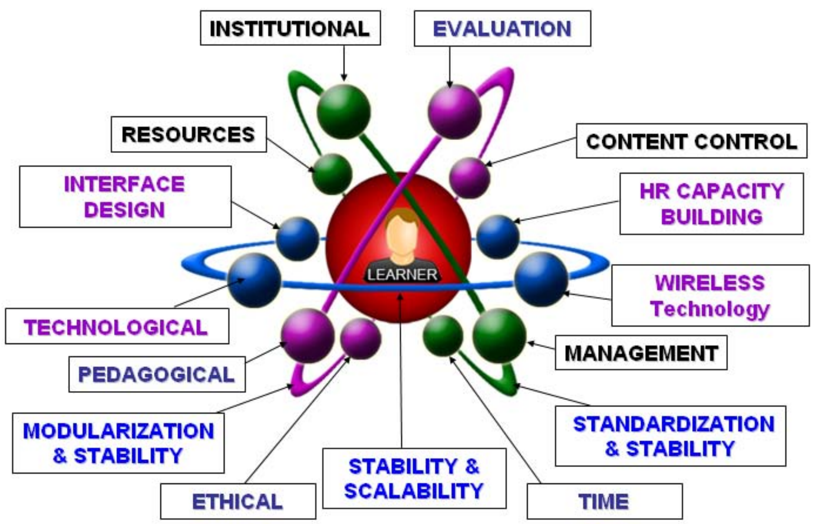

Figure 4 : ELAMEER-IDRUS e-Education Framework for UoMust

Advantages of Elameer-Idrus Orbital E- Education Framework
The instructionally designed orbital e-Education framework that will be used to digitize education activities and comprehensively covers all the education dimensions in UoMust is presented in Figure .4 with all the dimensions and sub-dimensions details. It has the following advantages:

1-The first framework that pays great attention to capacity building and ensuring well training for productive application
2-The first framework to study time. In the new world, time is money and in education we cannot keep it open freely without any control.
3- The first framework to study the up-to-date wireless technologies and their great benefits to the learning process. It is also the first to identify technology as a factor that can influence learning process or even end it.
4-The first framework to take modularization into consideration.
5-The framework could be useful and applied in any e-learning process, because we have taken into consideration the factors of M-learning, B-Learning and U-learning.
6-The first framework to take scalability into consideration.
7-The first framework to take standardization into consideration.
8-The first framework to take stability into consideration.

The Post-Evaluation Results
The results of the post evaluation for the new orbit model come in the highly positive side and (87%) of the academic staff welcomed the e-education orbit framework and encourage widely to adopt it and use it and (72 %) believe that it covers a lot of the e-learning area and then using of this framework in the higher education

come in the accepted zone with (69%). The good technological area in the orbit framework was completely in the positive side (excellent) and (92%) welcomed the strong technological domain in the framework. The solution of missing communications infrastructures by the wireless up to date technologies in the technological domain was very good grade (87%) and was welcomed. The managerial domain and its developed come in the accepted grade range (65%) and also the same for educational domain (67%). Human resources capacity building was also welcomed and come with (83%) in the zone of the very good grade and (75%) want the focusing of the HRCB to be on the senior academic staff. Furthermore, the VCLE was one of the e-learning components and (87%) welcomed adopting e-learning in UoMust need for a good video conference learning environment.

Distance education still away from the Iraqi higher education because of the luck information about it and its great benefits and the thinking about to certified distance education is come only with (65%) in the grade of accepted only and also the new mobile learning technologies are still also a way (60%) and in accepted grade and this result was completely known to us since the mobile technology is still at its first steps and mobile using was just allowed in 2004. The results obtained from the post evaluation are shown in table.1.

Table 1: Some of the result obtain from the post evaluation

Excellent 90-100	**Very Good 80-89**	**Good 70-79**	**Accepted 60-69**	**Poor 50-59**	**Very Poor Less than 50**

Statement	SA	A	N	DA	SDA	N	MEAN	%
UoMust need for a complete e- higher education system as the proposed	117	72	21	10	6	5	**5.146**	**86**
E-learning in UoMust need for a good MIS (Management information system)	89	95	5	13	4	25	**4.766**	**79.43**
Adopting e-learning in UoMust need for a good framework like the Orbit proposed.	147	49	12	6	1	16	**5.242**	**87.37**
Orbit framework covers all the learning dimensions in UoMust.	89	35	45	24	7	31	**4.354**	**72.58**
Developed the technological domain in the framework is important	167	47	10	0	0	7	**5.558**	**92.64**
Developed the managerial domain in the framework is important	67	40	29	44	9	42	**3.939**	**65.65**
Developed the educational domain in the framework is important	65	62	17	27	22	38	**4.03**	**67.17**
The wireless technologies and its progressed push it to play a big role in the learning process.	123	66	27	10	3	2	**5.255**	**87.5**
Adopting e-learning in UoMust need for a good human resources capacity building plan	143	37	16	5	11	19	**5.034**	**83..91**
Adopting e-learning in UoMust need for a clear and good step by step strategy.	144	23	27	3	7	27	**4.922**	**82.03**
Adopting e-learning in UoMust need for a good video conference learning environment (VCLE).	122	39	43	12	7	8	**5.00**	**83.47**
Orbit framework could be used in Iraq higher education universities	71	48	26	29	33	24	**4.099**	**68.32**
Wireless technologies are the solution for the Iraqi infrastructure problems.	34	15	72	76	26	8	**3.701**	**61.68**
Wireless technologies are the solution for the Iraqi funding problems and the lowest in costs.	18	17	167	6	9	14	**3.943**	**65.72**
Focusing on the capacity building for the senior academic staff is very importing factor in adopting it.	123	39	11	5	2	51	**4.352**	**75.54**
It is very important to build a clever e-gate for UoMust instead of the UoMust president news website	89	37	62	26	5	12	**4.619**	**76.98**
It is very important to design the learning materials to be used in mobile learning also	54	17	27	77	35	21	**3.632**	**60.53**

as future step								
Start thinking about to certified distance education is very important step towards develop UoMust	42	83	21	21	26	38	**3.913**	**65.22**
The proposed e-education for the UoMust is complete what it needed to install e-learning	62	47	51	34	17	20	**4.186**	**69.76**

CONCLUSION

In Taiwan, they start to build the intelligent class rooms "create an intelligent classroom embedded with individualized and interactive learning materials and assessment tools" , and in Iraq, we still after the wood blackboard .(Chang & Lee, 2010).

Dealing and designing for human beings is a very dangerous operation and to achieve it, all the elements of the design was studied very carefully and in e-learning we need to study a lot of different elements in its nature and try to find the correct formula for the best design and frameworks.

From 2003 and even before in Iraq, all these types of designs are done suddenly without any studying or planning and most of the decision makers are completely away from any kind of understanding the new learning theories and the impact of the ICT technologies in education and learning and still focusing on the chalk and talk as the best way of learning in face to face learning methods.

Khan framework was truly a revolution in the field of e-learning and for more than 16 years this framework is standing strongly in this field, and we hear from him two years ago how he designed his framework and added the eight dimension to his framework and our trial is completing what he had started, and we still believe in his framework and think it is one of the best frameworks but it cannot properly work in all learning different environments and as a word of truth as we stated we start from his framework.

At the end our framework becomes a completely different framework from Khan Framework with the similarity in some of the framework elements, and we believe that they simulate between the learner and any e-learning element is a very important and continuous operation.

After studying the learning environment and factors influencing the design we have a special framework for UoMust and the Iraqi higher education.

It was found that any e-learning project tries to complement the traditional way of face to face teaching method is best to be in a blended learning mode. To enhance the development of teaching and learning methodology through sharing of information on the latest pedagogical technique and delivery system for the students.

• Preferably to upgrade the ICT knowledge and skills in students and lecturers.
• Preferably to increased usage of ICT in educational management.

While the States of America fund the education sectors with huge numbers of the money to use up to date educational technologies(Executive Office of the President of the USA, 2010) , and the same in a lot of the other countries the Iraqi budget for education is still less than 5% of the complete Iraq budget and Iraq is a rich country and its budget for 2011 is more than 80 billion dollar. In States now days a lot of universities in its classic studies start to adopt at least one subject to be online and in Iraq, Jordan ,.. etc. we have still not accredited distance education.

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EMBRACING COMPLEXITY: USING TECHNOLOGY TO DEVELOP A LIFE-LONG LEARNING MODEL FOR NON-WORKING TIME IN THE INTERDEPENDENT HOMES FOR ADULTS WITH AUTISM SPECTRUM DISORDERS

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ABSTRACT
The purpose of this study was to employ complexity theory as a theoretical framework and technology to facilitate the development of a life-long learning model for non-working time in the interdependent homes for adults with Autism Spectrum Disorders (ASD). A "Shining Star Sustainable Action Project" of the ROC Foundation for Autistic Children and Adults in Taiwan (FACT) was selected as the research target, and the staff of the FACT, the medical team of the Hualian Yuli Veteran Hospital, adults with autism and their families were interviewed, observed and analyzed to develop this model during four short-stays of the project from July 2009 to December 2010. Participant field observation and informal conversations were employed and qualitative data were analyzed by using the constant comparison method through application of QSR Nvivo 9. The results showed that dynamic interaction, mutual adaptation, self-organization and co-evolution are four key elements for developing a viable life-long learning model for non-working time in the interdependent homes for adults with ASD to adapt to the impact of an aging society, to improve the quality of medical services, and to enhance the quality of life for the medical teams, patients and their families. The present study also found that the model help medical teams to avoid burnout by learning leisure skills and relaxation techniques, ways to release stress and how to enhance life-long learning for themselves and caregivers/patients' families.
Keywords: interdependent home, autism, complexity, quality of life

INTRODUCTION

Raising adults with Autism Spectrum Disorders (ASD) can be stressful and confers exceptional challenges on caregivers and their family members (Baker, Hartley, Seltzer, Floyd, Greenberg & Orsmond, 2011; Smith, Jinkuk, Seltzer, Greenberg, Almeida & Biship, 2010). The challenges are difficult to overcome because the nature of core symptoms of ASD, which include impairments in communication and reciprocal social interaction, and the presences of restricted and repetitive behaviors and interests (American Psychiatric Association, 2000). Therefore, developing long-term care services for adults with ASD is one of the most crucial issues for the autism community. Chiang, Lee, Frey, & McCormick (2004) used a videogame-based intervention to improve the quality of friendship for individuals with ASD and found positive impacts on several components of friendship quality, peer recognition through physical competence, and social expectations among participants. Related research also echoes these findings of the study and points out that using technology has the potential to enhance the quality of learning motivation for individuals with ASD (Narkon, Wells & Segal, 2011).

Non-Working Time in the Interdependent Homes

Lu, Chiang and Wang (2008) first stated that interdependent homes could create a happier and friendlier environment for people with intellectual disabilities. The concept of interdependent homes involves a "mixed" care system between professional/organizational facilities and home-based cares. Groups of parents who have children with ASD are united to set up home-based care facilities and take turns being the parents of the interdependent homes. In order to insure quality of care, professionals from health care, education, and social work are retained to provide professional services to support the interdependent homes on a regular basis. However, the study points out that there remains a lack of human resources at the interdependent homes, particularly during non-working times and days (e.g. after-work, days-off, weekends, holidays, summer and winter vacations). Because adults with ASD have diverse interests and disabilities, it is a complex challenge to construct a life-long learning environment in the interdependent homes. McConnell, Lekan-Rutledge, Nevidjon & Anderson (2004) stipulated that complexity theory is valuable for long-term care settings to adapt to complex situations because the theory has been pervasively applied in numerous types of research and practices to adapt to multiple environmental changes and multidisciplinary collaboration in both natural and social sciences. As a result, the purpose of the current study represented an attempt to employ complexity theory as a theoretical framework and technology to facilitate the development of a life-long learning model for non-working time in the interdependent homes for adults with ASD.

METHODOLOGY

FACT Short Stays

This study cooperated with the 5-year "Shining Star Sustainable Action Project" of the ROC Foundation for Autistic Children and Adults in Taiwan (FACT). The staff of the FACT and the medical team of the Hualian Yuli Veteran Hospital (HYVH) were recruited as the service team for this project. The goals of the FACT Project are as follows: (1) initiative collaboration between the FACT and HYVH; (2) designing an autism-centered long-term care program with the concept of home rebuilding; and, (3) developing a multidisciplinary holistic care model by combining medicine, nursing, psychology and counseling, social work, and occupational therapy. Major activities in the FACT project were described in Figure 1. A collaborative memorandum of understanding (MOU) between the FACT and HYVH was initiated and signed on July 20, 2006 and the second MOU was signed on November 25, 2008. The project began to execute the first short stay during July 20 to July 31, 2009. According to the health conditions, availability and appropriateness screenings of participants, the other 3 short stays were held during October 19 to October 30 in 2009, May 3 to May 15 and November 8 to December 31 in 2010.

Figure 1: Developing Processes of "Shining Star Sustainable Action Project"

Participants

The medical and support teams, adults with autism and their families were interviewed, observed and analyzed to develop this life-long learning model for non-working time in the interdependent homes during 4 short stays from July 2009 to December 2010. The medical team members included the superintendent and a psychiatric doctor, one head nurse, two clinic counselors, one social worker, and two occupational therapists from the HYVH. The support team members are two teachers and three social workers from the FACT. The first stays recruited 9 adults with autism and some of their parents to participate. With screening process, the number of participants decreased to three individuals at the forth stay (Table 1). All participants in this project were interviewed and observed when they were available during those short stays.

Table 1: Demographic information of Participants with ASD

Case No.	Gender	Age	Diagnosis*	Education**	Short Stay Participation
1	Male	29	SASD+ID	SSHS	1, 2, 3, 4
2	Male	31	SASD+ID	SSHS	1, 2, 3, 4
3	Male	34	MASD+ID	SSHS	2,3,4
4	Male	24	MASD	SVSHS	1,2
5	Male	28	SASD+ID	SSHS	1,2,3
6	Male	20	MASD+ID	SSHS	1,2,3
7	Male	19	SASD+ID	SSHS	1,2
8	Female	19	PASD+HD+EP	SSHS	1
9	Female	23	ASD+EP	SVSHS	1,2

*Note 1: SASD: Severe ASD; ID: Intellectual Disabilities; MASD: Moderate ASD; PASD: Profound ASD; HD: Hearing Disability; EP: Epilepsy
**Note 2: SSHS: Special Senior High School; SVSHS: Special Vocational Senior High School

Data Collection and Analysis
Two qualitative research methods, participant field observation and informal conversations, were used to collect responses and feedback as field notes from the adults with autism and their family members, the medical team members, and the support team members in this study. All data were gathered and analyzed by the primary investigator who has previous qualitative research experience and long-term working experience with autism populations. Member checking, peer debriefing and auditing are three main research procedures to enhance the trustworthiness, credibility and transferability of this qualitative study. The QSR Nvivo 9 Software Package was used in coding, sorting and generating themes of the data.

Theoretical Framework: Complexity Theory
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. Complexity theory has been pervasively applied in a variety of professions to adapt to multiple environmental changes and multidisciplinary collaboration in recently research (Paley, 2007). Evolved from Chaos theory and the idea of Lorenz attractor (Figure 2), complexity theory which emphasizes uncertainty and randomness constructs a non-linear dynamic system that traditional organizational theories are inability to explain and predict. In the healthcare- and education-related literatures, there is a growing attention in complexity theory and its implications. For example, there are a variety of research and professions that employ complexity theory as the theoretical framework in their studies, such as medical education (Fraser & Greenhalgh, 2001; Rees & Richards, 2004), health promotion (Wilson & Holt, 2001), shared care for patients with long-term mental illness (Byng & Jones, 2004), and healthcare management (Plsek and Wilson, 2001).

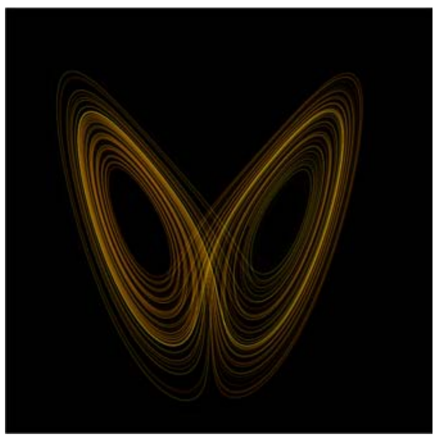


Figure 2: An icon of chaos theory - the Lorenz attractor (Source from Wiki Foundation, http://en.wikipedia.org/wiki/ File:Lorenz_attractor_yb.svg)

Complexity theory has a great strength when being used to explain the adaptability and survivability of systems that need paradoxical explanations (Grobman, 2005). The theory provides a graphical framework that outlines a complex zone with appropriate degree of agreement and certainty between simple and chaotic situations (figure 3). Since a theoretical framework of a study could provide a theory-based structure that can hold and support the conceptual foundation of a research work, it presents this complexity theory which may help to explain why the research questions under the study exists. Thus, the present study uses the theory as theoretical framework to construct a life-long learning model for non-working time in the interdependent homes for adults with ASD.

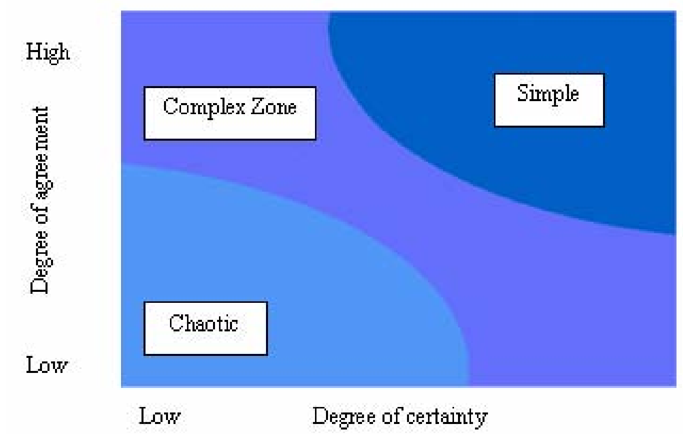


Figure 3: A graphic framework of complexity theory (Adapted from Plsek & Greenhalgh, 2001)

RESULTS & DISCUSSION

According to the results of the qualitative information, dynamic interaction, mutual adaptation, self-organization and co-evolution are identified as four key elements for developing a viable life-long learning model for non-working time in the interdependent homes for adults with ASD through technology. Those elements help not only these individuals with ASD and their families but also the medical teams and related professionals to adapt to the impact of an aging society, to improve the quality of medical services and to enhance their quality of life.

Dynamic Interaction

Dynamic interaction addresses on the importance of increasing interactions between the organizations, professionals, and adults with ASD. For example, the FACT and HYVH have to find possible solutions to develop viable human resource arrangement for non-working time in the interdependent homes since it is a home-based long-term care model for adults with ASD and their parents. Therefore, dynamic interactions are highly recommended and technology can play a crucial role to facilitate better interactions between the organizations and these family members. For example, the immediate communications via Web 2.0 technology (e.g., Facebook, Plurk, Twitter, Google+) are advised to increate the dynamic interaction. Figure 4 demonstrates that the FACT has begun to use Facebook to interact with individuals with ASD and families who have children or adults with ASD.

Figure 4: The FACT Facebook page

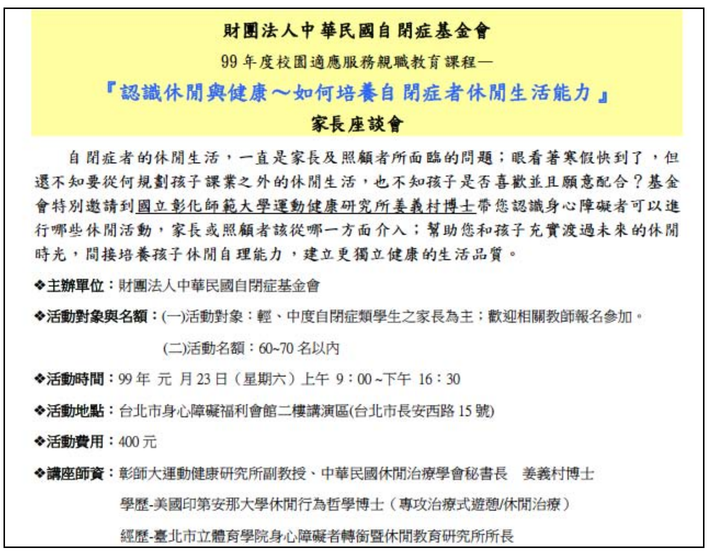
Mutual Adaptation

According to complexity theory, mutual-adaptation stipulates that developing multidisciplinary collaboration is extremely important to adults with ASD in such a diverse life-long learning environment. Traditionally, the professional, medical or support team members who provide services for adults with ASD are mostly from the areas of medical, nursing, special education, physical therapy, occupational therapy and social worker professions. All of those professionals do not have academic trainings or practical experiences on facilitating leisure, recreation, sports or other life-long learning activities for non-working time in the interdependent homes. Therefore, the model suggests that mutual adaptation shall be promoted to advance technology-related and leisure-related knowledge in those helping professions. For example, higher educators in those professions are recommended to revise their curriculum and to add more technology-based (e.g., e-learning) and leisure-related courses (e.g., therapeutic recreation) in their professional preparation, practical trainings and continuing education. In this study, one occupational therapist identified her needs in leisure-related continuing education and said,

> *"It is a pity that I did not have a chance to attend leisure education workshops two years ago. I think that leisure and recreation activities are definitely needed for those adults with ASD if they plan to stay here for a long time. During weekends and holidays, I always think what leisure activities that I can teach if I am on duty. Unfortunately, this is one of my limitations because I do not have any previous training on providing therapeutic recreation sessions or prescriptive leisure activities for those adults with ASD."*

Self-Organization

Self-organization strongly recommends that service providers (e.g. FACT and HYVH) and parents support groups shall start to advocate and develop non-working time leisure and recreation programs for individuals with ASD. The concept of self-organization not only provides leisure and recreation for non-working time for adults with ASD, but also gives a window for the medical team members to avoid burnout by learning leisure skills and relaxation and perceiving fun and enjoyment during their service delivery processes. Therefore, continuing leisure education programs are identified as an important component for their self-organizations. Figure 5 shows that the FACT began to hold a leisure education workshop for professionals who were interested in teaching leisure education and parents who have children with ASD on January 23, 2010.



財團法人中華民國自閉症基金會

99年度校園適應服務親職教育課程—

『認識休閒與健康～如何培養自閉症者休閒生活能力』

家長座談會

自閉症者的休閒生活，一直是家長及照顧者所面臨的問題；眼看著寒假快到了，但還不知要從何規劃孩子課業之外的休閒生活，也不知孩子是否喜歡並且願意配合？基金會特別邀請到國立彰化師範大學運動健康研究所姜義村博士帶您認識身心障礙者可以進行哪些休閒活動，家長或照顧者該從哪一方面介入；幫助您和孩子充實渡過未來的休閒時光，間接培養孩子休閒自理能力，建立更獨立健康的生活品質。

❖**主辦單位**：財團法人中華民國自閉症基金會

❖**活動對象與名額**：(一)活動對象：輕、中度自閉症類學生之家長為主；歡迎相關教師報名參加。

(二)活動名額：60~70 名以內

❖**活動時間**：99 年 元 月 23 日（星期六）上午 9：00~下午 16：30

❖**活動地點**：台北市身心障礙福利會館二樓講演區(台北市長安西路 15 號)

❖**活動費用**：400 元

❖**講座師資**：彰師大運動健康研究所副教授、中華民國休閒治療學會秘書長　姜義村博士

學歷-美國印第安那大學休閒行為哲學博士（專攻治療式遊憩/休閒治療）

經歷-臺北市立體育學院身心障礙者轉銜暨休閒教育研究所所長

Figure 5: The FACT Leisure Education Workshop Flyer

Co-Evolution

The study found that both the FACT and HYVH have to expand their concepts on their service spectrum for adults with ASD in this interdependent home, such as adding learning time slots (e.g., after school hour, midnight, early morning), changing learning styles (e.g., needing a great amount of multimedia to keep concentration), facilitating feedback opportunities (online electronic interaction), and increasing their learning motivation (e.g., computer attachment, video-/audio-information). This theme identified that the professional organizations have to co-evolve and improve their services and innovations on technology-based learning and leisure opportunities when there will be a lack of human resources during non-working time. For instance, the executive of the FACT expressed his opinion on providing technology-based learning and leisure opportunities for adults with ASD and stated,

> *"I believe that this approach is absolutely correct. Those adults with ASD have strong needs in continuing education in this long-term care model and in such a remote site. It is impossible to invite teachers or experts to come here every weekend; of course, we won't have enough*

money to do that. Therefore, I think that using technology-based learning is a very good way to do it! Additionally, if we can use this technology to teach them to make friends, have some fun and enjoyable time, that will be awesome!"

CONCLUSIONS

The aim of this research is to develop a life-long learning model for non-working time in the interdependent homes for adults with ASD by employing complexity theory as a theoretical framework and using technology as a facilitation technique. Paley (2007) states that applying complexity theory in health care service and health related organizations is a right approach, however, it is believed that this approach is still in its embryonic state of the complexity science development. The results show that this life-long learning model builds on the theoretical base of complexity theory used to address survivability and adaptability successfully outlined four key elements to develop better services for non-working time in the interdependent homes for adults with ASD. In addition, it also assists helping professionals to prevent burnout by learning leisure skills and relaxation techniques, ways to release stress and how to have continuing leisure education opportunities for themselves and caregivers/patients' families.

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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ESTABLISHMENT AND USABILITY EVALUATION OF AN INTERACTIVE AR LEARNING SYSTEM ON CONSERVATION OF FISH

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ABSTRACT
In this study, we develop an interactive AR Learning System based on Augmented Reality and interactive touch-screen. The learning content knowledge is about conservation of fish in Taiwan. The system combines the game by the concept of AR book which allows children to learn about the importance of conservation of fish. A mechanism is designed to verify whether the game based on AR book well delivers the educational messages. The whole mechanism is an interactive game using touch screen to interact with the rod as a tool to get rid of the shackles of keyboard and mouse. It provides a more realistic interaction. The evaluation results show that the interactive AR Learning System has positive usability.

INTRODUCTION
The concept of conservation is popular presently in Taiwan. Therefore, we must come to understand and learn about the basic information of fish. There are six kinds of Taiwan endemic species fish which have been extinct and nine kinds of endangered Taiwan endemic species fish (Baskin, 1994; Wang, 1999). The cause of impacts includes ecological changes in habitat, alien species invasion, river fish poisoning and electrocute, and so on. The rivers have been serious polluted and damaged by human's illegal hunting, abandon alien species, land development without planning, and so on. It causes endanger of Taiwan endemic species of freshwater fish. Conservation of fish is the responsibility of all people. The river conservation action must be taken from daily life.

Augmented reality (AR) has been increasingly applied in various fields. Many studies use augmented reality in the design of instructional systems for investigating issues such as learning stimulus, motivation and achievement. We develop a conservation species learning system through the AR technology. In AR, through the combination of virtual objects and real scenes, learners are able to interact with virtual fishes, getting the sense of excitement to improve their learning effects and interests.

LITERATURE REVIEW
Augmented Reality
AR is a new technique of the computer vision application used to facilitate interaction in the digital arts. Recently, many scholars and institutes have conducted research examining AR, which is also called Mixed Reality (MR) given that it is an extension of Virtual Reality (VR). Using computer graphics, VR can simulate objects in the real world and create an environment in which people can interact with the simulated objects. AR is the image, object, or scene that is generated by a computer to blend with the real environment to enhance the visual experience. To summarize, AR adds virtual objects to the real environment. AR technology must possess three characteristics: the combination of virtual objects and the real world, real-time interaction, and the representation of 3D space.

Milgram and Kishino (1994) treat the real environment and the virtual environment as a continuum, as shown in Figure 1. The real environment is on the left end and the virtual environment is on the right end. VR typically replaces the real world, whereas AR augments the virtual images produced by the computer with objects from the real environment. Presently, AR is applied extensively in the fields of education, medical technology, military training, engineering, industrial design, arts, and entertainment (Azuma, 1997; Azuma, et al., 2001).

AR combines virtual objects with the real environment and displays the virtual objects generated by computers to users. Milgram and Kishino (1994) define two ways of displaying AR: See-Through AR and Monitor-Based AR. In See-Through AR, the users can see the surrounding environment through a monitor that also displays the virtual image. Accordingly, the effect of the augmented environment is strongest with See-through AR. In Monitor-Based AR, a computer combines images captured by a webcam with virtual images. The final image after this combination is displayed on a Head-Mounted Display (HMD) or on a computer monitor. HMDs are either pure or equipped with a small webcam. The former system is small and can be equipped with a head-mounted tracking instrument that tracks the viewing angle and the direction the user's head is facing. This pure HMD is more suitable for research and for the application of AR. The HMD with a small webcam has an immersion effect (Hsieh & Lin, 2009; Hsieh & Lin, 2010; Hsieh, et al., 2010).

Now, plenty of scholars apply AR to education, Dünser and Hornecker (Dünser & Hornecker, 2007) observes the condition of students' reading AR textbooks, and further probes into how students from 6 to 7 years old operate the novel interactive teaching media. When students use paddle to interact with the AR textbook, the monitor will display text, sound, avatar etc. related to AR textbooks. The main focus is on that we can observe students' reaction while they are using touchable interactive interface. Liarokapis et al. (Liarokapis et al., 2002) propose a Multimedia Augmented Reality Interface (MARIE) E-Learning, applied to engineering education, in order to enhance traditional teaching and learning methods. The AR system uses virtual multimedia to interact with users and is fitting for the tabletop environment. MagicBook (Billinghurst et al., 2001) exploits AR to design a set of books for user to read. It is like a normal paper book, but specially, the content in the book is made up of 3D animation, presented by AR, which shows the information from the book. A book is a real object while its content is a virtual object. Therefore, users can use handheld HMD to experience the AR scene in Magic Book. This reading method can help users turn their imaginary world into reality and then inspire more imagination in reading.

Touch Screen Technology

There are several types of touch screens: resistive touch screen, capacitive touch screen, SAW touch screen, optical touch screen, and electromagnetic digitizer. In this study, we use optical touch screen as system interactive interface. The comparison of touch screens is to be delivered in the subsequent section (Sears, 1991; GTouch Groovy Technology, 2011).

Resistive touch screen and capacitive touch screen: The advantages include fast response and high accuracy of recognition. But, its reflectance is higher and the material fatigue easily. Therefore, it cannot last long life to use. Capacitive touch screens are specifically designed to improve the shortcoming of low scratch resistance with resistive touch panels.

Optical touch screen and SAW touch screen: Such kinds of screens can be easily installed and are not affected by the panel size, but it is non-linear combination of distortion. Hence, the software must calibrate so that the response speed is slower. SAW touch screen technology overcomes the flaws in capacitive touch screens that are susceptible to interfere by signal noise and static electricity.

Electromagnetic digitizer: Electromagnetic digitizer operates based on electromagnetic sensing; it involves the use of an electromagnetic pen that functions as a signal transmitter while the electromagnetic board acts as a receiver. It is stable, reliable, high-accuracy rate, low reflectivity, locating accuracy, and movement sensitivity. It belongs to a kind of linear structure of the touch panel.

System Development

Augmented reality enables users to see the real world with virtual objects superimposed upon it. In this study, we develop an Interactive Augmented Reality Learning System (IARLS). The system is divided into two parts: hardware and software. In the hardware the touch screen is used and in the software Virtools Dev 4.0 and 3D Max 9 are used. As to the implementation of augmented reality, we combine ARToolKit and Virtools. Figure 1 shows the system development tools.

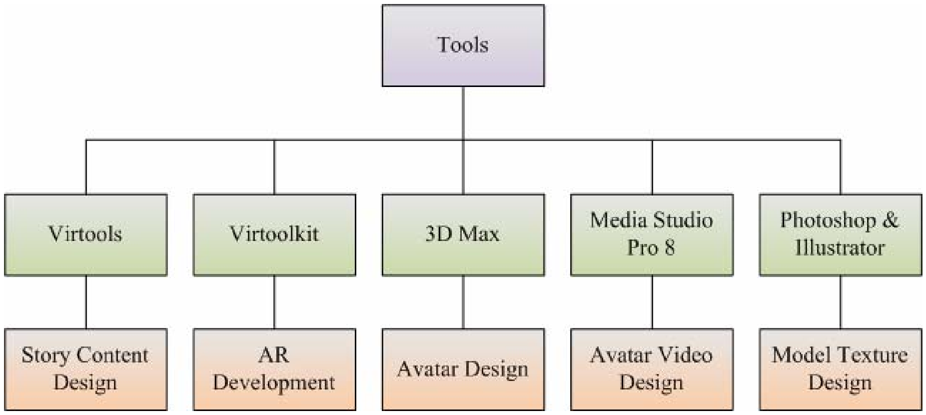

Figure 1: System development tools

In this work, several avatars are designed, including conservation of fish, alien species fish, and river pollution objects, as describe below.

(1) Conservation of fish: We design three kinds of conservation of fish to let learners select in the system of learning game. There are Oncorhynchus masou (see Figure 2), Macropodus opercularis (see Figure 3), and Varicorhinus alticorpus (see Figure 4).
(2) Alien species fish: The river brings in alien species from elsewhere is one of the major factors that causes conservation of fish to die. It includes Gambusia affinis (see Figure 5) and Oreochromis mossambica (see Figure 6).
(3) River pollution objects: They indicate the factors that harm the environment. They are discarded fish hook (see Figure 7) and garbage in system.


Figure 2:
Oncorhynchus masou


Figure 3:
Macropodus opercularis

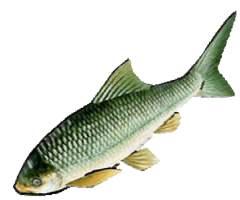
Figure 4:
Varicorhinus alticorpus

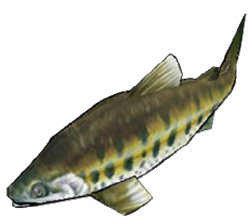
Figure 5:
Gambusia affinis


Figure 6:
Oreochromis mossambica


Figure 7:
Discarded fish hook

The system development contains five steps.

- Step 1: Building avatars, objects and 3D scenes via 3Ds Max.
- Step 2: Drawing textures of avatars, scenes and system surfaces via Potoshop CS3 and Illustrator CS3.
- Step 3: Creating the system introduction video via Media Studio Pro 8.
- Step 4: System programming of augmented reality based on Virtools SDK and ARToolkit as the system development environment.
- Step 5: Finally, we utilize Virtools as system building platform to integrating all components.

System Operation

In the system operation processes, at first the Learners must understand the domain knowledge of Taiwan endemic species of freshwater fish via the AR Book. The teaching video is displayed upon the AR Book. The system forces learner to learn; the game start only when the learners complete the whole learning processes via the AR Book. The game employs a bonus mechanism to give rewards to the learners. As to the 3D model objects, there are Taiwan endemic species of freshwater fish, alien species fish and garbage. The alien species fish and garbage endanger Taiwan endemic species of freshwater fish. It means that the alien species fish and garbage are hazards. Consequently, learner needs to use fishing rod to angle those hazards. The game will increment the bonus point when the learner uses fishing rod to angle them. Oppositely, the game will subtract the bonus point when the alien species fish and garbage endanger Taiwan endemic species of freshwater fish, or the learner carelessness angle Taiwan endemic species of freshwater fish. When the bonus points exceed the threshold, it indicates that the learner successfully pass the game level. The system operation flowchart is depicted as in Figure 8. The Figure 9 shows the sketch of Taiwan endemic species of freshwater fish in the AR Book and the system installation is shown in Figure 10.

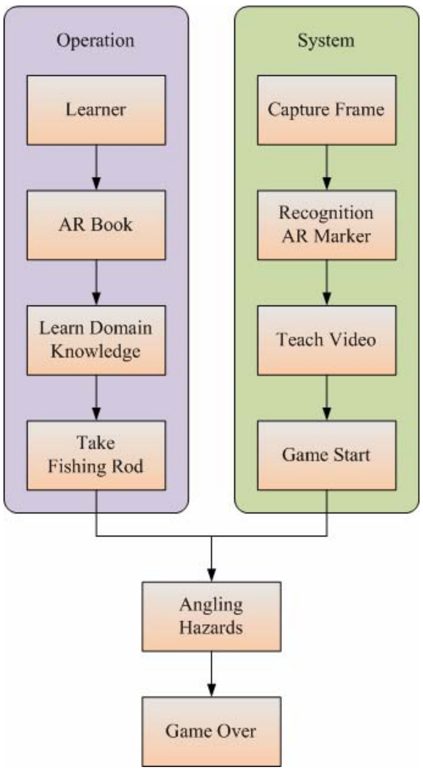

Figure 8: System operation flowchart

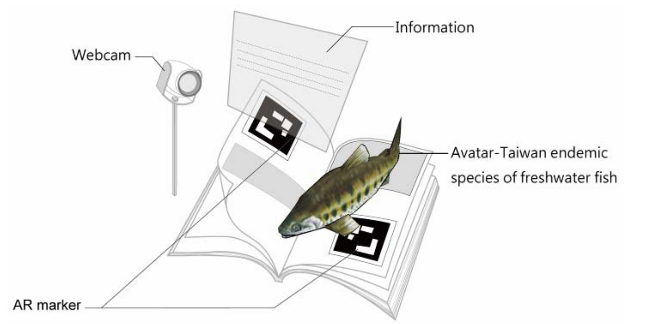

Figure 9: The sketch of Taiwan endemic species of freshwater fish in AR Book

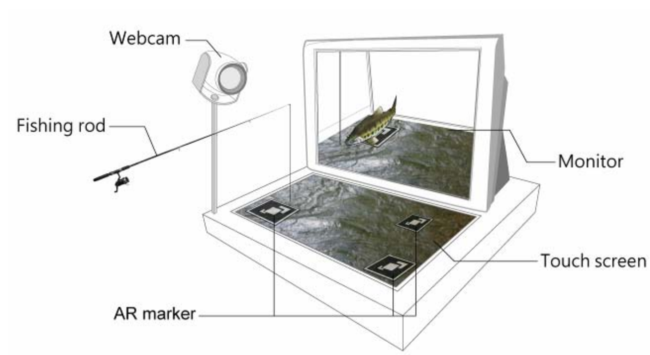

Figure 10: System installation

The peripheral hardware of the system operation includes webcam, monitor, fishing rod, and touch screen. The webcam is used to capture the marker of AR Book. The monitor is used to display the game scene. The fishing rod is used to angle hazards by learners. The touch screen shows virtual river, and there are hazards in it, the learner can interactive with it by fishing rod. There are two markers under the touch screen in order to locate avatars in the virtual river.

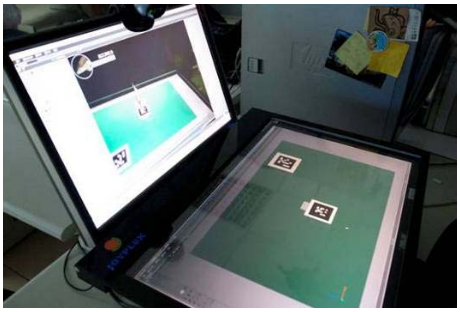

Figure 11: System presentation

Figure 12: System operation of the subject using fishing rod

System Evaluation

In the part of system evaluation, it mainly evaluated the system usability from the end users perspectives. We utilized the well-known questionnaire System Usability Scale (SUS) to evaluate the system usability. The questionnaire is revised by experts with significant experiences in the related fields. A 5-point scale ranging from 1 as strongly disagree to 5 as strongly agree is used for the measurement. The revised version of the SUS questionnaire is in Table 1 (Brooke 1986, Tullis and Stetson 2004). The revision majorly focused on making SUS more suitable to system evaluation.

SUS is a questionnaire to evaluate users' subjective impressions about the system and their degrees of satisfaction. In the aspect of system usability evaluation, the SUS is an efficient, time-conserving, and labor-saving way of subjective assessment. At present, it is widely applied in the system usability. After users finishing answering the ten questions, the scale offers a formula which transfers the subjective impressions 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 (Brooke, 1986; Isman & Isbulan, 2010; Liu & Lin, 2010).

Table 1: SUS questionnaire

System Usability Scale
1. I think that I would like to use this system frequently
2. I found the system unnecessarily complex
3. I thought the system is easy to use
4. I think that I would need the support of a technical person to be able to use this system
5. I found the various functions in this system are well integrated
6. I thought there is too much inconsistency in this system
7. I would imagine that most people would learn to use this system very quickly
8. I found the system very cumbersome to use
9. I felt very confident using the system
10. I needed to learn a lot of things before I could get going with this system

Subjects finish operating the system and fill out the SUS questionnaire. Listed in table 2 are the "SUS scores" of the interface of the IARLS system. As summarized in Table 2, the mean SUS score is 78, the median is 66, the maximum is 89 and the minimum is 57. These scores indicate that the IARLS system is usable. We have interviews with these subjects on their ideas about IARLS after they finish operating the system and filling out the SUS questionnaire. Subjects said that this idea is very foresight. The system may be less than perfect and that is not too much learning effectiveness. Some of the learners themselves had been used relevant augmented reality system. The system could let people understand basic concept of conservation of fish in Taiwan and achieve learning by doing.

Table 2: SUS scores descriptive statistics

	N	Mean	Median	Min	Max	SD
Stat	33	78	66	57	89	11

Table 3: SUS Questionnaire and Statistics of Each Item

System Usability Scale	Mean	SD
1. I think that I would like to use this system frequently	3.37	0.72
2. I found the system unnecessarily complex	2.28	0.77
3. I thought the system is easy to use	3.81	0.48
4. I think that I would need the support of a technical person to be able to use this system	2.87	0.96
5. I found the various functions in this system are well integrated	3.42	0.72
6. I thought there is too much inconsistency in this system	2.64	0.75
7. I would imagine that most people would learn to use this system very quickly	3.52	0.56
8. I found the system very cumbersome to use	2.41	0.43
9. I felt very confident using the system	4.01	0.41
10. I needed to learn a lot of things before I could get going with this system	2.08	0.68

Beside the SUS score that shows the usability of IARLS, this survey in Table 3 reveals the following findings:

- The 9th item gains the highest mean. It indicates that most learners feel very confident while using the IARLS system.
- The next four with higher ranks are the 3rd, 7th, 5th, and 1st items. They showed that this system achieves good characteristics such as easy to use, quick to learn, well-integrated, and attractive to interact with.
- The standard deviation of 4th item is relatively high. It indicates that some learners are familiar with the AR system before attending the experiment, but some are not. Therefore, some needs technical supports, but some can interplay with the system totally by herself/himself.

Subjects give some comments for us that it will be able to enhance learning effectiveness for learners if the system of the fluency is more smoothly and more stable. And so, there are some reasons we must improve for system through analysis of SUS questionnaire as follows.

- The system is a little bit complicated: Subjects feel that the procedure to use the system is a little bit complicated. Subjects who operate system need taking AR Book and look at the teaching video at the same time. Then, subjects must pick up the fishing rod and play the game. Although it leads to a simple and interesting learning system, but the procedure is complicated.
- The system is not stable enough: The system is not perfect. Sometimes it causes crash occasionally during the operating procedure. If the system crashes, it must be restarted and so that the learners must re-learn again. For this reason, Subjects feel some trouble.
- Need the assistance of technical staff: Although subjects have taken information technology and e-learning courses, they have only a handful of contact with augmented reality. However, there are some subjects who do not know how to manipulate the system and AR Book. Thus, we will add the operation manual or instructions that users read it before they manipulate the system.

CONCLUSION

In this paper, we propose an augmented reality system with an interactive touch-screen technology in an innovative way on the learning of Taiwan endemic species fish. The environmental consciousness is popular currently. Therefore, this study aims to make people have a better understanding of Taiwan fish conservation issues. The system is well designed and evaluated via SUS survey and interview. The evaluation shows that IARLS promising.

Based on the above two evaluations including questionnaires and interviews, the evaluation results show that this system achieved positive usability, the learners enjoy the interaction with the developed system, and most significantly, such kinds of AR systems are acceptable. Listed below are some results and findings after the evaluation.

- The AR interfaces of IARLS system are easy to use and not complex.
- This system is easy to learn and instructive to derive imagination. Moreover, the learners didn't need the support of a technician to help me use this system.

- The learners are willing to explore the systems, and gain more comprehension via the AR interface.
- The system and the AR interface are well integrated.
- The interface is very user-friendly and made learners feel confident.)
- The learners would like to interact with this system, and think that the AR interaction is quite attractive.
- The learners feel quite excited when facing the AR interface. Therefore, they feel emotionally fulfilled, mentally satisfied, and have good feelings when interplaying with the ARt-based interface.
- In sum, the learners feel the AR interface of IARLS is usable. (the mean of SUS score is quite high: 78)

The results of experimental evaluation of the questionnaire and interview reveal that the learners think that the interface is very interesting and novel which they have never touched before. It means that the learners accept this kind of interactive interface. Anyway, there are still some directions for improving the system. In the future, we will continually revise this work based on the feedbacks of subjects, and perform expert evaluation on the system.

ACKNOWLEDGEMENTS
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EVALUATION OF EDUCATIONAL TELEVISION PROGRAMS FOR DISTANCE LEARNING

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ABSTRACT
This study was conducted to evaluate the effectiveness of educational television programs in distance learning system. Using the procedure of survey method, this study finds out the worth of educational television programs. Its results are based on the responses of the learners of distance teaching system. The views of students were collected by using a questionnaire prepared by researcher because no standardized tool for the purpose of study was available. Questionnaire was developed by reviewing related literature on topic of study that was improved in light of the views of experts. Content validity and face validity of questionnaire was further determined by expert opinion. Results of the study indicated, ETV programs were very useful for students & majority of students get benefit of it. Therefore, there were some problems as well. In the light of the results of this study it was also found that majority of students don't get the broadcasts schedule of ETV programs because of which they miss the ETV programs & approximately half of the students who view the program cannot note down the important features of program because of slow writing speed and non availability of recording facilities.
Keywords: ETV Programs, Distance learning, Distance Education, Education.

INTRODUCTION

Distance education system almost all around the world has same structure of guiding students. In distance education student centered learning is soul of the program that demands a learner to work independently. But, educationists are also agreed as according to the code of student centered learning techniques that some advance educational guidance for students is necessary to achieve the better results. Assignments and examinations are also integral parts of this system that demands to provide some type of activity where a student must be able to get regular lecture by expert teacher to understand the lessons. Regular lecturing facility for distance learners is only possible in scheduled workshops at study centers only. Many distance learners are also working people who cannot leave their jobs and places for contacting teachers in institutions on regular basis. In the situation, media play vital role in providing educational assistance to learners where no other regular interaction between teacher and student is possible. ETV, from broadcast media is an important source that is used in many countries to telecast the educational lessons for distance learners. AIOU is also using this media for teaching many courses of different levels in Pakistan. Different users criticize ETV programs of distance learning programs in Pakistan. This study aims to evaluate these programs to find out the effectiveness of these programs for distance learners as well as to point out the problems of learners to prepare guidelines for better planning and implementation in the field of distance education in future.

RELATED LITERATURE

Distance Teaching is a recent international movement as compared to other modes of education. It has manifested itself in different nations according to their own cultural, political & economical factors. Distance Teaching comprise any organized educational activity for school dropouts, for rural & urban adults, for young men & women, for industrial & official workers aimed at improving their knowledge, employment or earning potential or giving them general education. Isman & others (2003:12) views "Distance education provides participants flexibility by enhancing productivity of learning and teaching." Infect, Distance Teaching learning system is one of the most popular methods in Pakistan. It is considered useful for Pakistan as well as for the other countries.

AIOU was pioneer of distance learning in Pakistan but keeping in view the benefits of the system now formal universities are also turning towards the mode. Many universities are offering distance education courses along with the formal system in Pakistan because it is more convenient, suitable, economic and feasible for developing societies. It make possible for adults and those who are not able to continue their regular studies because of different reasons. "Distance education is a system that is not bound to age, place, cast and any other differentiation that is related to social structure and social classes". (Jajja, 2007: 84). Distance education is defined as "a field of education that focuses on teaching methods and technology with the aim of delivering teaching, often on an individual basis, to students who are not physically present in a traditional educational setting such as a classroom" (Harrry,K. &Khan,K. (2000).. Honeyman & Miller (1993: 24) explains distance education as “"a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both." It is flexible system of education for those who are not able to attend the educational institutions on regular basis due to different reasons. It is especially valuable for the working people who cannot leave their jobs and want to improve their education. “Modern Distance education system was firstly started from UK but is very popular now a day all around the world due to its flexibility in rules for learners”(Moore, Michael & Greg , 2005: 82). Different universities in the world are working adopting the system of distance education. In Pakistan that is a developing country and not able to provide education to all at the doors, distance education system of AIOU is playing vital role in providing facility of education to all in almost all areas of Pakistan. Allama Iqbal Open University (AIOU) is a charted university in Pakistan. It was established in 1974. It is the pioneer in non-formal and distance education in Pakistan and second Open University of the world. Now AIOU is among the list of Mega Universities of the world and provides an opportunity to working people to enhance their qualification without giving up their jobs or place of living. AIOU is running programs of all levels (certificate courses to PhD Degrees). AIOU is utilizing all possible media for instruction including; correspondence materials, Radio and TV, Satellite Transmission, Online Teaching, Non-broadcast media, Tutorial instruction and Group training workshops etc.

Education process in distance education as well as in formal system is a communication process. In formal education system, each learner and teacher/educator has a regular face to face link with each other but distance education system lacks in regular face to face connection. The communication in distance education system is based on use of different types of Medias. A variety of media such as radio, television, computer and Internet etc are being used as a part of learning material by many Open and Distance Learning (ODL) institutions. (Kulandai, s., 2002).

İsman and others (2003:12) by coding Kinross (2000) explained “technology breaks down all barriers by facilitating easier use of knowledge and creating common place for everyone. It is also reflected that technology become representative which creates home schooling rather than unique learning under the dimension of flexibility.”

As keeping in view the effects of different types of Medias in education process; it is clear that modern communication Medias should be used in recent years. Television has significant role in communication process of distance education as well as has proved effective media of learning not only for informal education but also for formal and non formal education.

Role of television in distance education is prominent. Most of the educational content is conveyed to learners through media e.g. print, television, radio etc. But “Television play role to deliver lessons to distance learners who has no regular interaction with a formal teacher in preparation of assessment”. Chute, Thompson, and Hancock, 2009:24). Like other countries, television is an important component of Distance learning in Pakistan too. It is considered one of the most versatile A/V aids ever developed. It is an effective & interesting medium of education for largest possible number of people. ETV is capable of creating interest & motivation in both children & adults.

Television is an audio visual media. It is interesting for all age people. Various Educationists recommend the use of television for educational process too. Künüçen, Kaya, Mirici, Künüçen & Öztürk (2003: 20) have recommended the use of audio visual Medias in learning process for effective education of learners. They view, “Audio-visual activities take an important part in the learning process. Eyes and ears are sense organs that are responsible for important functions. Information that has been received through eyes and ears enables man to have certain thoughts, feelings and impressions. Hence, it is safe to assume that sight and sound have important role in learning about the world, as well as perceiving, comprehending and commenting.”

ETV is capable of creating interest and motivation in both children and adults (Mohanty, 1986:85). ETV is defined as “Educational Television” (Webster’s new world college dictionary). When television is used for educational purposes, it is called educational television. ETV Program means the Television Program prepared for education of a lesson. In broader view, ETV denotes any television used for education of community. It is a persuasive & effective medium for educating largest possible number of people. It is capable of creating interest & motivation in both children & adults & has become a major instrument of education as well as significant component of distance education learning & alternative system for various categories of learners. Rao (2010) highlights some of the unique characteristics of educational television. He reports "Fixed schedules, scarcity of time, ephemeral, continuous, holistic, aimed at average target viewers & rich in meaning are some salient features of broadcasts television." (P-14). In modern society of today where technology has affected all fields, field of teaching and learning has also got benefits. “Different Medias are used in education. Use of satellite and telecommunications is a new trend that has helped to improve instructional system in Distance education much more". (Western Cooperative for Educational Telecommunications (1999: 12). So, trend of distance education is also growing day by day in all societies. But on the other hand television is still used because of different reasons. "One most important reason for this is the availability of Television in almost all corners of the world today". Khawaja (2008: 28). Television that is a source of entertainment and source of information is also available to different corners in Pakistan. Distance education in Pakistan is also using it for teaching purposes of its registered learners for different programs.

TV graphically brings happenings right into living rooms, complete with color, sound, time sequences, and even to some degree, the associated "feelings. So, Effective use of ETV can make learning process easy & interesting for learners. With the help of ETV program, a learner can learn about a topic with in a fixed time. During a program, ETV teacher tries to teach in such a way that he tries to explain most important topics within a limited time. It has been observed that, ETV Programs are not retrievable for learners, so they attend lectures attentively.

Keeping in view the best results of the use of ETV in teaching learning process, Allama Iqbal Open University, Pakistan working for providing education & training to the people of Pakistan not only facilitates its students through correspondence courses, tutorials, workshops, laboratories, but also with television, radio broadcasts & other communication medias. PTV initiated educational programs in 1973 in Pakistan. AIOU offers a number of ETV programs on PTV 2. Rashid (1998, 68) views, Pakistan Television initiated educational programs in 1973. AIOU also uses this medium for its mass education programs. The medium has however been excluded for the time being from some courses because of its high cost and having lesser coverage than radio. AIOU offers ETV programs of different levels. Schedule booklets of programs are posted to students in advance so that they may prepare themselves for the lesson broadcast on television.

Distance learners like formal learners face problems in different areas. A study report , analyzing students' learning problems indicated, distance learners remain mostly weak in achievement as compared to formal system learners because of weak/ no coordination with teachers on regular basis. In formal education system, teacher student relationship is strong. Students learn with the help and assistance of teachers. Distance education system lacks in the area" (Khalid, 2010: 126). Another study on, how to improve students' learning indicated, quality of education system basis on quality of its teaching services. In distance education system, where teacher student interaction is weak, use of communication technologies can improve the gaps. Distance learners cannot attend lectures of teachers in a regular classroom throughout the sessions but facility of lecture can be provided to students at home by using satellite, broadcasting systems etc (Noreen, 2005: 56). By comparing use of different communication technologies for distance education, use of Television and Radio is considered most important. Radio and television both can facilitate the distance learners scattered in wide range of area. Use of ETV in distance education is more effective than radio because radio is only an audio media but television is an audio visual medium of communication technology. Keeping in view the uses of ETV programs, AIOU is using this in many courses. Programs for different level courses are broadcasted on television. It is helping learners not only to provide facilities of lecture by teacher at home or on workplaces but is highly costly for the institutions. But the question is whether ETV programs are playing role for achievement of its purpose? What problems students face while getting benefits of ETV programs? The answers of the questions are important because many people related to education discuss these. Moreover, Distance Learners also have been found criticizing ETV programs in general discussions too.

STATEMENT OF PROBLEM

Literature studied on use of educational television programs (ETV Programs) for distance learners helped to point out the significance of ETV programs for distance learners. Study of related literature on the topic, general observations and informal discussions with distance learners helped to decide that a study about the evaluation of ETV programs for distance learners should be conducted. So, under study research was conducted. The topic of study was selected as "Evaluation of educational television programs for distance learners". The study on topic was necessary to point out the problems of distance learners related to ETV programs that could be helpful for distance learning institutions to improve the area in future. Moreover, best efforts of distance education institution, using, ETV programs to facilitate its learners in Pakistan could be appreciated because the study aimed to evaluate the effectiveness of ETV program of AIOU, Pakistan too. In addition, the study aimed to get answers of following research questions

1. Are ETV programs effective for distance learners?
2. What are views if distance learners about the effectiveness of ETV programs of AIOU, Pakistan?
3. What are problems of distance learners related to getting benefits from ETV Programs in learning process?

OBJECTIVES OF STUDY

Objectives of this study were as followings.

1. To investigate the views of distance learners towards ETV programs in Pakistan.
2. To evaluate the effectiveness of ETV programs telecasted for distance learners in Pakistan.
3. To find out the problems of distance learners in getting benefits from ETV programs.
4. To give suggestions for the improvement of ETV programs of AIOU.

SIGNIFICANCE OF STUDY

Use of ETV Programs for distance learners is important because face to face teacher student interaction is very poor. Only correspondence materials, tutorial meetings, workshops arranged by distance education institutions provide chances of learning to students for preparation of examinations. Effective use of ETV Programs can provide additional help to learners to prepare course assignments and do preparation for examinations. No doubt, ETV Programs are a part of many courses of distance learning but like all other areas of teaching learning system, this component also have some problems. So, the study is very helpful for distance learning institutions who are offering ETV Programs as a part of teaching learning process. Moreover, following points also indicates and explain the importance of this study.

1. It evaluates the views of Distance Learners about ETV Programs.
2. It helps to find out advantages of ETV programs for distance learners.
3. It helps to evaluate the effectiveness of ETV programs telecast in Pakistan
4. It helps to identify the limitations of ETV programs telecast by television channels in Pakistan
5. It can be helpful for to improve the quality of ETV programs.

METHODOLOGY

This study was conducted by following the case study method that is a technique of descriptive research methods. Population of study was consisted on the students of distance learning in Pakistan who were ever enrolled in any course where ETV programs were used as a part of instruction of courses. Only AIOU, Pakistan was using ETV Programs in different courses of distance education in Pakistan. 250 students from the list were selected. They were approached by sending questionnaire with a covering letter of request to answer the questions asked. Only 193 students answered and mailed the letters with filled questionnaire back. So, only these 193 questionnaires were used for data analysis. For data analysis, collected data from respondents about analysis of use of ETV Programs for distance learners was firstly converted to quantitative form and then analyzed simply by applying the method of computing percentages by using the SPSS program on computer.

RESEARCH FINDINGS

ETV programs are no doubt very effective for distance learners in studies and preparation of assignments and examinations. The distance education institutes spend lot of money and energy for broadcasting of ETV programs. AIOU is also ignoring to work in the area and providing the facility to its students.Evaluation of ETV programs through the survey and analysis of responses of 193 distance learners some answers related to research questions of the study revealed following results.

ETV programs are effective for distance learners of AIOU. Majority (92%) of distance learners are aware about the ETV programs. Many (58%) of distance learners who watch ETV programs of AIOU are in view that programs are interesting. In view of majority (62%) of distance learners, ETV programs of AIOU increase their knowledge. For many (55%) distance learners, ETV programs are very helpful for preparation of course assignments and examinations. ETV programs of AIOU are effective for learners of formal education system too as well as students of distance education system in learning process. In view of majority (60%) of respondents, teachers deliver ETV lecture with full preparation. In view of many (56%), teachers also explain contents well about the lessons with good examples. Majority (89%) of distance learners contacts their tutors to discuss further points but most of them (67%) contact during the workshops.

About the attitude of distance learners related to ETV programs of AIOU, many (58%) of them who receive the schedule of ETV Programs do not watch these programs. Moreover, Distance learners who watch ETV programs are not aware about the theme and procedure to get more benefits from ETV programs in learning process. Many (78%) learners watch programs without studying course unit related to the lesson of program before watching the programs. Some (43%) distance learners are also not satisfied with teaching technique of teachers who are recorded in programs.

About the problems of distance learners related to ETV programs, most (66%) of respondents reported that distance learners do not receive the schedule of ETV programs on time. ETV programs cannot be recorded by many (75%) of distance learners due to lacking the facility of recording. Many times (in view of 52%) students cannot watch ETV programs because of technical faults of recording and broadcasting. some (42%) distance learners reported that duration of ETV program are not sufficient to fulfill their learning needs.

DISCUSSION AND CONCLUSIONS

ETV program are best medium of communication used in distance education system. It is popular media used in distance teaching system in all around the world. Role of television in distance education is prominent. "Television play role to deliver lessons to distance learners who has no regular interaction with a formal teacher in preparation of assessment". Chute, Thompson, and Hancock, 2009:24). Like other countries, television is an important component of Distance learning in Pakistan too. It is considered one of the most versatile A/V aids ever developed. It is an effective & interesting medium of education for largest possible number of people. ETV is capable of creating interest & motivation in both children & adults.

Keeping in view the effective use of ETV programs, television broadcasting is used as a major instrument of education not only in Distance learning but also in alternative systems for various categories of learners. Allama Iqbal Open University, the oldest distance-teaching institute has regarded ETV as an integral part of the whole teaching learning process form years. Pakistan television initiated educational programs in 1973. AIOU also uses this medium for its mass education programs. This medium has however been excluded for the time being from some courses because of its high cost & having lesser coverage than radio. ETV programs are considered important in Distance learning because contact between learner & tutor is not regular. Moreover, regular teaching is arranged occasionally but students have to complete their assignments for continuous assessment before they have to study all course books within duration without the help of a teacher. ETV helps students living in remote areas, having no peer guidance, no teacher's guidance but doing effort to upgrade or fresh his knowledge because of urge to become a useful citizen has acceptable & respectable level of education.

In general, Television is a source of entertainment for everyone. Videos are source of information as well as best source of learning too. Educational videos make learning easier for every age student by adding picture with sound and actions. Ozkan (2002:39) reported "The use of video cases in education has grown very quickly in recent years." ETV is a source to present educational lessons to distance learners through electronic broadcasting media. ETV programs play their role as teacher for the students who are studying in distance learning system. So these programmers should be good, well prepared & well organized & helpful for students. On the other hand students should watch these programmers with positive attitude. The study is interesting and valuable in the sense that it has pointed out some valuable points related to distance learners and ETV programs.

The finding of this study has pointed out the positive attitude of distance learners only to some extent toward ETV programs. Best way to get benefit from ETV programs for learners is to be pre-time well informed about schedule of program. So that students may read course unit before watching a program. But unfortunately, according to findings of study most of students don't read course unit before watching program & nor all learners receive schedule of ETV programs (some time not on time & sometimes never).

The study pointed out that many distance learners don't watch ETV programs because of some reasons. For example, sometimes they don't know the value of ETV programs. Sometimes if they watch program, they don't find it interesting or relevant with their exams. Sometimes they don't watch program because they are not informed about the schedule. Sometimes students receive schedule, but it doesn't match with the schedule of a working student. Sometimes student doesn't get benefit of program because of technical faults in recording or in transmission. This study has supported that best way to get benefit from ETV programs for learners is be pre-time well informed about schedule of program. So that students may read course unit before watching a program but unfortunately, according to findings of this study most of students don't read course unit before watching program and nor all learners receive schedule of programs (sometime not on time and sometimes never).

Most of studies & experts of distance & Non-formal teaching systems, advocate about the effectiveness of ETV programs. ETV Programs help to increase the knowledge of distance learners about a lesson. Students of distance learning system mostly don't have the guidance of their teachers but have to do lot of work for passing their exams. They prepare assignments assigned by their departments for continuous assessment. Moreover, they also prepare different topics for their courses about exams. On the other hand it is a reality that most of distant learners are working people and have no eye contact with their tutors for the most of time during a semester programs. This study has pointed out effectiveness of ETV programs prepared by AIOU. These programs are helping distance learners of this university in increasing knowledge and preparation of assignments for continuous assessment. This means ETV programs are helping distance learners for preparation of final exams.
Selection of teachers for ETV programs is an important task. A good classroom teacher is not necessarily a good

TV teacher. Art of successful TV teaching is a different task that requires no small degree of talent for the task. Teaching with some response from students is quite different from teaching in a studio atmosphere. According to findings of this study, Selection of teachers for teaching in ETV programs has been proved good in a way that majority of students are getting help from these teachers because they teach well & come having good preparation. They explain lesson with good examples.

For effective use of ETV programs for distance learners, recording of program should be good. Teaching at T.V. is not an easy task & on the other hand recording of an educational activity is also a good art. Only a tactful teacher & presence of well-trained technical staff for recording is must for a good recording. The study has pointed out some weak areas of AIOU, ETV programs in recording and broadcasting areas.

In the light of findings of this study, ETV programs of AIOU are not poor in sense of teachers teaching. Perhaps organizers of the ETV programs have good talent of teachers having studio atmosphere for teaching. Hence, sometimes programs bear some technical faults of recording. This study has indicated some technical faults of ETV programs also. As for example voice on TV is not found clear sometimes students cannot catch some scenes because process goes through quickly and teachers also speak fluently. So, a student wishing to write important points of lessons cannot write. For the best results special attention should be given to the technical aspects of recording.

For best results ETV programs can be helpful for students only if they not only watch programs but also to write key points of lesson or try to record the program for future use if they have recording facility. This research has proved that students mostly have no facility of recording. Because of poor writing speed, they also cannot write important points of a lesson. This weak point of students can spoil the effectiveness of this media. So, students should try to improve their writing speed to get benefit from these programs.

RECOMMENDATIONS

The study as result of analyzing the views of distance learners and literature review on the topic, propose some recommendations for distance learners, teachers delivering lessons on ETV as well as distance learning institutions. The recommendations are as followings.

1. All students of distance learning should watch ETV programs with interest without missing any one related to their course. Moreover, they should study course unit before watching lesson on Television.
2. Students should try to write down key points of lesson during the lesson & for this purpose they should try to improve their writing speed & art of noting a lesson.
3. Teachers delivering lessons on T.V. should speak slowly & try to repeat main points. This will help students to note key pints of lesson.
4. Programs should be repeated more than one. Re telecast of program should be on the demand of students & at night times so that maximum students may get benefit of these programs.
5. Recording of program should be available to distance learners in other forms like as CDs in study centers. Students should be shown recording of a program during workshops at study centers too.
6. Broadcasting schedule should be sent to students on time. Moreover, schedule of daily programs can be provided to students at the time of admission along with the study material.
7. Broadcasting schedule of each ETV program should always be published in some daily papers.

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ICT TRAINING COURSES FOR TEACHER PROFESSIONAL DEVELOPMENT IN JORDAN

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ABSTRACT

Information and Communication Technology (ICT) is increasingly having pervasive role and presence in the educational milieu as it continues to shape all aspects of our lives. Numerous reform projects have been in place aiming to infuse ICT across education systems. Teachers are widely believed to be the key agents of any educational change. Accordingly, the Jordanian Ministry of Education adopted several ICT training courses aiming to prepare teachers to integrate ICT effectively across the curriculum. The current study focuses on the conduct and effectiveness of ICT training courses within the Jordanian education system. Interviews, questionnaires, direct classroom observations, and field-notes of classroom practices were used for data collection. The findings suggest that ICT professional development courses for teacher were helping them to improve their ICT skills and knowledge. However, other finding highlighted problems regarding the conduct and the nature of these courses including timing and modes of training, follow-up, teacher's belief, school culture, workload, and motivation, appeared to impact the effectiveness of training courses.

INTRODUCTION

Schools, as all other social institutions, are rapidly embracing information and communication technologies (ICT). Globalization and the knowledge-based economy are leaving no choices for education systems worldwide but to adopt ICT and weave it into their educational milieus, and the Jordanian education system is no exception. The system has adopted several ICT-related education initiatives aiming to reform the system towards the knowledge-based economy.

In recent years, ICT-related Initiatives are adopted and implemented by education systems with greater appreciation of their complexity. A major aspect of the complexity involved with ICT integration into education systems is based on the many factors involved with it including factors associated with the human side of the integration (e.g. teachers, on-going support, trainers, and headmasters) and the technological side of it (e.g. access to computers, technical support, and the e-materials). During the early attempts of integrating computers into education systems the technology itself was overemphasised at the cost of the human side. These attempts were based on the assumption that technology can revolutionise education and therefore, resources and efforts were diverted to providing schools with computers and other technologies. During that stage, technology was conceived as an end in itself, which resulted in computers being distributed to schools with little thought given to their best use (Richardson, 2005; Veen, 1993). However, the early attempts were doomed to failure as it became clear that technology could not improve educational practices and outcomes by itself. Therefore, a shift in the focus occurred towards other supporting factors to the successful integration of ICT across education systems.

The failure of the early attempts to revolutionise education through the infusion of computers shifted the attention considerably to teachers. Accordingly, teacher-related issues are discussed as integral components to any successful educational intervention and therefore have gained extensive research and debate (Cochran-Smith, 2004; Doyle & Ponder, 1977; Fullan, 1993; Gillingham & Topper, 1999; Sarbib, 2002; Townsend & Bates, 2007). For instance, Veen (1993) asserts that teachers' beliefs about content and the pedagogy, along with their overall competence, far overweigh any other factors in respect of their adoption of ICT, including technical support provided by schools, and principals' support of ICT integration. Other studies have confirmed that teacher factors such as competence, attitude and time, are of a greater significance than factors associated with hardware (Farenga & Joyce, 2001; Means, 1994; Veen, 1993). Hence, preparing teachers to utilize ICT across the curriculum is paramount to any successful ICT-related initiative.

Teacher training courses, both pre and in-service, can help teachers who are tentative to move faster and adopt technology while they show the more enthusiastic teachers new ways in implementing ICT into their profession. Thus, the Jordanian education system has adopted several ICT training courses aiming to improve their use of ICT in the classroom, including: International Computer Driving License (ICDL), Intel Teach to the Future, World Links, iEARN and CADER. The courses aimed to improve teachers' ICT proficiency at three levels: ICT skills, pedagogical skills, and curriculum training (Alutaibi, 2003). The ICDL course focused on improving teachers' ICT skills, including word-processing, spreadsheets, and surfing the Internet. On the other hand the

Intel Teach to the Future program aimed to train teachers and students to use technology effectively in the classroom (Intel Corporation, 2005; Ministry of Education, 2002) and World Links focused on preparing students, teachers and the educational system to enter the information age through providing schools and teachers with skills and educational resources to harness ICT (World Links, 2002). In addition, CADER was offering a Higher Education Diploma in ICT, which specializes in training teachers to use modern pedagogies and integrate them with ICT. While iEARN course had been adopted early in 2004, it was then discarded during the early stage of its implementation, as it appeared to focus only on the student side of the education system.

However, improving teachers' integration of ICT in teaching has proved to be not a straightforward task to be carried by the education system. The literature has identified several factors which can impact the effectiveness of ICT training courses when assigned for teachers including: individual differences among teachers, school culture and teacher interaction, and follow-up and ongoing support provided to teachers when they try to implement their newly developed skills.

Individual differences among teachers: ICT professional development courses should consider the fact that teachers are widely divergent regarding their knowledge about ICT (Bradshaw, 2002; Galanouli, Murphy, & Gardner, 2004; Gilmore, 1995; Rosen & Weil, 1994). Such consideration can prevent programs from being frustrating for teachers with little or no experience in using ICT, and at the same time they avoid being disappointing for other teachers with better ICT knowledge and skills.

School culture and teacher interaction: Apparently, the self-contained culture of schools is not aligned with the emerging aspects and skills of the knowledge-based economy such as collaboration, teamwork and communication. Increasingly, the world is more dynamic and in such an environment neither teachers nor schools can perform effectively in their traditional isolation. According to Fiszer (2004) "isolation is the enemy of improvement when the practitioner must be ready to meet constantly changing student needs" (p.16). Moreover, the literature stresses the need for teachers to share experiences with each other in order to best learn how to integrate ICT in pedagogy. As Lewis (1998) puts it, schools have the potential to be learning places for teachers too, providing that the culture of schools is reshaped to facilitate this.

Follow-up and ongoing support: Pre-service education is not sufficient for teachers to be able to handle their job for the rest of their lives; rather, they require ongoing professional development and support. In the information age, where innovations are constantly introduced and change is happening rapidly, the demand for ongoing professional development is in high priority (World Bank, 2002). Furthermore, it might be relatively straightforward to present professional development programs, but a greater challenge arises when teachers try to implement what they learn in real classrooms. Anderson (1997) suggests that teachers might abandon new practices while they are in the early stages of implementation because of lack of assistance. This is, according to Fiszer (2004), because teachers might see their newly developed skills and knowledge as "incompatible" with the everyday teaching/learning situations that they face. Therefore, Bradshaw (2002) found that in order to maximize the return of the investment in staff development, significant resources need to be redirected to follow-up activities. In addition, she warns that without follow-up and coaching, any staff development would not impact on more than 5-10 percent of participants' practice.

These issues, among others, need to be taken into account in order to ensure the positive impact of ICT training courses on classroom practices. As part of the appreciation of the importance of issues identified in the literature while staying attentive to issues might arise from the current investigation within the Jordanian context.

BACKGROUND TO THE RESEARCH

The sound value of this study stems from shedding light on an issue that is of great interest to countries that adopt ICT training courses to improve their teachers' performance for the information age. As a developing country in the Middle East and North Africa region, Jordan is striving to improve its education system for the knowledge era. ICT professional development courses are integral to improve educational practices as they empower teachers with knowledge and skills required for integrating ICT in the classroom. Such moves and actions need to be guided with research. The Jordanian education practices need sound and grounded research to guide decisions and strategies. Thus, the current study can provide a clear picture for decision makers, and other research, of issues associated with ICT training courses in Jordan.

The primary purpose of this study was to explore Jordanian teachers' experiences with ICT training courses adopted by the Ministry of Education. Large expenditure and great efforts were dedicated by the Jordanian education system to updating itself in order to become more 'compatible' with the knowledge-based economy. Furthermore, the heavy reliance on external aid in order to initiate and implement education reform projects requires extra and careful planning for such projects. The efforts need to be aligned with clear vision into what is aimed for and how it is achieved. It is well documented that ICT-related initiatives in Jordan lack scholarly investigations to guide them (Alomari, 2009); rather, they rely on official reports which usually portray patches of success within educational initiatives. The main focus of the study was to answer the question "what influences the effectiveness of ICT training courses adopted by the Jordanian education system?"

More specifically, the present study tries to answer the following research questions:

1. What kind of ICT professional development is available for Jordanian teachers?
2. What issues influence the effectiveness of ICT training courses for teachers?

Research Design: The current study utilized a mixed methods approach in order to investigate Jordanian teacher preparation to use ICT to support teaching and learning. The combination of both questionnaires and case studies were found to be adequate for the investigation. The purpose of gathering different types of data is to understand "more fully, to generate deeper and broader insight, to develop important knowledge claims that respect a wider range of interests and perspectives" (Greene & Caracelli, 1997, p.7). In this way, a phenomenon can be studied from different perspectives and a variety of information can be collected which strengthen the investigation (Creswell, 2003; Greene & Caracelli, 1997; Mark, Feller, & Button, 1997; Sandelowski, 2000; Tashakkori & Teddlie, 1998). Sandelowski (2000) states that this aspect of mixed-method inquiry is a significant advantage for researchers because it can "expand the scope of, and deepen their insight from, their studies" (p.246) which can reflect upon better understanding and more warranted defensible claims (Brewer & Hunter, 1989; Mark, et al., 1997).

This study employed an Explanatory Sequential Design (Creswell, 2003; Creswell & Clark, 2007) to collect, analyze, interpret and report data (Greene & Caracelli, 1997). This approach starts with quantitative data collection and analysis and is followed by qualitative inquiry. However, the overall enquiry remains predominantly qualitative (Figure 1). Therefore, the present study is seen to be interpretive, that is, although initial design included both quantitative and qualitative approaches, the quantitative part has developed into the qualitative one.

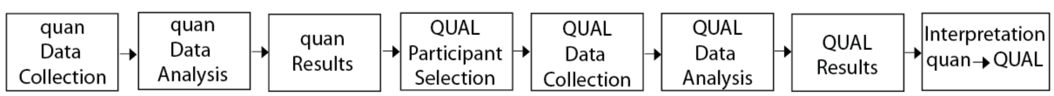

Figure 1: The Explanatory Design (Creswell & Clark, 2007, p.73)

The study was carried our over an extended period of time between August 2004 and October 2008. Twelve schools were selected through stratification from the three regions of Jordan: Northern, Central, and Southern regions. The stratification enabled the study to target particular schools and clusters of schools where ICT integration and training were active. Participating schools were carefully selected from both rural and urban areas as well as boys and girls schools from each region. Nevertheless, the study was predominantly qualitative. The qualitative approach has been deemed appropriate for the in-depth investigations requested in the present study because by its nature, it allows the researcher to develop understanding of the meaning or nature of others' experiences (Strauss & Corbin, 1998; Windschitl, 1998). It facilitates substantive exploration into a novel learning environment about which little is known, which was the case of teachers' experiences and utilization of ICT training courses adopted by the Jordanian Ministry of Education. In addition, it enables the experiences of participants to be portrayed, and a detailed account of the context to be taken into account. The qualitative approach enabled this study to uncover intricate details by allowing an account to emerge which was descriptive and comprehensive (Best & Kahn, 1986; Merriam, 1998), and which was "grounded" (Patton, 1980, p.41) in the real experiences of the two participating schools during their integration of ICT.

Population and sample of the study: A total of 120 teachers, 10 teachers from each of the 12 schools, were handed teachers' questionnaire. One hundred and fifteen teachers completed the questionnaire as well as the 12 principals of the participating schools. The main criterion for selecting teachers from each school was their participation in ICT professional development courses provided by the Ministry of Education.

Early contacts and investigations through mentors, principals, teachers and documents obtained from the Ministry revealed that thirteen schools from the Central Region had received equipment and ICT professional development courses as part of the Discovery Schools initiative. A hundred Discovery Schools were selected in Amman by the Ministry of Education in order to pilot and steer ICT integration across the Jordanian educational system. Thus, the Discovery Schools were at the forefront of ICT integration as they were meant to showcase best practices in ICT, and therefore, they were receiving extra attention from the education system through infrastructure and professional support. Four Discovery Schools from the Central Region participated in Phase (1) of the study. Two of these four schools were selected for in-depth investigation. The following criteria were employed for selecting the two schools:

- Participation in ICT training courses provided by the Ministry of Education;
- ICT resources and infrastructure;
- School administration's support for ICT implementation;
- Teachers' utilization of ICT in teaching;
- Positive attitudes towards ICT on the part of teachers and principals; and
- School's willingness to participate in the study.

The two schools, Fajr and Noor, were selected as they reported having optimal conditions for ICT integration in Jordan compared with other schools, which allowed them to serve as 'critical cases' within the educational system. Two teachers were selected from each of the two schools: a mathematics teacher and another science teacher because these subjects had been digitized and had supporting electronic materials. Mathematics curricula had been digitized for all grades (1-12) and science curricula had been the second to follow.

Research instruments: A variety of data gathering instruments were utilized in order to investigate the research questions. Questionnaires, interviews, and observations were used to collect data. The study comprised two phases: Phase (1), in which the researcher administered two questionnaires: Questionnaire (1) was directed to teachers in the twelve selected schools and consisted of (31) items and Questionnaire (2) was directed to the principals in the twelve schools. In addition, nine face-to-face interviews were conducted in the two schools in the participants' native language (Arabic language). According to Stake (1995), "the interview is the main road to multiple realities" (p.64), therefore, interviews are used in qualitative research to obtain data from different sources to provide different perspective at the issue of concern. Thus, teachers were interviewed for approximately 45 minutes in order to explore their experiences with, understanding of, and expectations from ICT training courses. Moreover, considering the crucial role of principals in ICT integration at the school level, the principals of the two schools were interviewed for approximately half an hour to 45 minutes. The interviews were semi-structured in nature in order to guide the discussion without being limiting. In addition, lesson observations were carried out. This technique is highly valuable for data collection in qualitative inquiry, which requires researchers to 'be there' in the real context of the research offering "dynamic 'slices' of classrooms" (Forman, 2005, p.109).

A pilot study was carried out in order to check the clarity, instruction and layout of the questionnaires. Twelve participants who had undertaken at least one ICT training course were involved in piloting the study and their responses helped in reshaping the questionnaires. It became clear that the open-ended items were generally left unanswered, which led to re-formatting the open ended items to become clearly structured, easier, and faster to complete. In addition, one item required re-wording in order to eliminate ambiguity. Furthermore, for the interviews and observations, the researcher did member checks by sharing findings with some participants who were willing to participate in this process and asking for their comments on that.

Triangulation of data: In the current study, triangulation was achieved in three ways: type of data, data sources, and data analysis. Firstly, triangulation was sought through the kind of data collected. That is, data collected in each phase of the study, Phase (1) and Phase (2), triangulated each other. In Phase (1), data were collected through two questionnaires distributed to teachers and principals. Phase (2) provided chances to ask participants to expand and clarify some answers had been provided to the questionnaires in Phase (1), especially in respect of questions that revealed misinterpretation by participants. Secondly, triangulation was sought through a diversity of data sources including data collected from teachers and principals in schools, as well as other stakeholders and officials from the regional directorates of education and the Ministry.
Thirdly, triangulation was sought during the analysis and discussion of the data. On one hand, findings were compared and interrogated within the research itself, the finding from the two phases, and on the other hand with other findings from previous studies. In addition, some of the findings were shared with some participants in order to benefit from their perspectives on the data.

Data analysis: For the two questionnaires, there were two stages of analysis. The first was a preliminary analysis of the two questionnaires during the data collection in Phase (1) in order to guide the selection of two schools and teachers for Phase (2). The second stage of analyzing the questionnaires included comparisons of results between schools and the three regions of Jordan. However, simple descriptive frequency tabulation was the main means for analyzing the two questionnaires.

For the qualitative phase, it was crucial to identify the unit of analysis. Brewer and Hunter (1989) define units of analysis as "those entities *about* which we collect data and about which we want to generalize or make inferences" (p. 109, italic in source) and therefore, they define what the case is. In present study, the unit of analysis was the school, which implied examining the uptake of ICT by the school and how teachers in the selected schools experiences and integrated ICT across the curriculum. In addition, the analysis examined the school as a unit within the larger context of the educational system and how this influences a school's adoption of ICT.

Thematization and categorisation were used to make sense of the data collected during interviews, observations, and school visits during Phase (2). Themes and patterns were matched and compared between the two case studies. However, for the final discussion of findings, both quantitative results and qualitative findings were integrated in order to confirm/disconfirm, cross-validate, and gain in-depth understanding (Creswell, 2003; Tashakkori *et al.*, 1998) of teachers' experiences with ICT. The findings then were compared with other studies.

FINDINGS AND DISCUSSION

This section presents findings related to factors associated with teachers' adoption and implementation of ICT regarding the main two research questions.

ICT training courses

As indicated above, ICT training courses adopted by the Jordanian Ministry of Education aimed to improve teachers' ICT proficiency at three levels: ICT skills, pedagogical skills, and curriculum training (Alutaibi, 2003). This section presents findings related to the first research question: "What kind of ICT professional development is available for Jordanian teachers?"

Participation in ICT training courses: Participation in the four ICT courses was greatly varied among teachers from the three regions of Jordan. The ICDL course was the most widespread of all, with least variation across regions compared with all other courses. One hundred and thirteen (98.2%) teachers reported undertaking the course, of whom 38 (97.4%) in each of the Central and the North regions, and 39 (100%) in the Southern Region. On the other hand, the iEARN course had a substantially lower profile, with only 2 (1.7%) teachers among all participants reporting undertaking the course. Furthermore, the World Links course showed high presence in the Central region, as 12 (30.7%) teachers reported having undertaken this course, while none of the teachers from the South region reported undertaking it, only 4 (10.2%) teachers from the North region (Table 1).

Table 1: Number of teachers participated in ICT training courses by November 2006

	Central Region/schools				
	Fajr	Noor	Salam	Urdon	***No. (39)***
ICDL	11	7	12	8	**38 (97.4%)**
World Links	0	4	5	3	**12 (30.7%)**
Intel	7	3	3	1	**14 (35.8%)**
iEARN	0	1	0	0	**1 (2%)**
	Northern Region/schools				
	Wefaq	Fatima	Karama	Sabeel	***No. (39)***
ICDL	6	7	12	11	**36 (92.3%)**
World Links	2	1	1	0	**4 (10.2%)**
Intel	3	7	6	2	**18 (46.1%)**
iEARN	0	1	0	0	**1 (2%)**
	Southern Region/schools				
	Qalam	Sail	Alam	Rayah	***No. (39)***
ICDL	10	10	10	9	**39 (100%)**
World Links	0	0	0	0	**0 (0.0%)**
Intel	7	4	2	1	**14 (35.8%)**
iEARN	0	0	0	0	**0 (0.0%)**

Table 1 shows that Al Fajr, Noor and Salam schools from the Central region with high participation in Intel, World Links, and ICDL programs. Seven teachers from Fajr School had participated in the Intel course. However, none of the teachers from that school reported undertaking either World Links or iEARN. On the other hand, 4 teachers reported undertaking World Links course from Noor School and 5 from Salam School, and these were the largest proportions of teachers among all schools.

It may thus become apparent that the ICDL course was most consistently taken up by participating schools across all three regions, while World Links and Intel were better represented in the Central and North regions. However, this can be understood in light of the mechanism of disseminating ICT across the Jordanian education system, which it starts from the Central Region where the centre of the education system is located, before it spreads to other regions.

Skills developed by training courses: ICT skills and pedagogical skills: As discussed earlier, ICT training courses usually target two levels of teacher' ICT skills: ICT skills, and pedagogical use of these skills. Predictably, as the vast majority of teachers from all the three regions reported undertaking the ICDL course, 88 (76.5%) teachers reported developing computer skills (e.g. Word processing, presentation and accessing to information). However, only 58 (50.4%) reported developing pedagogical skills from ICT training.

Furthermore, teachers from the Southern Region were more likely to develop computer skills (e.g. Word processing, presentation and access to information) than both the other two regions, as 33 (84.6%) of them reported developing such skills. However, 20 (51.2%) teachers from the Central and 23 (58.9%) from the Northern regions reported developing pedagogical skills compared with 15 (38.4%) from the Southern. This tendency might be due to World Links and Intel courses which were concentrated in the Central region before expanding to the Northern and Southern regions, as was already demonstrated in Table 1 above.

As a result of ICT training, Jordanian teachers are expected to practise their newly developed skills in teaching. Teachers from all three regions reported the greatest use of ICT use was searching for additional teaching resources. In addition, 52 (45.2%) teachers reported searching for additional sources on the Internet and 37 (32.1%) reported using ICT to prepare for lessons. Nevertheless, ICT-based interaction in the school culture appeared to have minimal presence among teachers, as only 5 (4.3%) teachers reported using ICT for communication and 13 (11.3%) of them reported uploading files (e.g. lessons) to the Internet. This might be linked to the availability and quality of Internet connection in.

Overall, teachers from the Central Region reported the highest use of ICT among teachers from all regions. Twenty-two (56.4%) teachers from this region reported searching for additional sources on the Internet compared with 15 (38.4%) from both the North and South regions. Nevertheless, the use of Internet and the World Wide Web for communication remained low in the Central region, as only 3 (7.6%) teachers reported using ICT for communication. Teachers from Fajr and Noor schools reported greater use of these two functions of ICT than did teachers from all other schools in the study.

According to Navarro and Verdisco (2000), dealing with teacher issues has all the characteristics of the most difficult problem that faces educational policies. Thus, it has been recommended that 30% of a school development budget should be allocated to staff development (Harvey & Purnell, 1995). Nevertheless, teacher training in Jordan received approximately $US 300,000 (1.36%) out of $US 22M the total spending on the JEI, which is a significantly small amount (McKinsey & Company, 2005). While this might be justified as the reform was in its early stages and there was a need to provide schools with infrastructure, it remains an indication of the existing balance in investing the educational dollar. However, dealing with teacher issues is a complex task. That is, these issues are "politically and ideologically charged; their financial implications […] are huge" (Navarro & Verdisco, 2000, p.3). In addition, the ambiguity of skills required for teachers to become competent in ICT adds to the complexity of the task (European SchoolNet, 2005; Navarro & Verdisco, 2000; Rudd, 2001).

The system's approach of providing teachers with ICT professional development showed clear fragmentation. Participants reported the absence of national standards for ICT training courses (e.g. ICDL, World Links, Intel) which had been internationally developed. Each of these courses was responsible for developing its own standards, which added to the fragmentation. Benefiting from the experiences of other countries such as Denmark, France, Hungary and Switzerland (European SchoolNet, 2005), the Jordanian educational system can develop its own national ICT certificate. The development of national standards for international courses operating within the educational system could make ICT training less fragmented through compelling the international ICT training courses to meet the national agendas and standards.

Issues impact the effectiveness of ICT training courses
This section presents findings regarding the second research question: "What kinds of issues are related to the effectiveness of ICT training courses for teachers?" both teachers and principals portrayed several issues associated with the effectiveness of ICT training courses conducted by the Ministry of Education including: time and timing, modes, follow-up, teacher belief, school culture, teacher workload, and motives and incentives attached to attending courses.

Timing and time of ICT training: Timing and time of ICT training have been identified in the literature as crucial factor for the success of ICT professional development. On one hand, enough time should be allocated for teachers to participate in training, and on the other, enough time should be allowed for teachers to practise their newly developed ICT skills in classes (Downes *et al.*, 2001). Furthermore, the timing of training courses should be suitable for teachers, and should not exploit teachers' non-work time (Galanouli *et al.*, 2004; Gilmore, 1995; Mathew *et al.*, 2002).

Teachers in this study complained about the limited time available for them to develop and practice ICT related knowledge and skills which impede their desire to utilise ICT properly. For example, a teacher noted: "*it is unrealistic for the teacher to search for other materials than the textbook if his/her workload is more than nine lessons a week."* (Q1:85) Another wrote, *"Using the computer needs time for preparing the digitised materials, and we, the teachers, suffer from the lack of time and work pressure."* (Q1:110)

Moreover, in regard to time allocated for training courses, only 49 (42.6%) teachers from the three regions of Jordan believed that it was enough to develop new ICT skills. Seventeen (43.5%) teachers from the Central Region, and 16 (41%) from each of the Northern and the Central regions, believed that the time was enough for them to develop new ICT skills.

Sixteen teachers commented on issues regarding time and timing of ICT training courses. The timing issue appeared to be of significance especially to female teachers. Understandably, making training after school hours or during holidays can be at the cost of teachers' own time. The timing of training was problematic as it was usually conducted after school hours or during holidays. Usually, teachers from the three regions of Jordan travel between half and one hour to central locations in major cities of each of the 36 directorates where ICT training is conducted. Therefore, female teachers may find it difficult to maintain a balance between their family commitments and their professional live. Thus, the majority of comments were provided by female teachers and there was a request from teachers to make training courses during the school day and to consider training as part of teacher's workload. One female teacher commented:

> *"The place where training takes place and its distance from where one lives should be considered. Training should also be considered as part of the teacher's working hours."* (Q1:36)

There were frequent complaints, especially among female teachers, about the timing and location of training:

> *"The place where training takes place and its distance from where one lives should be suitable. Training should be considered as part of the teacher's working hours."* (Q1:75)

This remark was prompted by teacher training courses which were conducted mainly after school hours or during holidays. Additionally, teachers also complained about having to make their own way to training sessions. The location of courses certainly meant that teachers from other regions were required to travel independently to these locations, sometimes spending over two hours traveling to the central location without financial assistance from the education system (Nawal, a computer lab coordinator, February 28, 2007) making training courses a burden on teachers.

Furthermore, 28 (24.3%) teachers in Phase (1) who had received training asked for more training on ICT. In addition, the principal of Noor School reported that teacher training was not enough for teachers to be able to use ICT in their teaching as some teachers simply did not know how to utilize ICT.

Teachers in this study reported an extensive reliance on one-session courses and workshops for their ICT professional development. For instance, during an English language lesson given by Reem, an English language teacher from Fajr School with 13 years of experience, she tried to practice what she had learnt in one-session workshop on using the new English Interactive Online (EIO), however, her frustration was clear, especially that she tried her best but without any assistance or follow-up. Indeed, this approach without follow-up has been labeled as the least effective one, as well as the least cost-effective in terms of what teachers develop and implement from such short courses (Sun, Heath, Byrom, Phlegar, & Dimock, 2000). Teachers need time to master and practise new skills in order to be able to pass them on to students.

Modes of ICT training courses: Several issues are identified in the literature regarding the mode of training including: the location of training, starting points of courses, and skills taught (Downes, et al., 2001; Fiszer, 2004; Guskey, 2000; Mathew, Callaway, Letendre, Kimbell-Lopez, & Stephens, 2002; Strudler, Mckinney, & W. Paul Jones 1999). In addition, as teachers are expected to implement skills that they develop from ICT training in classrooms, training should ensure a direct link between these skills and their implementation in real teaching environments. Browne and Ritchie (1991) as well as Granger *et al.* (2002) stressed that learning isolated skills can have little impact on classroom practices if training courses do little to help teachers to transfer these skills to classrooms.

Participant teachers in this study commented on several issues regarding their ICT training. Teachers expressed their frustration about both the physical environment and the quantity of machines. Some teachers were asking for more space as the *rooms were very crowded* (Q1:116). In addition, teachers asked for *more machines* to be able to practise what they learn during their courses (Q1:121) as *the number of computers was not enough which causes teacher's frustration* (Q1:116). In one teacher's words,

> *"The role of training [courses] would become greater if they are implemented in classrooms during practicing teaching, because the purpose of this training is implementing the computer in teaching."* (Q1:3)

The literature recommends that ICT training should consider individual differences between teachers in terms of their previous knowledge of ICT (Galanouli, et al., 2004; Gilmore, 1995; Rosen & Weil, 1994). In the present study, 71 (61.7%) teachers from the three regions of Jordan indicated that ICT training courses took into account their previous knowledge, and 25 (64%) teachers from each of the Central and North regions indicated that their previous knowledge was considered by ICT training courses. Nevertheless, this indicates that a large proportion (38.3%) of teachers believed that their previous knowledge was not considered by training courses. According to one teacher, "*training courses do not consider the individual differences. Some teachers do not know how to turn on the computer."* (Q1:80)

Training courses should have clear aims and strategies to achieve these aims. Contents, time, location, as well as the way of distributing a professional development course within the system have to be addressed. When teachers undertake new ICT courses they are expected not only to develop knowledge but also to accomplish a level of autonomy and confidence in using this technology in classrooms (Granger *et al.*, 2002). The aims of the course have to be clear; in the first instance, whether the goal is to provide teachers with ICT skills or skills for the pedagogical use of ICT (Downes, et al., 2001; Tawalbeh, 2001). Moreover, the location of the course has to be considered - whether it is a computer room, a classroom or even a lecture room - as this can reflect upon the transferability of newly acquired skills by teachers to classrooms (Granger *et al.*, 2002). Furthermore, in order for teachers to be able to make sense of what they learn during ICT training courses, they should be given the opportunity to have hands-on practice during training courses (Downes, *et a*l., 2001; Gilmore, 1995; TeleLearning, 1999), and to have enough time afterwards to practise on their own (Strudler *et al.*, 1999).

Follow-up to training: Follow-up has been identified as a major ingredient of any successful use of ICT by teachers across the curriculum as it helps teachers to make sense of their newly developed skills in light of their own practices in classrooms (Bradshaw, 2002; Fiszer, 2004; Lewis, 1998). As Fiszer (2004) notes, teachers might abandon their newly developed skills if they find them "incompatible" with real teaching/learning settings.

Teachers commented on the lack of follow-up for ICT training in Jordan and frequently requested more efforts to follow-up training courses. For instance, a teacher wrote: *"teachers must receive follow-up in the field when they implement technology."* (Q1:1) However, Table 2 shows that only 16 (41%) teachers from the South Region received follow-up to their training, compared with 10 (25.6%) and 9 (23%) from Central and North regions, respectively. However, this finding might be linked to the distance of the South Region from the centre of the education system where mentors, especially from the Central and the North regions were, often removed from their duty to reinforce other field such as authoring and training, as will be discussed later.

Table 2: Number of teachers reporting receiving follow-up after ICT training in the three regions

	Central Region/schools				
	Fajr	Noor	Salam	Urdon	***No. (39)***
Did you receive any follow- up?	3	4	2	1	**10 (25.6%)**
Was the follow-up adequate to transfer skills to classrooms?	6	4	1	0	**11 (28.2%)**
	Northern Region/schools				
	Wefaq	Fatima	Karama	Sabeel	***No. (39)***
Did you receive any follow- up?	1	1	2	5	**9 (23%)**
Was the follow-up adequate to transfer skills to classrooms?	1	1	4	2	**8 (20.5%)**
	Southern Region/schools				
	Qalam	Sail	Alam	Rayah	***No (39)***
Did you receive any follow- up?	5	3	5	3	**16 (41%)**
Was the follow-up adequate to transfer skills to classrooms?	2	2	3	3	**10 (25.6%)**

Twenty-nine (74.3%) teachers from the Central Region reported receiving follow-up to their training and only 10 (25.6%) believed that the follow-up was adequate to transfer ICT skills to classrooms (Table 2). Fajr and Noor schools reported receiving more follow-up than any of the other Central Region, and teachers in these two schools showed more satisfaction with their follow-up. However, during the course of the current study, it became clear that these positive responses were due to teachers' misinterpretations of the term "follow-up" used in the questionnaire. That is, investigation in Phase2 showed that teachers reported visits to schools by officials and stakeholders as being "follow-up".

A major feature of successful ICT professional development is the quality of follow-up which teachers receive after the training courses (Lewis, 1998). Anderson (1997) cited "lack of good assistance" as one of the reasons that can cause teachers to abandon new practices they learn during their training courses as soon as they return to the classroom. Fiszer (2004) also warns that without follow-up teachers might abandon the new skills they develop during professional development courses because of "incompatibility" with the real teaching/learning setting they face. In addition, Bradshaw (2002) concludes that in order to maximize the return of investment in staff development, significant resources need to be redirected to the follow-up activities. Similarly, according to Huberman and Miles (1984), it is the assistance and support that teachers receive, once change is underway, which decide the life or death of innovations in schools.

Mentors are the main source of support and assistance for in-service Jordanian teachers. Although principals are also considered to be permanent mentors in schools, more than half (57%) of the principals in this study indicated that they were *unable to assist teachers in integrating ICT in their teaching.* Therefore, follow-up was exclusively the responsibility of subject mentors from the regional directorates of education. Nevertheless, it became clear that these mentors' role was limited due to first their workload, and second due to their lack of competence to guide teachers in the implementation of ICT.

Noor and Fajr schools were expected to receive intensive follow-up, due to their location within the vicinity of the Ministry and the directorate of education, and to their extensive participation in ICT integration. During Phase (1) of this study, approximately 57% of Noor's teachers reported that they received follow-up for their ICT training, and approximately half of that percentage (28%) were from Fajr School. However, as indicated earlier, during Phase2 of the study it became clear that even participants in the two schools who reported receiving follow-up had misinterpreted this item in the questionnaire as referring to ordinary visits by stakeholders and officials. As the two schools were extensively involved with reform, they were often visited, but the purpose of visits was not follow-up for teachers in order to ensure their proper ICT implementation. While teachers who were undertaking Cader course were indeed visited by their trainers once a week, this course was available only for a meagre number of teachers.

It became clear that follow-up in the two schools was not consistent. As the two schools were among the first in the country to participate in reform during the pre-piloting and piloting stages of implementing the new curricula, both schools received intensive follow-up during the initial stage of the implementation during the school year 2003/2004. However, the principal of Noor School highlighted to this inconsistency as he noted that

> *"The digitisation started there was intense follow-up and mentors used to visit the school very often but this was only during the first year of the program. The follow-up*

was only in the beginning of the program and now it is superficial." (Ali, December 15, 2005)

Furthermore, participants from all levels of the education system pointed to the underperformance of follow-up. Participants commented on mentors' competence in providing assistance to teachers regarding ICT integration. Leila, a biology teacher with 22 years of teaching experience from Fajr School, had undertaken the Intel course, during which she was required to develop a portfolio of her activities (e.g. presentations and work sheets). However, after the end of the training course, it is up to teachers to use the newly developed skills or not. Although Leila acknowledged that her mentor was cooperative, she did not have ICT knowledge and skills to help her. In addition, Yousif, a mathematics teacher with 13 years of experience from Noor School stressed that mentors "are neither prepared nor qualified to supervise teachers to use technology" (Yousif, December 30, 2005).

Furthermore, participants commented on the mentors' availability to provide follow-up for teachers. Mentors were overloaded as each mentor was responsible for 120-130 schools, each of which is expected to be visited, supported, and evaluated during the schooling year. Furthermore, they were often assigned to the authoring team of new curricula as well as training teachers. The overload of mentors prevented them from providing proper assistance and follow-up to teachers. Rajab, a mentor from Directorate2, mentioned that he used to visit the Discovery Schools very often, four to five times a week, sometimes daily during the piloting of the e-math during the 2004/2005 schooling year (Rajab, December 8, 2005). However, after that the number of visits dropped dramatically from twice a week to once or twice a year (Hassan, January 19, 2006) as mentors were taken from their mentoring responsibilities to other duties leaving teachers without guidance.

Belief in the potential of ICT: The literature has demonstrated that teachers are more likely to adopt ICT when they are convinced of its benefit for their teaching and students' achievement (Downes *et al.*, 2001; Grunberg *et al.*, 1992; Lai, 1993; Means, 1994; Subhi, 1999). Therefore, educational interventions should dedicate time and effort to convince teachers of the benefits of ICT for teaching and learning.

Teachers reported major changes as a result of undertaking training courses. Table 3 shows that 110 (95.6%) teachers from the three regions reported becoming more aware of the benefits of ICT after undertaking ICT training. Furthermore, teachers reported major changes in their instructional strategies as a result of ICT training, with 94 (81.7%) teachers indicating that their instruction had improved as a result of ICT training. In addition, 95 (82.6%) participant teachers believed that their teaching became more student-centred as a result of their ICT training. These findings were also confirmed by principals' accounts. Thirteen (92.8%) principals believed that teachers who had undertaken ICT training became more effective in their teaching as a result of their training. In addition, 10 (71.4%) principals believed that ICT teacher training was reflected positively in students' achievement.

Table 3: Number of teachers reporting belief and instructional changes as a result of participating in ICT training

	Central Region/schools				
	Fajr	Noor	Salam	Urdon	***No. (39)***
More aware of the benefits of ICT	11	6	11	9	**37 (94.8%)**
My teaching has improved	8	5	8	9	**30 (76.9%)**
My teaching is more student-centred	10	5	10	9	**34 (87.1%)**
	Northern Region/schools				
	Wefaq	Fatima	Karama	Sabeel	***No. (39)***
More aware of the benefits of ICT	6	8	11	11	**36 (92.3%)**
My teaching has improved	5	6	12	7	**31 (79.4%)**
My teaching is more student-centred	5	7	11	6	**29 (74.3%)**
	Southern Region/schools				
	Qalam	Sail	Alam	Rayah	***No (39)***
More aware of the benefits of ICT	10	10	9	8	**37 (94.8%)**
My teaching has improved	9	9	9	7	**34 (87.1%)**
My teaching is more student-centred	8	9	9	6	**32 (82%)**

Overall, teachers from all three regions reported highly positive impacts of ICT training on their attitudes towards ICT and upon their instructional methods. Sami, from Noor School, summarized the transformation of his attitude towards ICT in one of his early postings to the electronic discussion board on World Links website as follows:

> *"For me, learning how to use the computer was stressfull [sic], because I thought it will be very hard, and I thought that it will need a computer engineer to turn on the computer. However, when I started my course I found out that it's really easy and it suit every body, and I learned most of what I know now just by playing on the computer and practicing over and over. And the most intersting [sic] thing happened when one of my friends interduced [sic] me to the Internet, and it was a new era for me. It did really change my point of view in many aspects."* (Sami, May 27, 2004. Posted online in English)

On the other hand, Yousif was against the integration of ICT in education. Unlike Sami, he was a mathematics teacher who had received a laptop from the Jordan Education Initiative as part of the e-math; however, this did not change his belief, especially after his struggle with maintenance. However, he proceeded to explain why he opposed the integration of ICT in his teaching:

> *"I could not rely on the wage I receive for being a teacher, so I have another job after school hours to be able to support my family."* (Yousif, December 30, 2005)

Due to the low income, teachers are pushed by their family responsibilities to find a second job, which is usually private tutoring after school hours. Additionally, Jameel, a mathematics teacher from Noor School with 15 years of experience, mentioned the pecuniary motive behind his decision in recent years to work after school hours:

> *"After three months of chasing for the laptop to be fixed, they wanted to fine me… we are hidden soldiers [teachers] and we need support, well, now I finish school and go straight to my other job. It is private tutoring because, I swear, we are not able to cope. Before three years I never though of private tutoring, but now it is getting hard and you could not cope without a second job."* (Jameel, 15 November 2006)

Leila, from Fajr School, was an example of the enthusiasm and positive attitude amongst teachers towards ICT. She said that she used computer labs at least once a week. In addition, she cited an example of commitment to using ICT:

> *"I bought a laptop on my own and used it in classrooms even before ERfKE [Education Reform for the Knowledge Economy] started in 2003, even before computers were made available for the school. That time laptops were large and heavy and because I used to carry my laptop with me most of the time, I started to have shoulder and back pain. I think technology is very useful for education and the decision by the ministry of education to integrate technology into education was a wise decision but the important thing is how we go about implementing the decision. Any reform is nothing if it is not implemented properly."* (Leila, December 7, 2005)

In addition, although Samar, a mathematics teacher with 20 years of experience from Fajr School, had participated in ICDL program only, she was enthusiastic to try new ICT-related ideas. She was engaging her students with activities by asking them to digitize lessons and chapters from textbooks of all grades. The teacher could not hide her smile of pride when she brought a large portfolio which contained her work with her students. The portfolio comprised color-printed presentations and floppy disks. In this case, we see how a teacher was able to adopt ICT in her instruction even without having received formal training in the pedagogical use of ICT.

School culture: Teachers' interaction and collaboration in schools can improve their adoption and implementation of ICT (Fiszer, 2004; Sandholtz, Ringstaff, & Dwyer, 1997; Wenger, 1998). Through these activities, teachers may learn new skills from one another and verify their competence by reflecting on their own practices. Furthermore, teachers may overcome daily problems regarding implementation of ICT by working with more experienced colleagues who might be able to offer scaffolding of ICT skills both during and after training.

All principals (100%) indicated that they facilitate collaboration amongst teachers. In addition, 99 (86%) teachers from the three regions reported increased collaboration with other teachers as a result of their ICT training courses. Teachers from the South Region reported greater collaboration (36 teachers [92.3%]) compared with 34 (87.1%) and 29 (74.3%) from Central and the North regions, respectively. In addition, teachers from the South Region reported having more opportunities to observe other teachers when implementing ICT, with 11 (28.2%) reporting doing so compared with only 6 (15.3%) and 7 (17.9%) from the North and the South. Nevertheless, only 24 (20.8%) teachers from the three regions reported having observed other teachers during implementing ICT.

However, this factor was generally missing in schools and most teachers were seen to have only minimal interaction. Only enthusiastic teachers with self-motivation sought collaboration and interaction with other more knowledgeable teachers while they implemented ICT in their curriculum. For instance, Sami was a physics teacher of with 15 years of experience He was a regular user of the Internet, and maintained a high profile on the electronic discussion board "Collaboration Centre" which was available for teachers who participate in the World Links course. He frequently posted to this website while discussing issues with others. In addition, the pattern in which he responded to my emails indicated that he was a regular and a frequent user of ICT. Sami was a Master Trainer with World Links. In addition, he maintained his own website. Thus, other teachers in his schools used to visit him during his classes in the computer lab. Each time the researcher attended his classes in the computer labs there were other teachers attending his class to learn from his utilisation of ICT, even though they were teaching different subjects. The observations were self-motivated by these teachers in order to see how he used technology in his teaching and to learn from that. (OBNS.1, an English language teacher who was attending the class) Sami himself pointed out that through such occasions teachers try to learn from each other in a collaborative way. Sami mentioned that he had helped other teachers to overcome some downfalls of the technology via the Internet by instructing them through emails. Unfortunately, he constituted an exception as collaboration among teacher was not a norm in the school culture.

For teachers who undertook the World Links course, there was an electronic discussion board, to which they were requested to contribute. However, browsing through the discussion board showed that most of the postings were made only to fulfill the course's requirement. Some postings included only the teacher's name and e-mail address. In addition, the majority of participants in the discussion board posted only once and then disappeared. However, there were a few active participants, who were mainly coordinators or trainers in the program. Furthermore, there were a small number of postings where teachers participated by asking questions or sharing their own experiences. For example, some teachers shared plans for lessons that integrate ICT in teaching, which can be used by other teachers as models, while other teachers posted links of useful websites.

Teacher workload: Teachers' workloads and the time constraints can severely hinder technology acceptance by teachers (Hu, Clark, & Ma, 2003). Clearly, in order to achieve the goals of the educational system and to enable teachers to implement new initiatives, it is essential to reduce teachers' workload (Fullan, 1982, 2003; Grunberg & Summers, 1992).

Ali, the principal of Noor School, noted that *teachers are already overloaded; they could not cope with this pressure and the pressure from training.* In addition, Yousif pointed to the pressure on teachers to meet certain deadlines, as they were required to finish the textbook by the end of the year. Therefore, for Yousif:

> *"including extra activities or spending more time on additional sources will distract me from the main goal for which is completing the textbook before the end of the school year."* (Yousif, December 30, 2005)

Sami also mentioned that teachers being overloaded as one main obstacle facing ICT integration. In addition, mentors were aware of this aspect as Rajab stated that: *teachers are overloaded to learn, prepare, and practice what they learn.* (Rajab, December 8, 2005) Therefore, One teacher proposed

> *"giving teachers enough time to be able to show techniques and skills he/she learns by using computers to teach students in an innovative and interesting way apart from the traditional way."* (Q1:49)

It is unreasonable to expect teachers to attempt and try new teaching strategies and methods without giving them time to do so. Trying new teaching strategies while overloaded with other teaching responsibilities can be a daunting task for teachers and might involve mere recycling of old practices in order to accommodate both pressure to change practices and overload creating the illusion of improved performance. Accordingly, teachers' load needs to be taken into account when planning for ICT training courses in order to ensure the actual implementation of skills developed during the courses by giving teachers enough time and support to try new teaching strategies.

Motives and incentives: Motives and incentives for teachers who undertake ICT professional development programs are identified in the literature as a supporting factor for ICT professional development (Downes, et al., 2001; Dusick, 1998; Shuldam, 2004). In the Jordanian context, as noted earlier, the Jordanian education system considered ICT training courses as prerequisite for teacher promotion and rewards. The vast majority of teachers (81%) reported receiving incentives for their participation in ICT training courses. According to one teacher "*money incentives have big role in teacher's acceptance of learning new technologies."* (Q1:26) Nevertheless, Sami criticised this link between the incentives and the ranking system, which according to him made teachers compete to participate in these courses and *forget what they learn during training course as soon as they receive the certificate.* This was also confirmed by Ali, as he noted that:

> *"Training courses do not qualify them [teachers] to use technology in their teaching; teachers may undertake training courses only for the certificate or the rewards and forget what they learn after that."* (Ali, December 15, 2005)

Basil also referred to this point as he said that

> *"until now, teachers undertake ICT professional development programs only for the certificate, teachers' ranks, or money rewards."* (Basil, December 13, 2005)

While motivation, through certification and promotions, is essential for joining ICT training courses by teachers, the system needs to ensure that motivation is not an end by itself. Like any other educational interventions, ICT training courses are expected to improve students' learning through improving classroom practices. Thus, there should be special efforts through follow-up and mentoring to ensure the transfer of skills into classrooms.

LIMITATIONS OF THE STUDY

The small number of interviewed teachers and principals can be seen as a limitation of the study, therefore, and we acknowledge that our findings are context specific. Therefore, the reader has the full choice over identifying how findings in the current study may transfer into similar contexts (Lincoln & Guba, 1985). In addition, further studies can be conducted in order to compare what has been found in the Jordanian context with other similar contexts.

CONCLUSIONS

The Jordanian Ministry of Education adopted several ICT training courses aiming to prepare them to integrate ICT effectively across the curriculum. The adopted training courses helped teachers to improve their ICT-related skills and knowledge which improved their perceptions of ICT in their profession. Nevertheless, it became clear that the conduct and nature of these courses subvert their potential benefits to teachers. Several factors, including timing and modes of training, follow-up, teacher's belief, school culture, workload, and motivation, appeared to impact the effectiveness of training courses. Accordingly, the planning and design of courses should take into account such factors in order to insure the positive impact of these courses on teaching practices and eventually on students' achievements.

The discussion above highlighted several issues appeared to influence the positive impact of ICT training courses on teacher utilisation of ICT in their profession. Issues such as teachers and mentors overload, one-session courses and workshops, lack of follow-up for teachers after they return to schools can undermine the accomplishment from ICT training courses. In addition, careful attention should be given to both levels of skills sought by teachers, both ICT-related skills and the pedagogical use of ICT. While motivation is important to motivate teachers to undertake training courses, it is more importantly to ensure that the promotion is not its ultimate goal.

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IDENTIFYING THE COMPUTER COMPETENCY LEVELS OF RECREATION DEPARTMENT UNDERGRADUATES

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ABSTRACT
Computer-based and web-based applications are as major instructional tools to increase undergraduates' motivation at school. In the recreation field usage of, computer and the internet based recreational applications has become more prevalent in order to present visual and interactive entertainment activities. Recreation department undergraduates should develop their knowledge and skills in the use of computer as entertainment tools as well as support and guide people to use these technologies for recreation activities. However, some drawbacks are encountered in the integration of computers to recreation classes. The aim of this study is to investigate how often recreation department undergraduates use computers and related software for recreational purposes. Based on the findings of the research, some practical suggestions have been put forward.
Keywords: Recreation department undergraduate undergraduates, Usage of computer, Computer Competency

INTRODUCTION
In recent years, computer technology has been increasingly utilized for educational settings. Undergraduates are substantially involved in technology in and out of the classrooms. Within the environmental conditions that the speed and substructure of internet networks, and digital technologies rapidly changes and improves, technology cannot be considered separated from education (Semiz, 2011). Most schools have been built according to computer technology needs and equipped with necessary hardware, software and network infrastructure for the internet access.

Nowadays the teachers have a position rather than a reflection of learning and teaching processes of information, also guiding undergraduates' learning. Undergraduates are also working to configure their own knowledge of learning environments, in a sense, learn to learn. Faculty is moving towards a student-centered direction (Geçer & Dağ, 2010). As Salinas states that "using technology as a fully instructional tool instead of an aid to teach or toy to fun, will conceive undergraduates who learn exploring and creating new knowledge, and be ready to the problems which await them in 21st century" (Salinas, 2008; p: 659).

Various studies carried out in order to examine the attitudes to investigate computer competency levels of different undergraduate groups from different departments (Guy & Lownes-Jackson, 2010; Wallace & Clariana 2005; Banta & Howard, 2004; Grant, Malloy, and Murphy, 2009; Gülbahar, 2008; Tella & Mutula, 2008; Yaman, 2007).

However, the Recreation department undergraduates' have not been investigated under the framework of computer competency researches. It is thought that this first study will help to cover the shortage of information related with computer competency in Recreation field.

Both the educators and the public accept that it is necessary for the undergraduates to be competent in computer use. In order to benefit from technology in education, both the teachers and undergraduates should have enough knowledge about computers. However the discussions about the limits of computer use in educational activities are still continuing because many schools computers are used only for internet access and game play. The suitability of computer applications with the curriculum and the applications in classroom is usually overlooked (Moursund, 1995). According to framework of The Council of Higher Education of Turkey, Recreation departments are settled as a sub unit of the Physical Education and Sports High Schools or Departments.

(1) Computer technology in physical education
It is not important the name of field or department but if it is educational area, creating rich environments for learners is very crucial in the teaching process. Teachers can easily reach to meaningful learning by the assist of instructional technologies. Therefore, teachers' competency in use of computer technology, integration of computer technology into the teaching and better facilitation of undergraduates learning by technology have been expected from physical education (PE) teachers (İnce et al, 2006).

Technological devices are commonly used in PE include laptop computers, LCD projectors, digital video and digital cameras, audio equipment, heart rate monitors, pedometers, portable devices like mobile phones, PDAs, GPS, game consoles, including exergame dance mats (Mohnsen, 2008). Integration of these technologies in PE is named as the initial start for moving from traditional physical education into a more technological form of PE (Kretschmann, 2010).

Using the correct technological devices, teachers can record video clips of some physical skills and movements or can download such clips to their computers and then let the undergraduates access these videos through a web site. Physical education teachers can introduce the best players of a sport through technological devices. Moreover they can record one of the best undergraduates' serve or tourniquet and then explain these techniques to the classroom via their videos. In this way undergraduates will focus on the subject easier and the learning will be facilitated (Yaman, 2007).

On the other hand, various problems may occur during the integration of technology with physical education. The primary problem is that the procedure and the preparation of computer take very long time. Another problem is that enough financial resources could not be supplied for the new technological hardware. Finding suitable software is also an important problem (Bird, 1998). Such kind of problems may force the recreation department undergraduates to neglect the use of computers in their classrooms.

(2) Operational Definition and Aims of Recreation Departments
Recreation can be defined as those non-competitive physical activities that take place for leisure purposes in our community. It can be categorized into areas of aquatics, outdoor recreation and adventure, fitness, tracks and trails, and community recreation.

Active recreation plays a vital role in our wellbeing and brings people together to create stronger communities. Recreation departments are leading various projects throughout the state in order to achieve this aim. Recreation departments strive to improve the quality and level of recreation services in Turkey.

(3) Computer technology in recreation field
Today one of the most important problems in recreational field is the didactic way of entertainment. Another leading problem is the lack of communication and dialogue between recreation experts as well as people; also between communities.

Educational technology will contribute seriously to the solution of these problems if it is used truly. During the last few years educators have begun to use computer supported teaching methods more often to increase the participation of undergraduates to the learning activities and to promote access to learning materials. Computer supported teaching which is defined as the use of computer by the undergraduates in teaching is an interactive process, which makes learning easier (Azarmsa, 1991).

Researchers point out that computer contributes greatly to educators on adopting some 'structuralist methods' in which people cannot adopt successfully on their own (Jonassen et al., 1998). The education programs in Turkey have been designed according to the 'constructivist method' since 2005-2006 academic year, which is considered to be the most important innovation in the field of education. The use of computer in and out of classroom activities has gained more importance in this new curriculum (Yaman, 2006).

In addition; after graduation when recreation department undergraduates go into employment they could be employed in fields that frequently use informatics technologies and computer networks. Lawson and friends (2006) showed and accentuated the importance of using computer in recreation field.

In 1999, Wang and Manning have used computer simulation models for recreation management. Their study explored the utility of computer simulation as a tool for describing visitor travel by building a dynamic model of visitor travel on the carriage roads of Acadia National Park, Maine, USA.

Similarly, Manning and friends (2006) used computer and recreation-monitoring system at Acadia National Park, which is one of the most intensively used national parks in the United States. Although its' annual number of visitors (2.2 million in 2004) does not rise to the level of some of the "crown jewel" western national parks (Yellowstone National Park with 2.9 million in 2004), visits to Acadia are concentrated on its comparatively small size of less than 50.000 acres whereas Yellowstone, in comparison, it is about 2.2 million acres. Given the intensive character of visitor number in Acadia, it is vital to monitor recreational use and its associated impacts to help ensure protection of important park resources and the quality of the visitor experience.

The similar research showed that using computer in PE and also in recreation fields increasingly gains value and is going to be very important in the future (Mavi, 2007). Therefore, it must be a necessary educational tool for the undergraduates in recreation departments.

(4) Undergraduates' attitude towards using a computer
As individuals who are more integrated with technology, they can follow developments all over the world. Moreover, this contributes to their self-improvement. With the help of computer, it is not that difficult to reach to the source of information while it gives the chance to benefit from the experts in the field. When these advantages are considered, it can be understood that learning technology is inevitable.

The use of computers in learning processes can help to develop cognitive skills of undergraduates in thinking, problem solving and learning. It is necessary for all the teachers, candidates of being teacher or people who want to be an educator in different fields like recreational events to apprehend technology well and put the focus on the undergraduates or employees. Due to various factors many of the teachers and experts are still reluctant about integration of technological facilities in their classes. They need to develop their personal knowledge and ability in technology in order to help and guide their undergraduates and employees (Teotrakool, 2006; Long, L. & Long, N., 2004).

The teachers have defined some obstacles in integrating technology to their classes; time, education, technological support and hardware problems (Cuban, 2001).

Internet facilities help to all employees in physical education area to search in order to get information. In addition to this, at educational areas, physical education undergraduates get various capacities and properties for their future life. In that sense, technology gives opportunity to people to have self-differentiated features in order to get wide range of knowledge, and everyone has the same opportunities for achieving this knowledge (Yaman, 2007).

In Turkey context, wide range of information related to physical education and sports is accessible through the web sites of the General Directorate of Sports and Youth (www.gsgm.gov.tr) and Ministry of National Education (www.meb.gov.tr) as well as some other popular web sites like www.sporbilim.com, www.eurosport.com and www.sportengland.org. It is suggested that undergraduates are well informed about how to access useful information through Internet, and teachers need to know these resources themselves in order to be of their undergraduates' help. Physical education teachers teach practical, technical and theoretical aspects of teaching subjects. They should actualize and enrich their information not only using the books but also through internet facilities. Asking their undergraduates to return their homework via internet and find subjects on web sites, they can employ computers as the means of communication with their undergraduates (Yaman, 2007).

The main purpose of this study is to investigate the level of computer competency (skill level for Microsoft Windows Operating System, Microsoft Office Word, Microsoft Office Excel, Microsoft Office Power Point and Multimedia programs) of the recreation department undergraduate undergraduates as computer users. Secondly, the study aims to investigate their computer ownership rate, the availability of computer laboratories in their schools, the usage of computer by family members and the availabilities to access computer laboratories.

METHOD
(1) Sample
The research covers all the undergraduates who study at the School of Physical Education and Sport in Muğla University, Turkey in 2010 – 2011 academic years. The sample group of 139 recreation undergraduates was chosen randomly among department undergraduates.

(2) Procedure
In the research both quantitative and qualitative methods were used. The data was collected through administration of the survey called "The Survey of Recreational Technology Use" to the recreation department undergraduates. The survey was administered to 139 recreation department undergraduates at Muğla University College of Physical Education and Sport in Muğla, Turkey. In the research validity was defined according to the specialist's view.
The reliability of the instrument was calculated using Cronbach's Alpha. The pilot results from the Cronbach's Alpha demonstrated that the questions in the pilot questionnaire were reliable. An overall alpha score for the pilot data was found to be 0.977, which indicated high reliability of the instrument. The alpha scores for each skill section of the basic computer skills were as follows: Microsoft windows operating skills, r = 0.843; Microsoft office word skills, r = 0.922; Microsoft office excel skills, r = 0.936; Microsoft office power point

skills, r = 0.973; and multimedia programs using skills, r = 0.840. For each variable one way analysis and t-test technics were applied with SPSS statistical software. Also optimal scaling technic was used to reach detail information related with one of the research question.

(3) Instrument
For the research, a questionnaire with 43 items measuring different competences in the use of computer was developed. The undergraduates were invited to choose one answer among the four alternatives given as; "no experience", "little experience", "some experience" and "high experience".

In the analysis no experience was graded with 1 point, little experience with 2, some experience with 3, and high experience with 4 points.

The survey comprised of 6 parts. In the first part the presence of personal computers at home, the presence of computer laboratory at school, the possibilities of computer use and some demographical questions were asked. In the second part abilities in Microsoft Windows operating system use, in the third part Microsoft Office Word abilities, in the fourth part Microsoft Office Excel abilities, in the fifth part Microsoft Office Power Point abilities, and in the last part abilities in Multimedia programs use were questioned.

There were 9 questions about Microsoft Windows Operating System, 9 about Microsoft Office Word, 9 about Microsoft Office Excel, 8 about Microsoft Office Power Point and 8 about multimedia programs.

Open-Ended Questionnaire:
For gathering data on the perceptions of recreation academicians, four open-ended questions were asked. These questions addressed the expectations of academicians about the using of computer technology at their lectures, perceptions about the processes they experienced during the using computer technology, thoughts on what they gained from the using computer technology, and envisioned about the use of technology within their future lectures.

(4) Descriptive statistics of data
Demographical characteristics of participants
According to Table 1, it can be stated that 87.1 % of the undergraduates (*n* = 121) has personal computers at home but 12.9% (*n*= 18) of them do not own computers. 52.5 % of the undergraduates (*n*= 72) stated that their families use computers at home but 47.5 % of them (*n* = 67) stated that their families do not. Finally, 74.8 % of the undergraduates (*n* = 104) stated that they couldn't always have benefit from the computer laboratories of their schools but 25.2 % of them (*n* = 35) stated to have benefit.

Table 1: The frequencies of demographical characteristics of the sample group

		n	*%*
Ownership of personal computer	Yes	121	87.1
	No	18	12.9
Presence of computer laboratory at schools	Yes	73	52.5
	No	66	47.5
Computer use of the families	Yes	72	52.5
	No	67	47.5
Benefiting from computer laboratories	Yes	35	25.2
	No	104	74.8
	Total	139	100.0

The ability to use programs
According to Table 2, the results generally indicated that for the undergraduates' ability to use windows; most of the undergraduates stated to have fully experience with the start menu, settings menu, and programs menu. However, they stated to have little experience for files menu, control menu, search menu, help menu, run menu and play games. For the undergraduates' ability to use word; although some of the undergraduates stated to have experience with table menu, window menu and help menu, most of them stated to have little experience with all of the menus of word. For the undergraduates' ability to use excel, most of the undergraduates stated to have any experience and little experience with all of the excel menus, but approximately 9-12 % of them only stated to have fully experience with the excel menus. For the undergraduates' ability to use power point, the similar results were seen for the power point menus. However, almost half of the undergraduates stated to have fully experienced with multimedia program menus. The frequency of the undergraduates' statements for having any experience with the multimedia program menus was found very low (approximately 10%).

Table 2: The frequencies of the undergraduates' ability to use programs

The Ability to…		Have… Any Experience		Little Experience		Experience		High Experience	
		n	%	*n*	%	*n*	%	*n*	%
Use Windows	Start Menu	-	-	4	2.9	39	28.1	96	69.1
	Settings Menu	-	-	4	2.9	41	29.5	94	67.6
	Programs Menu	-	-	4	2.9	40	28.8	95	68.3
	Files Menu	1	.7	9	6.5	37	26.6	92	66.2
	Control Menu	1	.7	8	5.8	42	30.2	88	63.3
	Search Menu	1	.7	9	6.5	39	28.1	90	64.7
	Help Menu	1	.7	7	5.0	40	28.8	91	65.5
	Run Menu	1	.7	9	6.5	38	27.3	91	65.5
	Play Games	5	3.6	9	6.5	38	27.3	87	62.6
Use Word	File Menu	8	5.8	37	26.6	60	43.2	34	24.5
	Edit Menu	10	7.2	41	29.5	60	43.2	28	20.1
	Insert Menu	10	7.2	43	30.9	60	43.2	26	18.7
	View Menu	12	8.6	46	33.1	53	38.1	28	20.1
	Format Menu	14	10.1	43	30.9	56	40.3	26	18.7
	Tools Menu	13	9.4	44	31.7	55	39.6	27	19.4
	Table Menu	13	9.4	38	27.3	61	43.9	27	19.4
	Window Menu	12	8.6	40	28.8	62	44.6	25	18.0
	Help Menu	12	8.6	36	25.9	67	48.2	24	17.3
Use Excel	File Menu	40	28.8	39	28.1	43	30.9	17	12.2
	Edit Menu	42	30.2	40	28.8	42	30.2	15	10.8
	Insert Menu	42	30.2	41	29.5	43	30.9	13	9.4
	View Menu	41	29.5	49	35.3	36	25.9	13	9.4
	Format Menu	44	31.7	43	30.9	39	28.1	13	9.4
	Tools Menu	43	30.9	44	31.7	39	28.1	13	9.4
	Table Menu	41	29.5	40	28.8	45	32.4	13	9.4
	Window Menu	42	30.2	39	28.1	44	31.7	14	10.1
	Help Menu	42	30.2	41	29.5	39	28.1	17	12.2
Use Power Point	File Menu	33	23.7	37	26.6	46	33.1	23	16.5
	Edit Menu	33	23.7	33	23.7	48	34.5	25	18.0
	Insert Menu	35	25.2	29	20.9	50	36.0	25	18.0
	View Menu	35	25.2	32	23.0	48	34.5	24	17.3
	Format Menu	35	25.2	33	23.7	46	33.1	25	18.0
	Tools Menu	35	25.2	34	24.5	47	33.8	23	16.5
	Table Menu	35	25.2	32	23.0	47	33.8	25	18.0
	Window Menu	34	24.5	32	23.0	46	33.1	27	19.4
Use Multimedia Program	File Menu	18	12.9	19	13.7	42	30.2	60	43.2
	Edit Menu	16	11.5	18	12.9	44	31.7	61	43.9
	Insert Menu	14	10.1	16	11.5	46	33.1	63	45.3
	View Menu	15	10.8	19	13.7	42	30.2	63	45.3
	Format Menu	15	10.8	19	13.7	42	30.2	63	45.3
	Tools Menu	15	10.8	22	15.8	39	28.1	63	45.3
	Table Menu	15	10.8	19	13.7	42	30.2	63	45.3
	Window Menu	14	10.1	21	15.1	40	28.8	64	46.0

RESULTS
The analyses of the responses can be stated and illustrated as in the following:

(1) t-test result for undergraduates' ability to use programs and gender of participants
When we looked at the *t*-test results of the undergraduates' ability to use programs and gender, it can generally be stated that there is no significant differences between computer competency results and gender variables ($p>0.05$). According to results of mean values of use of programs of males and females, both genders' showed high experience to use Windows and low level experience to use Microsoft Excel programs.

(2) t-test results for ownership of personal computers
In order to measure the level of program usages of the undergraduates by being an ownership of personel computer; the averages of all the subtitles of each program are compared with t-test analysis. The results indicated that the ownership of personal computer was found significant for use of windows programs (M = 3.66, $p < .001$), use of word (M = 2.84, $p < .000$), use of excel (M = 2.30, $p < .001$), use of power point (M = 2.55, $p < .001$) and use of multimedia programs (M = 3.18, $p < .001$).

Table 2 One way Anova results for class and computer competency

	Mean Square	F	Sig.	Group
Windows use	2,52	10,52	,000	1-3, 2-3, 4-3
Microsoft Word	3,61	6,05	,001	2-1, 4-1
Microsoft Excel	6,55	8,34	,000	2-1, 3-1, 4-1
Microsoft PPT	12,40	15,72	,000	2-1, 3-1, 4-1
Microsoft MM	6,56	7,93	,000	1-3, 2-3, 3-4

(3) One way Anova results for use of computers by class of undergraduates
The results showed that use of computers by class variable was found significant for computer competency of all programs (Table 2). According to one way anova results there is a significant difference between all programs and different classes of undergraduates ($p < .001$). After that Tukey test was performed to find detail statistical information about which class made differences related with computer competency. The results indicated that fourth, second and first class students have superiority to use windows and multimedia to third class undergraduates ($p < .001$). Moreover, second, third and fourth have superiority about using of Microsoft excel and power point to first class undergraduates. When we look the results related with Microsoft word program second and fourth class undergraduates have a high level experience than first class undergraduates ($p < .001$).

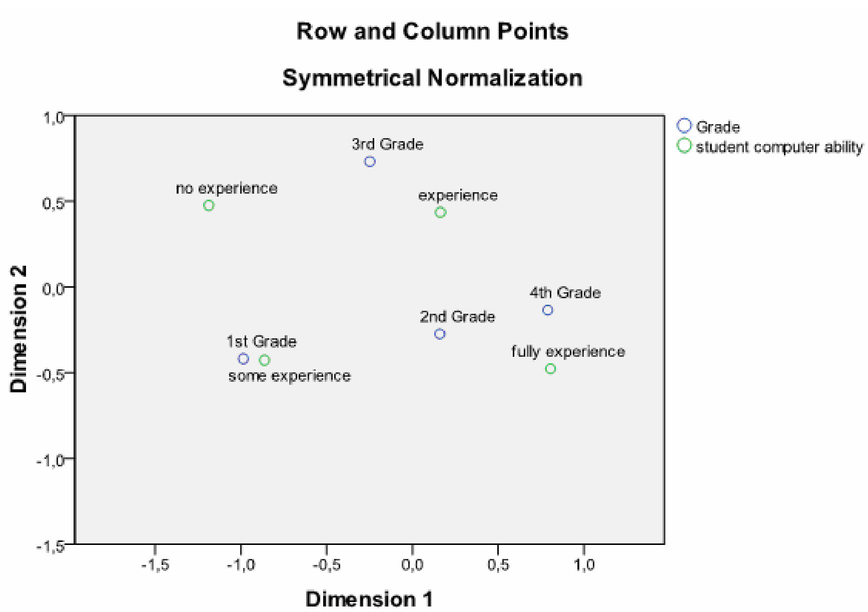

Figure1. The results of optimal scaling between class and computer competency.

Finally, optimal scaling results showed detail analyze between class variable and computer competency. According to results of some classes of recreation department, undergraduates' opinions about computer competency can be collected in one dimension. Also, the computer skills of first class undergraduates are at the low level. Moreover, the usage skills of second and fourth class undergraduates are at high level. Most experienced class is found as fourth class undergraduates. However, even they defined themselves as an experienced class in using of computer; third class undergraduates were in second dimension as different than others. In study there was no class which has no experience related with use of computer.

Qualitative Findings

The open-ended questionnaire, composed of four questions, was administered to recreation department academicians in order to understand their perceptions about the computer competency in detail.

The questions addressed their expectations from the using of computer technology on undergraduates, their perceptions on the processes they experienced during the using of computer technology in their lectures, their perceptions about the level of improvement they achieved by the using of computer technology and finally their future plans about the use of computer technology in their field.

Academician's expectations about the future benefits of having computer competency Academician's answers given to this question were completed under five categories. One of the expectations mentioned by the Academician's was improving computer skills and learning an effective use of computers (40%). One of the academician expressed that "My prior expectation was to develop undergraduates' skills about computer usage." Other academician agreed "I hoped to become a lecturer who explains to undergraduates the importance and benefits of using computers and utilizes them in their future career".

One of the academicians, who had supported his lecture's schedule by computer skills, noted that he was expecting to show the difference between planning computer-based supported schedule and traditional schedule related with how to develop and reach new attractions or programs about recreation and to develop new recreational activities (20%). One of the academicians pointed, "Using computers for developing schedules and activities should be first opinion in their mind. I thought that we should produce more concrete and valid opinions in their mind about the benefits of using computers for improving their creativities related with recreation field". 20% of the academicians expressed that undergraduates have fear, anxiety and worry about using computers in their field. One of the academicians framed that "I realized that from my undergraduates they have doubt to find the answers to such questions like, 'aren't computers things that are really such frightening? Will it really help?, if yes, how?, will I learn?". Another academician introduced that "Before the using computer technology undergraduates told us so many doubts like, "I had been a little bit frightened and felt that it was difficult for me to learn using computers". Also academicians shared some thoughts were mentioned that undergraduates should have just expected to gain theoretical knowledge like the use of media and innovations in technology (10%) with using computer technology more frequently. Finally academicians declared that they desired to learn how to teach more effectively (10 %) with computer technology. Academicians expressed their wish to teach the new teaching activities, ways and methods of finding new ways to love the subject matter about recreation. One of the academicians expressed that "I realized that using computer technology added too much to my teaching profession, learn a lot to practice in my own expertise field within recreation".

Second open-ended question was related with undergraduates' perceptions about processes of using computer technology. More than half of the academicians pointed out that undergraduates found fun to using computer technology in recreation field (35 %). They also believed that more computer technology in their field was so beneficial that all they learned was so permanent. Furthermore, they mentioned their willingness to carry on with this teaching strategy. One of the academicians stated, "The using of computer technology has expanded my repertoire of teaching style". The academicians who mentioned that they improved their computer skills were about 30 %. "Even though, I had used computer before, I was so amazed to find the possible instructional tasks that I could do with it" was claimed by one academician. Another academician uttered, "After start to use computer technology in my lecture I realized that it has added so much for me. With the help of computer technology, I had the opportunity to utilize what we have covered about visual design principles in recreation field". The academicians concluded that they learned actively by doing (20%). One of the academicians acknowledged that, "I realized using computer is not a difficult task. It becomes simpler when a facilitator exists as working on the computer. We were demonstrated what is most suitable for our undergraduates and how to utilize from computers throughout our prospective teaching profession".

Before the adding computer technology in their lecture schedule, academicians reported that they felt fear or anxiety but after having experience year by year they were not afraid of using computer technology, overcame their anxiety and liked this teaching strategy anymore (10 %). Another academician posited that "Even though I am not familiar with technology in general, computers in particular, within the process of getting use to computer technology my attitude towards this issue has evolved regarding computer use and various activity preparation." The academicians realize the importance of reaching all sources about how to establish new activities or games and the use of technology in teaching-learning process about recreation was about 5 %. One of the academician s pointed out that "the using of computer technology is sustained by functioning different teaching games, projects and strategies, and was a best way to save the undergraduates from a monotonous atmosphere of lecture rooms".

Academicians' thoughts on what they gain from the using of computer technology in their lectures, their answers given to this question were grouped comprised of three categories. The ratio of the academicians who think that they learned how to use technology in education was 60%. One academician claimed, "I recognized how the use of technology impacts learning", while another stated "it gained me another dimension in my teaching background on effective teaching". Yet another academician added: "We, as scientist, have to make use of technology in such a modernized era. Or else, we will be disadvantaged in this era". The participants (20 %) have commented that they learned to reach worldwide sources about recreation as new games, activities, materials, and projects and their importance in recreation education. On that topic, one participant declared, "I became aware that all my thoughts were wrong about the needless to spend many hours in front of computer in teaching recreation".

Twenty percent of the academicians agreed that their computer skills have improved. On that issue, one academician informed, "I learned to use different software in my area", while another academician commented that, "I learned how to use computers more effectively." "Throughout use computer in my lectures, I learned how to develop various educational plans on computers."

Academicians' visions about the use of technology within their future classrooms academicians' answers given to this question were comprised of two categories. The percentage of the academicians claiming that they will utilize technology in their future classrooms was 75 %. One of the academician stated that, "computers are the essential part of my professional life anymore", where another noted that, "willingness to use technology in teaching has been formed in my mind, after some years." One another academician stated that, "a computer is a gift for us to increase the effectiveness of teaching." Twenty five percent of academicians asserted that they would continue increasing their knowledge and skills on computers in future. From that perspective, one academician has noted that, "my aim is to improve myself. Since I acquired a computer at home, I am searching the net in all my spare time." Another academician stated, "I am planning on how to integrate technology in my lectures about recreation. I know that some of my undergraduates will have a greater depth of knowledge than me in computer technology, I am aware that I have to adapt myself to technological innovations." One of the academicians also commented that, "Buying a computer should be a first step for recreation undergraduates. After that, everything will follow upon the knowledge they furnished themselves with."

CONCLUSION

Three main question areas are defined for the research and analyzed statically. As a result of the research the competence of recreation department undergraduates in computer competency is examined.

In the research first the relation between gender of participants and competence in Windows was analyzed. Results indicated that there is no significant differences between computer competency results and gender variables ($p>0.05$). According to mean value results males and females, showed high experience on many programs but they showed low level experience to use Microsoft Excel programs. While the analyzing similar researches about gender the reviews present different results. For example; some studies affirmed males had more positive attitudes than female (Bebetsos and Antoniou, 2009; Torkzadeh & Van Dyke, 2002). On the contrary, other study found that females were more competent and positive affirmed than males (Rugayah & Mustapha, 2004). These results indicated that there are supported and contrast studies about gender variable.

When it comes to ownership of personal computers and competence in Windows was analyzed. As a result of the analysis it is found out that the undergraduates who have personal computers are more competent in using all programs. The studies analyzing the impact of owing computer were explored that this factor had a significant effect (Pamuk & Peker, 2009; Akbulut, 2008). These results are supportive for our study.

The relationship between undergraduates' classes and computer competency results (one way anova) showed that there is a significant difference. While looking for the resource of differences between classes it was found

that fourth, second and first class students are more competent to use windows and multimedia than third class undergraduates. Moreover, second, third and fourth classes were more competent about using of microsoft excel and power point than first class undergraduates. When we look the results related with microsoft word program second and fourth class undergraduates were more competent than first class undergraduates.
According to our findings the following suggestions can be made:

Presenting CDs which include recreation techniques should become a habitual part of places.

The analysis of recreation techniques should first be taught through computer supported analysis and then performed practically.

In order to reach actual information about sports, computer and internet use should be promoted.

The undergraduates should be encouraged to receive and send their assignment via e-mails.

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INFORMATICS EDUCATION IN DIFFERENT DISCIPLINES AT UNIVERSITY LEVEL
CASE STUDY: A SURVEY OF STUDENTS' ATTITUDE TOWARD INFORMATICS TECHNOLOGIES

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ABSTRACT
This article presents a quantitative study on attitudes toward the usage of Information Technology related tools and applications. The study was conducted at a private university, Turkey, with 97 female and 113 male students involved as participants. They were each presented with a questionnaire to relate their attitudes toward IT and after undergoing a discrete IT course for the duration of one semester (15 weeks). The attitudes of the respondents were measured in terms of three dimensions, namely, usefulness, confidence and learning. Both genders exhibited the same levels of attitudes after undergoing the comprehensive IT course. The largest improvement for females and males was in the learning dimension which showed that their initial dislike toward IT was greatly reduced at the end of the course. In terms of confidence, female and male participants exhibited an enhanced confidence level after the course. One area of information technology quickly becoming ultimate is the field of Informatics. Information technology is the area of managing technology and spans wide variety of areas that include but are not limited to things such as processes, computer software, information systems, computer hardware, programming languages, and data constructs. To meet this growing need universities are beginning to develop degree programs with the integration of Informatics. In response to the widespread use of and ever-changing nature of Informatics, various investigations were carried out regarding attitudes toward informatics. Employing people who understand Informatics is a top priority for industries, business, government, education and the military sectors. Informatics can be defined as the multidimensional use of technology to support knowledge discovery assisting the decision maker to achieve the organizational goals. Informatics incorporates the way data is collected, organized, analyzed, represented, filtered and managed. Totally this paper attempted to investigate university student attitudes toward the integration of Informatics Technology in their departments and factors contributing to their attitudes so as to provide some constructive information and suggestions for the adoption of technology in informatics education.

INTRODUCTION

The rapid changes that take place in science and technology and developments also affect communication and information technology to a great extent. The rapidly spreading improvements have been felt in all parts of life. These transformations and developments have accelerated the creation, expansion, sharing and utilization of knowledge and they have also become the basic components in public services and economy as well as in information training. It is not quiet logical today to say that only acquiring knowledge is meaningful. Contributing to information production, acquiring changes and improvements as soon as possible and using these are the greatest targets of the modern societies.

When talked about computer assisted learning today in the world, it does not mean computers confined to laboratory settings anymore, instead the holistic outlook of countries to their education systems; a design and problem solving process come to mind. In order to be successful and productive in today's society, even more important than that, to build the inhabitable society of tomorrow, it is necessary for learning to learn, thinking to learn and coming to a understanding on how technology can be used in humanity's service.
Technology greatly affects daily life when looked to school walls. Technology has become an indispensible part of individual life in various areas from ATM's to internet connection. In most of the workplaces, technology usage has become the most preferred knowledge and skills.

In educational environments, the speed of the technological developments suitable to be used in these settings is unfortunately faster than the understanding of the value which these new equipments have contributed to and the pace of applying conscious applications. Therefore, naturally, negative and useless consequences such as the worshipping to technology, seeing the hardware side of technology as a must or having firm dependence emerge. In fact, the way of taking advantage of technological capabilities is more than only acquiring hardware and having internet connection.

As information technology has become the measure of successful performance both in business world, at school as well as in academic areas in recent years the need to integrate technology within educational activities have emerged in many parts of the world. The changing world order, by revealing concept of globalization, have the increased the importance of factors such as competition, and price in the world economy. An intense competition has been observed in the world economy together with the improvement of the information technology, the abrogation of custom walls and the international trade liberalization efforts. In this context, the opportunities brought by technology push the institutions to provide more vigorous and efficient services in global settings.

PURPOSE OF STUDY

The rapid IT developments in the Turkish education system in the past decade, have influenced expectations from higher institutions in Turkey. These institutions are expected to train and equip graduate teachers with adequate knowledge and skills to utilise Information Technology as an effective tool in their teaching practices.
In this study, the following research questions were investigated:

1. How are the Student attitudes toward the integration of Informatics Technology in their departments and factors contributing to their attitudes?
2. Are there gender differences in attitudes towards IT among the students before their enrolment in the Informatics Technology course?

Today, a number of researches have been made in the integration of computer-aided applications in universities Here, two issues strike one's eyes. The first is that the studies done are not completed truly towards the interdisciplinary education and the second is that the concept of information technology is seen from technology perspective. Based on this deficiency, studies that help the retention of information more easily should be done. Technology stands out as a numerical concept. However, there are a lot of departments which are not numerical/ quantitative and students of them are present in universities. In order for these students to comprehend issues in their field faster, they need information technology point of view. The main goal of information technology is not only rendering the easy usage of information technology equipments but also helping the retention of information longer in human mind, therefore, fostering the consolidation of new information. So as to provide this, the information technology concept should be transferred with interdisciplinary mentality. For this, the curricula of different disciplines ought to be examined and the most convenient information technology elements to be applied should be determined.

INFORMATION TECHNOLOGIES AND THEIR INTEGRATION

The concept of data processing can be briefly defined as the result that is produced when technology and information is jointly utilized. Data processing has some aspects: computer software, computer hardware, and computer user and information society. We can define data processing the results we attain when information and technology are jointly used. The English term information technology (IT) is Turkish equivalent of information and information technology. The second most important element of information technology is computers. The computers are composed of computer programs (or software) and the electronically physical components (or hardware) and these are two basic units. Previously, we were writing letters to our relatives and friends but nowadays we can write an email with the aid of a computer and send it. Also we can make net meeting with a camera and a computer. The computers keep data in a magnetic disc that is unique to them. With the help of special commands, when a need arises, the computers send the needed information in a understandable way through the outer environment unit called monitor after finding the required data.

Information technology is a combination of all technologies that include accumulation, storage and processing of data and the connection of data through cables which makes communication possible for a user. Information technology is a concept used for communication and computer systems connectable to all information services.

It is not possible to sort out information technology with only computers. The major information technologies covering a wider product range are computing and accounting machines used in companies and offices, insulated metal and cable products, electronic gadgets with other electronic parts; the products related with television and radio transmitters, telephone and telegraph line machines, television and radio receiver equipments, sound and video recording devices, photocopy equipments, auxiliary equipment, services related to telecommunication and computer.
The services in particular pertinent to information technologies are the wholesale sale of machinery and equipments and their procurement, the renting of office machines and information technology devices including computers, which can be cited as example of cervices related to telecommunication and computing.

Information and communication technologies are thought to increase their importance in educational settings in the future. The goal of researchers and educators who want to spread scientific literacy nowadays ought to be the development of new equipment and technologies; therefore, the instruction of information technologies and the integration of it to learning activities. Educators can use information technologies with the whole class, small groups or individuals. The educators can use information technologies for the presentation of knowledge, demonstration of process and skills, explanation of concepts, delivering of instruction, the formation of bonds between concepts and ideas, the demonstration of video with audio, and the exhibition of writings for the entire class (Meadows, 2004). One of the hardest tasks of students and educators is the application of information technologies to other subjects and the integration of it in an ordinary class. In this process, this learning activity possesses the attributes for the adaptation and integration of informatics which can lead the way for educators.

The information and communication technologies, which are claimed to be at the center of the technological advancements related with globalization, are now seen as the indicators of the information society we are in. The technological developments have accelerated the research processes of scientists. While the universities are rendering cost-effective education to students by using information technologies, they have reached higher qualification and flexibility (Tural, 2002).

The main objective of technology education is improving the level of technology literacy of societies to a certain extent, namely, to increase it. Technology education contains the education towards technology which we come across and which finds usage. The science and technology education is forming the basic components the man power that are masters of science and technology and bringing up technology experts for technological advancement and innovation. As such, the education that requires expert knowledge which is higher than the education literacy dimension is in question. In this case, a connection which has scientific dimensions could be mentioned with technological construction and systems which find usage in our daily lives or in different points of life and which can be improved. In education and technology relations, technology has been used to bolster education. This is used for supplying the educated and qualified human resources of the country and it improves general efficiency of education. Furthermore, some new technologies also develop distance education. Thus, meeting old demands and the opportunity of conferring top notch education in case of inadequacy of source of qualified personnel is formed.

EDUCATIONAL TECHNOLOGIES

Although educational technology, which is nourished by computer sciences, systems theory, cognitive sciences, psychology, sociology and some other sciences and which has some unique attributes and which is a multidisciplinary field, it is within the "educational sciences". In order to define educational technology, many expressions have been put forward by several institutions and organizations and it has been agreed upon in related committees and meetings. The expression above is the last educational technology definition of Association for Educational Communications and Technology (AECT), which is the international organization of educational technology. While educational technology is the name of a discipline, it has been used both as the expression of this discipline around which an application is developed and the name of developers' profession. In this respect, those individuals who work in the direction of information and principles put forth by the "educational technology" is called educational technologist. All the technologies introduced are called educational technologies.

When we analyze educational technology with its items, we see that it encompasses a large area from theory to application. Many elements stretching from educational psychology to learning and teaching activity are included within the scope of educational technology. The interaction of these elements among each other and their organic connection constitute the technology aggregate. When technology is developed for any educational discipline, the relationship between the estimated targets, for that area, and these elements that form technology with current applications must be taken into account.

While the importance of training and research system that depends on specialization in certain fields still continues in education, it gives its place to interdisciplinary and multidisciplinary research, with a growing trend. We may not yet say that this change is rapid and salient, but we may argue that the change of trends is in this direction. Discipline is the name given to a research area which has a unique educational background, methods and content and which proved that it can produce new information in any field and can develop advanced-level information in aforementioned field (Berger, 1970). Every discipline possesses a distinctive doctrine, a professional language, terminology, and intellectual pioneers and followers (Becher, 1989:22; Parker, 2002:374.).

The main dimensions of knowledge within a discipline is taken on and developed such as historical knowledge, theoretical knowledge, analytical knowledge, practical knowledge, experimental knowledge, empirical knowledge …etc
The dictionary meaning of the term "interdisciplinary" is the integration or containment of two or more academic disciplines or research areas. Therefore, inter-disciplinary presumes the use of arrangement of a priori information which is structured according to traditional academic disciplines. If you need to make a short definition, inter-disciplinary as a concept means to incorporate and to contain two or more disciplines (Kline,1995; Klein,2000; Cluck,1980)

The concept of information technology is seen as the product of inter-disciplinary education and research environment. Information technology concept opens new opportunities for under-graduate, masters and doctoral level students who wish to pursue their research and development careers in academic or industrial settings.
Information technology lessons enrich the multi-disciplinary research environment of students.

The generated large amount of data which is collected with different methods needs the effective transformation of useful information and information accumulation for organizations. An information technology system comes into existence with a series of method and applications that transform data into information and information accumulation in order to support decision making and controlling. These systems besides by safeguarding information can distribute it to related elements inside or outside an organization. The study area of information technology systems is related with analyses and design of these systems. Consequently, an information technology system is a discipline that integrates the technology and management of information systems in a certain field.

So as to ensure that education and learning process is effective, long lasting and more comprehendible, information technologies should be integrated into all lessons and all the individuals from the administrators to students should be enlightened in learning and teaching processes.

The USA, the leading country, and a lot of countries have taken necessary steps in topics related to hardware and network/internet in order to make educational technologies widespread. However, to make the educational systems really effective on student achievement, issues such as quantitative content and teacher training necessitate serious studies. Moreover, applications in the areas of hardware and network connection are almost inadequate and severe inequalities exist among regions in many countries. When we look at these four areas, for instance, related with the agreed targets in the United States, how national educational policies and goals should be determined becomes evident. The existing formulated target in the USA in hardware area is that all the teachers and students should have the latest model of multimedia computers in their classrooms. The objective in network connection is that all the classes should be connected to information highway. The aim in digital content is the supporting students with effective educational software and online resources in educational environments. The goal in professional development is that all teachers should have necessary in service training and support services so that their students can use computer technologies effectively. Whether the identified four goals in these four areas are being met can be measured according to indicators in every area.

Cradler (1996) is recommending some elements that should be kept in mind so as to integrate technology in school curriculum. These items can be summarized as follows: the needs of learners, the availability of resources, the determination of educational needs related to education and technology design and the supplying of technical support and counseling in technology usage for teachers. From the studies done in literature, two chief targets in technology integration can be suggested for the effective usage of technology in schools: One is how technology (for instance computer) will be used and the instruction of how information can be accessed. The other target is the effective usage of information technology (IT) and capabilities (accessing, processing and analyzing of data). According to Melmed (1995), in order to attain these goals, educators should take into consideration the results of the studies done in the area of educational technology and the contextual factors affecting learning targets. Teachers play especially an important role in establishing technology integration in training and education processes. The success of technology integration and students' effective usage of technology at school are contingent upon teachers' behaviors and their wishes for internalizing technology.

University which is one of the important components in societal transformation and its pioneering role in usage of technology in education and development are also significant for societies' adaptation to these technologies and the formation of information society. In order to increase technology utilization in universities, primarily lecturers should be eager to use these technologies in lessons and should reach relevant resources when needed.

On the other hand, the demands and expectations of students in the usage of technologies in the lessons is also an impetus factor for the existence of educational technologies in classrooms.

A study Based on Students' Opinion on the Integration of Information Technology to Lessons in Different Disciplines in Higher Education

METHODOLOGY

Subjects and Processes

There were 210 participants in this study (97 females and 113 males) from different intact student groups from Science and Letters Faculty's, Economical and Administrative Sciences Faculty's, Communication Faculty's, Applied Sciences Higher School's Turkish Language and Literature, Translation and Interpretation, Psychology, Management, Visual Communication Design, Public Relations and Advertising, Radio, Cinema and TV, Journalism and Accounting Information Systems departments. These students were registered for a compulsory discrete IT course. Their ages ranged from 19 to 22 years old . The female students had an average of 1.56 years of computer experience while male had an average of 1.60 years of experience prior to their enrolment in the discrete IT course. The average ages of females and males were 20.65 years old and 21.58 year olds respectively. All these students were predominantly from middle-class income families. The enrolment in the discrete IT course − Computer Technology (Bil 102) − which was introductory in nature, was compulsory for all participants in the survey. This course was facilitated by a male instructor who met with the students for two hours a week for fifteen weeks in a computer laboratory. In addition, the students were also introduced the fundamentals of each IT tool and application via computers.

The laboratory sessions, on the other hand, comprised hands-on instructions and several projects to be completed by the students. The projects consisted of homeworks and hands-on exercises in word processing, presentations, spreadsheets and homepages. Exams and homeworks were graded.

The first set of questionnaires was administered to the students on the first day of the course when the second, thirt and fourth identical sets were administered on the final day of the course. The passed time between first and others was one semester (15 weeks). The four questionnaires generated a matched pair of data for each student. This was done to determine the effect of exposure on the attitudes towards IT among the student teachers.

Used Items

Four sets of identical questionnaires were developed in theTurkish language. The questionnaire used was adapted from Wong (2002) and it measures the attitudes of participants towards IT. Several items in Wong's (2002) study were adapted from Christensen and Knezek (1998) and Loyld and Gressard (1984). Three dimensions were measured, these being usefulness, confidence and learning.

Wong (2002) and Davis (1989) defined usefulness as the student's beliefs in the enhancement of the quality of their academic or non-academic related work by using a specific system. Confidence and learning were defined as the student teachers' feelings of uncertainty and strong dislike respectively in using the Internet, specific software applications, other general software applications as well as the computer and IT in general for leisure or academic work respectively (Wong, 2002). The questionnaire included 24 items and each item was accompanied by a Likert scale ranging from a score of 1 to 5, with 1 representing "strongly disagree" and 5 representing "strongly agree" for positive items). The questionnaire was validated by an independent course instructor. The questionnaire was pilot tested on a group of students(210) who took the same course a semester before this study was conducted. No ambiguous items were found and the reliability for the 24 items was established at .79 using the Cronbach alpha, indicating good internal consistency. Wong, S. L., & Hanafi, A. (2007).

Data Analysis

A t-test was conducted to determine if there was any significant difference between females and males in terms of their prior computer experience before taking the Bil 102 course. One-way between-group multivariate analysis of variance was performed on the pre- and post- test scores separately to examine if average differences were significant between females and males in terms of usefulness, confidence and learning before and after completing the course. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices and multicollinearity. No serious violations were noted in any of the test scores. Analyses of variances on each dependent variable were conducted as follow-up tests to the Multivariate analysis of variance. Using the Bonferroni method, each analysis of variance was tested at the adjusted alpha level of .004. It is important to note that the alpha levels reported for confidence and learning were cumulative sum of the separate alpha levels for both as these two variables have reciprocal effects and are, thus not considered mutually exclusive of each other. A paired-sample t-test was conducted and tested at the .04 level to evaluate if there was any significant difference between scores from first to fourth times in respect of the three dependent variables. Wong, S. L., & Hanafi, A. (2007). The analysis was conducted separately for both females and males, to examine if female and male students' attitudes were more positive after completing the Bil 102 course.

Limitations of Study

It should be noted that the ratio of females to males who participated in this study was unequal and the number of participants involved was relatively small (N=210). These factors could pose a threat to the results generated from the Multivariate analysis of variance analysis. Based on the recommendations by Pallant (2001), the number of cases in each cell should be more than the number of dependent variables. The minimum number of cases in each cell for this study was three (the number of dependent variables). In this study, the number of cases per cell far exceeded the minimum number of cases set. Wong, S. L., & Hanafi, A. (2007).

Questionnaire

Within the scope of the lessons of information technology or basic computer technologies, students are given basic information technology concepts, about which the information technology has reached to the point from past to the present, as well as practical education on the standard application software. The most crucial points of this lesson are basic concepts of information technology and computer usage basic training. The commentary of university students related to the scope of this lesson will have a positive effect in the development of this course.

Gender:
Age:
Faculty/Department:
Computer Experience: …years

The students are required to answer the following survey questions, below, as "I Strongly agree", "I agree", "Neutral", "I do not agree" and " I strongly disagree".

A) The opinions of students on classical education method

1-)The classical plain explanation method in technology lessons is enough for me to understand the subject and system.
2-)Reading a text by looking at the picture in the book to understand the system is not boring and difficult.
3-) I can easily animate the subject in my mind by looking at the picture in the book and reading a text.
4-) I definitely have to repeat myself after the subject is told in so as to understand the system.
5-) It is absolutely necessary for me to comprehend the subject
that the teacher first explain it.
6-) If I understand the structure of the subject thoroughly in lesson, I become successful in workshop applications.

B) The opinion of students about constant visual materials

1-) Besides the picture in the book, I can fathom the book completely by the still pictures shown by a projector.
2-) I can grasp the subject with one picture displayed by a projector.
3-) I can understand complex systems easily with a still picture.
4-) It would be better if more than one picture instead of one was shown in order to grasp the system.
5-) I need extra course materials so as to understand the subjects.
6-) I can keep my focus on the subject without getting bored in course environment.

C) The opinions of Students on Computer Assisted Education

1-) There is absolutely a need for computer assisted education-teaching in education
2-) Computer is an ideal equipment for education.
3-) Classical system is sufficient for technology education.
4-) There is no difference between computer assisted- education and that of classical one.
5-) Computer assisted- education can be used as a method to supplement classical system.
6-) I can learn a subject by myself with the help of computer assisted-education, without a teacher's lecture.

D-) The ideas of students on motion picture

1-) I can more easily understand the structure of systems and subjects with moving picture.
2-) Animation is highly effective in the instruction of complex structures.
3-) There is no difference in facilitating understanding between the motion picture and still picture.
4-) I can more easily focus my attention on a subject with the aid of computers and moving pictures.
5-) The topics that seem abstract to me can be more understandable with moving pictures.

6-) Examining change in the system by punching the variables myself is required for my learning.
This research was applied to students of Science and Letters Faculty's, Economical and Administrative Sciences Faculty's, Communication Faculty's, Applied Sciences Higher School's Turkish Language and Literature, Translation and Interpretation, Psychology, Management, Visual Communication Design, Public Relations and Advertising, Radio, Cinema and TV, Journalism and Accounting Information Systems departments of a foundation university (private) in Istanbul

Ten basic expressions are used in this research. These 10 basic expressions were synthesized from the literature on computer usage on education. The sources used are listed at the end of the article.

1. To reach conventional education and training goals during the education program as a tool
2. To widen and enrich education whilst the education program
3. To motivate the learners
4. To support the learners about thinking on their learning.
5. On other conditions, providing those outside the curriculum a chance for an accession.
6. To increase the efficiency in education
7. To lower the education costs
8. To make education more efficient
9. To prepare for work life
10. To decrease the inequality among the students who reach Information and Communication Technologies in different ways.

These expressions reported above are evaluated by students of different faculty and departments of a foundation university. A foundation university is deemed eligible for this study. The newly established foundation universities have been making arrangements and updates in order to take the course curriculum to a degree for their faculties and departments. Especially within the scope of information technologies which is often appropriate to give a common curriculum, computer, information technology etc, from time to time the suitability of courses for students is an issue that should be considered. Based on this idea, a newly founded university, that is, assessment of a university with an unsettled information technology course curriculum will give accurate results.

CONCLUSION
Based on the findings of this study, most of the people answering this survey have agreed to the idea that information and communication technologies are indispensible parts of education. Another derived significant result is that the participants of this survey are of the opinion that the education of information and communication technologies should be bolstered. One other outcome that can be obtained is that the students' computer skills can not be sufficient.

The results drawn form these data put forward the significance of this study. This study will form a serious preliminary study in getting the ideas of people about the usage of Information and Communications in Education in Turkey. The obtained data will be compared with the studies done in other countries and will form the precedent knowledge on the situation of Turkey's ICT and education.
Every university, and even more important than that our whole education system, ought to have a mission and plan about educational technology. Educational technology, which is within systematic approach, for the evaluation of decisions with more objective criteria such as the determination of goals, strategy and solution suggestions, technological applications, integration and the evaluation of results is the necessity of research and continuous scientific reporting.

As a result of this study, the effective and efficient usage of technology as an educational tool can have a noticeable effect on students' achievements, attitudes, communication among teachers and their peers; it can also develop students' interactive, individual learning and high level thinking skills.
Effective technology integration requires radical changes in education and learning system and teachers and the schools that teach them play a key role in this process. Therefore, technology integration devoid of a well-informed, skillful and well-trained teacher will not bring any benefits to education.

In order to meet the related expectations about the utilization of technologies in universities in developed countries and the development of new technologies, the units that just work on this topic have been in operation for a long time. It became obvious that in a variety researches conducted in our country, in strategic plans of universities, in order to meet the determined necessities, these departments should be established within Turkish universities and become widespread.

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INTEGRATING ICT AT THE FACULTY LEVEL: A CASE STUDY

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ABSTRACT
ICT integration can be realized at various levels: It can be at a state level (central government); at an institutional level (Higher Education Councils); at an organizational level (universities and schools); at a faculty level; at a department level, or at an individual level. Thus, ICT integration can be studied at macro level as a system, or it can be studied at micro level or can be studied together. In this study, ICT integration is studied at macro level which covers the ICT integration both at administrative and instructional levels. Although each level is interrelated with each other, the aim of this study is to investigate how ICT is integrated at the faculty level in an institution.

Since ICT integration is a multi-faceted process and related to many factors, a qualitative case study is applied in order to understand this process in a holistic way with different angles. Data were collected through observations, official documents, individual semi-structured interviews and focus group interviews. Data were analyzed by using content analysis. Finally an ICT integration model is suggested.
Keywords: ICT, Integration, Integration Process, Technology, leadership

INTRODUCTION

Information and communication technology (ICT) is defined by Berce, Lanfranco and Vehovar (2008) as "a mixture of hardware (equipment), software (operating system, applications, etc.) and communication facilities (Local area Networks, wide area and backbone Networks, communication protocols, etc.)" (p, 190). Wang and Woo (2007) also defined ICT as a tool. They stated that "*ICT* can be hardware (such as computers, digital cameras), software (such as Excel, discussion forums) or both. In the educational context, it mainly refers to various resources and tools (software) presented on the computer" (p. 149).

ICT integration is defined as a "…process of using any ICT (including information resources on the web, multimedia programs in CD-ROMs, learning objects, or other tools) to enhance student learning (Wang & Woo 2007, p.149). ICT is not particularly reserved for education. The common point in ICT definition is that ICT is a tool to realize learning objectives (Koçak-Usluel, Mumcu-Kuşkaya & Demiraslan, 2007).

Many researchers examine the ICT integration process with various variables at the class level (micro level), at a national level (macro-level), or at the local school level (meso-level) (Tondeur, Keer, Braak & Valcke, 2008). To put it another way, ICT integration efforts can be examined at the state level, such as examining the –central-government ICT policies and its integration efforts; another one is at the institutional level, like the efforts of Higher Education Councils on the way of integrating ICT policies. The third one is the organizational level, like universities and schools do; finally, it can be at a faculty level, at a department level, or at an individual level indicating the integration of ICT into the instructional process. Thus, ICT integration can be studied at macro level as a system, or it can be studied at micro level. Also, it can be a mixture of the both as displayed in figure 1.

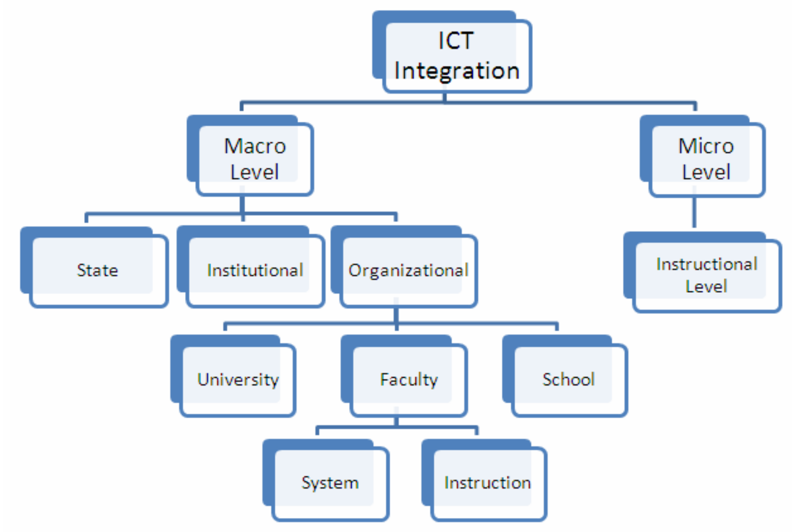

Figure 1. *Levels of ICT Integration as a Process*

ICT integration in education in Turkey had been studied with different dimensions: Factors that affect ICT integration (Koçak-Usluel, Mumcu-Kuşkaya & Demiraslan, 2007 & 2008; Demiraslan & Koçak-Usuel, 2005; Usluel, Aşkar, & Baş, 2008; Aşkar, Usluel & Mumcu, 2006; Özdemir & Kılıç, 2007), ICT integration at the system level (Akbaba-Altun 2006), and administrative dimensions of ICT integration (Akbaba-Altun, 2004; Toprakçı, 2006; Akbaba-Altun & Gürer, 2008).

To conclude, ICT integration is a complex process and happens at different levels. Although each level is interrelated with each other and ICT integration is a process rather than a product (Wang & Woo 2007), the aim of this study is to investigate how ICT is integrated at the faculty level. What kind of processes have participants gone through? What were the steps? Who is/are the leader/ leaders? What kind of problems and issues they faced during this process? Can all those experiences take us to a workable model?

METHODOLOGY

Since ICT integration is a multi-faceted process and related to many actors, a qualitative case study is applied in order to understand this process in a holistic way. In this research how, what and why questions are posed in order to understand how ICT is integrated at the faculty level. Yin (1994) reports that case studies are preferable when "how" and "why" questions are being posed; the investigators have little control over events; and focus is on a contemporary phenomenon within some real-life context (p, 1). Berg also (1998) claims that "case study methods involve systematically gathering enough information about a particular person, social settings, event, or group to permit the researcher to effectively understand how it operate or function" (p, 212). It was decided that case study was an appropriate method for this study because it was focused on a real-life situation, and the researchers had no control over the events.

Research Setting

This research was conducted at a faculty of education which was established in 2001. In the faculty, there are seven departments and nine programs under those departments. There are 48 faculty members and there are 974 students at that faculty. In the faculty, there are five electronic classrooms, two computer labs, four overhead projectors, and personal projectors. Most of the faculties have desktop computers at their offices. The faculty has its own web site and there is a link from this web site to faculty's information service. Student information system, student affairs control system, university dormitory control system, control system for graduates, and e-mail services are all available services from the university web site. In addition, there is a learning management system (LMS) that can be used by academic staff when requested. It has begun to build up in 2002 and in 2009 it has 4th version of it. During the data collection process, despite 74 academic members were enrolled to use this system, only 42 academics were actively using it. As of to date, 1736 students were enrolled in LMS and 138 courses have been offered in LMS.

Participants

The selection of the participants was based on purposeful sampling. According to Patton (1990) people can learn a great deal about the issues of central importance to the purpose of the research with purposeful sampling. Qualitative research focuses in depth on relatively small samples, which are selected purposefully. This faculty was chosen because it is in the process of ICT integration both macro and micro level. The participants of this research were faculty dean, head of computer center (head of IT department), the department of Computer Education and Instructional Technology 's (CEIT) chair, three academics who are at CEIT department and uses LMS, and one volunteer academic, one technique personnel, and seven research assistants. The faculty dean and other participants were asked individually to participate in this study. They were reminded that they could refuse to participate or discontinue at any time without any further questions. In addition, they were also assured that their confidentiality would be kept and no real names would be used.

Data Collection

The data were collected at the beginning of winter of 2009. The primary sources of data were semi-structured interviews, focus group interviews, documentation, and participant observation. The researchers participated in faculty training programs related to ICT integration and worked together with the faculty. They observed their all experiences and reflections during the training and took notes of their questions during the meetings. Faculty training had been done two times for the faculty and research assistants separately.

The semi-structured interviews are conducted with the deans, academics, head of IT department, and one technique personnel. This interview technique is also called a standardized open-ended interview by Patton (1990). The basic characteristics of the semi-structured interview questions were prepared beforehand (Berg, 1998). Since faculty of dean and four academics from CEIT department who are supporting the faculty's ICT integration with technical, administrative and educational dimension for understanding ICT integration in faculty level, they were included in the interview. Also an academic volunteer member participated in the interview. In addition to those participants, another interview was conducted with the head of IT department to understand the effects of HEC's ICT policy on university or faculty, university ICT policy and its effect on faculty of education and also how ICT policy at the faculty of education has an effect on the university.

The interview is conducted with one of the technical personnel who was responsible for solving the computer-related problems that faculty might have experienced either at the laboratory or in the electronic classrooms. *The Focus group discussion* is conducted with seven research assistants who had participated faculty training programs related to ICT integration.

*B*ogdan and Biklen (1992) describe documents as personal (intimate diaries, personal letters, and autobiographies), and official (internal documents, external communication, students records and personal files). According to Yin (1994), documentation sources can also include memoranda, announcements and minutes of meetings, proposals, progress reports, internal documents, newspaper clips and articles. Patton (1990) is accepted that answers of open-ended question in survey so the result of survey is accepted as documentation in this survey. In this research, NIC Regulations quality documents, information on faculty of education's web site and the result of survey about using materials in faculty were gathered as documents.

Data Analysis

Interviews were audio taped and transcribed regularly. Field notes were written on a daily base and indexed. As Berg (1998) emphasized well that "the most obvious way to analyze the interview data is content analysis" (p. 9), the data were analyzed by content analysis. In order to make data systematically comparable, an objective coding schema applied to the data that is at the heart of content analysis (Berg, 1998). In content analysis, researchers examine the communication in a systematic way based on coding schemas. Finally, findings were visualized with figures in a model. In order to provide reliability and validity, data were analyzed at different times with different researchers. In addition, findings were supported by participants' self-report statements.

FINDINGS

One of the initial questions was to explore whether the faculty and faculty members had ICT related or ICT integration goals /Objectives. The findings revealed that the faculty as an institution did not have written ICT policies on the web site and there is no any written goal in the quality documents of faculty of education. The dean of the faculty of education had his goals in his mind. He said that *"there should be top down and bottom up integration. We should train all faculty members about ICT use in their classes. But especially research assistant will be locomotive of this movement. In near future we all should use LMS and extend distance education for some courses. We should create common organizational culture. We should have standards together".*

The head of the IT department mentioned that the ultimate goal is to benefit from technological opportunities. The department of IT tasks has written in their homepage the following: "*The department of IT provides quality service to all units with advanced technology, research and continuing employee trainings, strategic applications*". To sum up, there are no specific integration goals or objectives.

Although there is no written ICT objectives for the faculty, academics talked about their personal objectives. The faculty coordinator said that *"there should be objectives at National Informatics Committees (NIC) regulations and also there should be some written objectives at Quality documents".* Another academic from CEIT department said that *"integration is a must. So, it is late to say there should be integration. Because it is everywhere. Everybody must use it. There should be teaching and learning everywhere. There is official goals at least national informatics committee has to use technology. There are LMS projects prepared by CEIT department to be use by all faculties.*

The volunteer participant also mentioned about what kind of goals should be. He said that " *I do not know politics about extending e-learning. If I know that faculty has objectives or goals I can have strategies align with those objectives. There should be individual objectives also in order to realize organizational objectives and vice versa. Right now I have personal objectives about using LMS for my measurement and evaluation courses. Those seminars triggered my attitude to use LMS. My colleagues had a positive role in changing my opinion."*

Since there is no written ICT related objectives, in practice there are ICT related objectives in minds. There are some attempts to realize those objectives. One of them is to give seminars about ICT integration. Those objectives seem to be in align with NIC and university objectives. It was found that there were task definitions in peoples' mind; yet, no written objectives about ICT integration existed.

Another inquiry was related to explore what kind of processes had participants gone through on the way of ICT integration. ICT integration policy had been composed at the university level for administrative purposes in 1997. ICT integration at the course level, on the other hand, had been started at the departmental level and extended to the faculty level. In the Faculty of Education, computers had already been used for administrative purposes, especially in the students' affairs. After the establishment of CEIT department in 2004 within the faculty of education in mentioned university, CEIT had a pioneering role in integrating ICT at the course level. The dean of the faculty said that "*this duty has given to head of CEIT Department. She prepared an integration program. We will continue based on that program."* But, at the faculty level, the integration process had started in 2007 by the help of CEIT. One of the participants said that *"integration has been realized since 2004 at CEIT department."* Another participant from CEIT said that "*first we started with e-learning than we continue with LMS."*

As to observe who the leader or leaders in ICT integration at a faculty level are, *o*ne of the participants from CEIT department defined the technology leader as a person who *"... uses technology effectively and productively, and who disseminate or diffuse it.* Participants have different views about who should be leader in integrating ICT at the faculty level. Most of the participants said that there should b*e "Not a leader but leaders".* One of the female participants said that "*in this process, faculty dean and the vice dean should take roles because it is easy and fast to integrate ICT from top down. Absolutely there should be a leader. From bottom up it is difficult and hard taking a long process*". Another participant from CEIT department mentioned about the role of the leader. He said that "*leader should be genius, should facilitate knowledge sharing processes, to others."* He also talked about CEIT's pioneer roles**.** He said **"***Each person can lead in his or her field. Since CEIT department mainly deals with technology, CEIT department can have a pioneering role."*

The head of the IT department also said that *"Normally nobody or any department can say you should use this technology. So there could not be a leader".* Faculty dean also said that "*I gave ICT integration task to the chair of CEIT. But, I see no leader*."

Our volunteer academic participant mentioned about how should be a leader. He said that *"there should be not one leader but there should be leaders. CEIT should be institutional leader. They should provide support to administrators and academic personnel. CEIT not only coach for today but they must help us develop objectives/goals for future."*

Another question in this study was to observe the patterns in the perceived problems of ICT integration process. Faculty in the department of the CEIT stated that ICT integration process had started with some problems. One of the participants said that "*there was no extra resource for integration and we started with whatever we had. More coercive power or official system can be established. There should be more personnel hired for integration. Students' participation can be encouraged. Briefly, ICT integration is a painful process."* Another participant from CEIT pointed out the need for awareness raising. How it should be done is to have them use ICT, it should be disseminated. *"Faculty development programs and in-service training should be given and conduct needs analysis. After determining all faculties needs, based on those individual needs, there should be technology planning."*

Another articulated problem was related to the faculty training/development problem. While a new technology becomes a part of the process, training and the process of informing others begin. According to the participants, there are some problems observed at this point. One of the participants said that "*training should be given for users to use a new technology and information process should be initiated. In this way problems can be solved."*

Participants also talked about the academics unwillingness and resistance. Mainly when academics have a lack of understanding on the usage of ICT tools, they become unwilling and reluctant to use the technology. Some of the participants said that:

> *"There is a negative attitude for technology. Some of them don't need more technology nor have an insufficient knowledge and necessary skills."*
> *"Faculty members except department of CEIT are unwilling at this point."*
> *"Some of the faculty members resist this integration process. But, they should improve themselves and be aware about their learning."*

These findings indicate that when starting for ICT integration, lack of resources, support from administrators, and felt needs are to be taken into consideration. Problems with the existence and use of hardware and software cause lack of motivation. In addition, there were staff development problem as well as academicians' unwilling and resistance to the integration.

From this point on, the inquiry was followed up with exploring the stakeholders' suggestions on what should be done for effective integration at the faculty level. Participants indicated that technology planning, coordination, providing facilitation, motivation, encouraging students, faculty training/development programs, ICT integrated curriculum, providing materials and maintaining equipment, full infrastructure, administration's commitment and leadership are needed for effective integration. The information of these requirements is presented in the relevant subtitles.

Leadership: According to participants, leadership is a very important component for effective integration; therefore, there should be more than one leader at the faculty level, especially within the CEIT department. As one of the participants claim *"ICT integration at the faculty level brings out the technological leadership roles. During the integration process, it is suggested that, there should be more leaders. But, CEIT department can take the pioneer role during this processes"* explain the leadership role.

Commitment of and support from the Administration: The support from administration has a primary role for effective integration. Administration should take pre-cautions whenever necessary. Administration and CEIT department should cooperate about the requirements and provide continuity of cooperation.

One of the participants explained the situation as *"administration must be committed to this process. Administration would know the needs of personnel and support budget, facilities of inventories and policies against problems."*

Full infrastructure: Some participants mentioned about the importance of technical infrastructure. According to them, technical infrastructure should be improved to overcome hardware and software problems and the faculty should allocate additional resources. Some of them said that:

> *"Integration process has been initiated without an additional source. Therefore there are some problems about hardware and software"*
> *"Technological infrastructure (both as software and hardware) is provided for effective integration. All of the classrooms must be technologically equipped. "*
> *"Limited resources should be improved."*

Providing materials and maintaining equipments: Participants emphasized the importance of providing necessary materials and equipment for effective integration. They also emphasized their problems as "*there is a money problem. There should be allocated budget for integration. Many of the existing hardware and software aren't up to date or out of order. Maintenance should be done.*" and "*we need various materials and equipments for using in courses. But we don't know how we can provide these materials"*.

ICT integrated curriculum: Participants indicated that integration of technology must be done in parallel with curriculum spreaded to all classes. One participant brought this issue with the following statement ***"****curriculum must be reviewed. It is decided that technology can be integrated which course and how can be done with* *program development."* Another participant said that "*course contents must be transferred to digital media and by this way must be opened for distance access."*

Continuous faculty training/development programs: According to the participants, in-service training should be organized for all faculty members for integrating ICT to their currıculum and courses in order to benefit from online environment. As a result, faculty members should be motivated in this regard. The following statements mention what kind of training the participants expected.

> *"In-service training should be organized for adapting to technology integration and using technology effectively."*
> **"***In-service training and development programs are insufficient".*

*Encouraging students***:** The integration process should be enriched by students. In addition, students should be motivated to take part as a volunteer for the integration process. Two of the participants said that:

> "*Academics as well as students must attend this process."*
> *"Students should be encouraged to use technology. Also different projects should be given to students outside the curriculum."*

Motivation: According to the participants, not only students but also faculty members need to be motivated. This motivation can be achieved by reward mechanisms.

One of the participants said that *"establishing rewards and incentive mechanisms, faculty members should be encouraged to use the technology."*

Facilitation: Providing facilitation: There is a technical personnel for helping both faculty members and students in electronic classrooms and computer laboratories. Participants all agree on this issue. Some of the participants said that:

> *"Faculty members are worried about if there is a problem using the technology what am I doing? So technical support would be given them."*
> *"There is at least a technique personnel for helping us when a technical problem occurs This personnel helps not only faculty members but also students."*
> *"We consistently encounter the situation as my computer is broken down, I can't enter students' grades to the database"*

Coordination unit: A coordination unit must be responsible for the integration process, providing technical, educational and motivational support to the academicians. One of the participants said that *"there is at least a coordinator for maintaining material, training, coordinating between departments."*

Technology planning: According to participants, a technology plan is an important component for using technology in institutions effectively. Thus, ICT integration process can be planned in the long range. This need was raised by one of the participants as *"The 5-year technology plan should be established for this prediction and the annual assessments should be done for the continuity of this plan."*

Having stated the patterns in explaining the required components of ICT integration as a process, researchers revisited the data to observe how this process could be realized. In order to integrate ICT at the faculty level, first, departments and faculty members are to be informed about this process. The steps emerged from the data were displayed in figure 2. In the next section, these steps will be defined briefly.

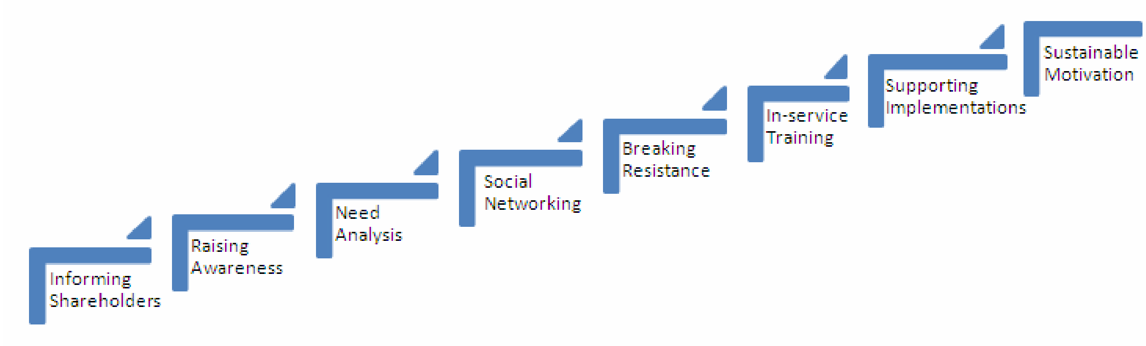

Figure 2. Steps in ICT Integration Process

Informing shareholders: All shareholders (including administrators, instructors, staff members, students, parents, community leaders, and technology experts) in institutions act together and share information with each other in ICT integration process, so rate of ICT integration process is accelerated. One participant said that *"the process of technology integration is important. Departments must be act together and all of them must be join this process. All staffs must be share their experiences. In addition, students should be involved in this process accompanied by academic staffs*"

Raising awareness: In order to integrate ICT into education process, individuals must be aware of all those technologies. This motto can be better understood by the following statement: "*raising awareness is the need to focus on technology integration. If diffusion of a technology is what is wanted, it should be introduced by using it.* "

Needs analysis: One of the prior conditions of ICT integration is to identify the problems and needs. Not only the needs of academic member but also student's needs are to be identified. One participant said that *"faculty members' ICT needs would be analyzed. After the needs analysis, a technology planning should be done."*

Social networking / social structure: Technology is utilized within a social system. While one faculty or a department decided to integrate ICT into their educational or administrative process, ICT integration process in other institutions must be reviewed. As one participant said that **"***to collect information through learning what is going on at different faculties and reviewing literature about what or how they do in the process of technology integration. We must examine our needs if they are similar to ours or not. We should communicate with them effectively."*

*Breaking resistance***:** Some faculty members could reject using technology for their neither administrative nor instructional purposes. For those people, the institution must develop different strategies to break this resistance. One participant mentioned about this situation in her statement as *"there is a need to break resistance. Staffs, who want to maintain their earlier habits, consider that their work loads would increase. We should show them that it just happens the opposite. Their job would become easier with using technology. "*

In- service training: Institutions should provide staff development and in-service training for academic members and administrative personnel to change their knowledge, skills, attitude, and habits as participants claim that "*in-service training activities should take place in our faculty as well as applied in other faculties" and "administrators must decide the continuity of in-service training."*

Supporting implications: In order to provide continuity of using technology, individuals should be supported and motivated with various reward systems. In addition, administrators should take necessary precautions to support successful applications. Those expectations are mentioned in the statements below:

> *"Firstly, in service training and developmental training are supported by administration. And then departments must support each other mutually. "*
> *"There can be various training about how to I use or integrate. In this way I can develop my own method with using various technologies."*

Sustainable motivation: Resistance can have various reasons that are based on needs, attitudes and resources to adopt and use technology. If the institution wants to integrate the ICT in their programs, individuals must be motivated permanently. One participant mentioned in the following statement how his motivation is lessened with lack of tools as "*Motivation is fallen as a result of lack of tools or access to technology. For instance, I haven't had a CD writer on my own PC.*"

Can all those experiences take us to a workable model?
Having considered the patterns in the data and the experiences of stakeholders during this process, a workable model which covers university, faculty, department and individuals, was proposed. The model and its components are shown in Figure 3. This integration model provides useful guidelines from top down to bottom up for incorporating ICT into teaching, learning and administration at the faculty level.

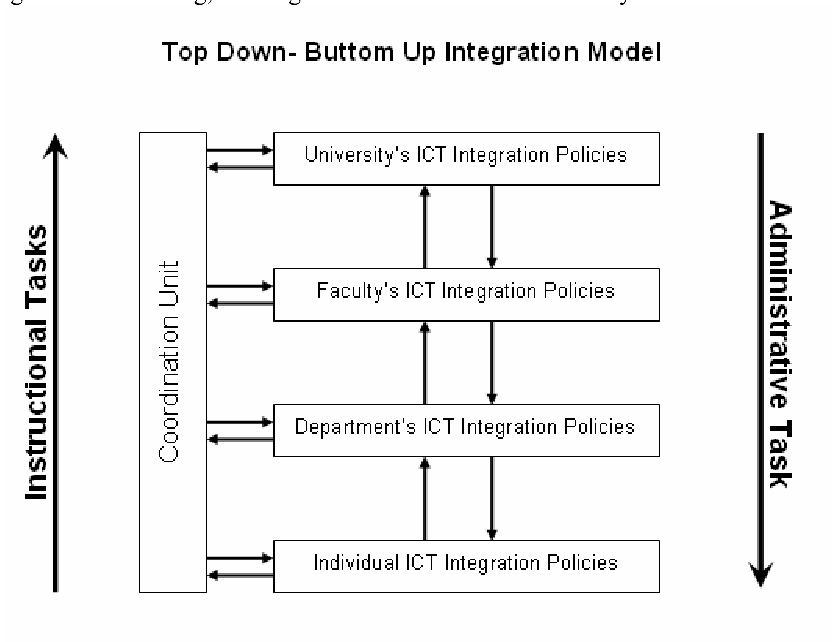

Figure 3. *Top Down- Buttom Up Integration Model*

ICT in education is a domain in which many components (university, faculty, department and faculty members) play a role. Each of these components has unique policies which might affect ICT integration process. ICT integration is the interactional output of these components. It covers both administrative and instructional level interactions. ICT integration process can be examined both from the university perspective and from the perceptions of individuals. Interactive integration works best when the interaction is bidirectional from top down and bottom up. In order to perform effective and efficient ICT integration process, there must be a coordination unit which could function in two-way interaction with university, faculty, department and individuals. In this top down and bottom up integration model, mainly top down integration imply the administrative system and infrastructure, policies etc.; in the bottom up, on the other hand, the instructional issues are addressed. In order to benefit from this model effectively and efficiently, the objectives and implications should go hand in hand.

CONCLUSION AND DISCUSSION
Technological changes in the past quarter of the century have challenged professional educators to reevaluate their instructional skills and to reconstruct their delivery as they assist students in integrating new technology tools (Toledo, 2005). ICT integration is a complex process and it has many dimensions with various levels. There are many studies to investigate these dimensions in ICT integration.

In this study, during the data collection time, there were no written objectives about integrating ICT into educational processes at the faculty. Yet, while writing the report for the findings, it was observed that, ICT integration objectives are included in 2010-2015 faculty strategic plan. Couples of suggestions are needed when transforming those objectives into realization. First, these objectives should be as clear and as precise enough to be understood by all shareholders. Secondly, those policies should have a road map, indicating how to realize them. Based on those objectives, training personnel, providing the necessary materials, upgrading and maintaining of the equipment should be taken into account. In order to effectively integrate ICT at the faculty level, university, faculty, department and each individual should have ICT related objectives that those objectives should be in line with each other. Therefore, these objectives should be gathered and examined. Finally, realizations of those objectives need strong and committed leadership.

The educational policies for the integration of ICT can serve for different goals (Berrocoso, Meneses, and Melchor, 2009). These policies should be able to coordinate efforts of a very different nature and to focus them to deliver on objectives established at regional or national level. Within the context of this study, it was found that in order to integrate ICT effectively, first there should be ICT related goals or objectives to determine the institutional policies. According to the faculty members, the faculty does not have any written ICT goals or objectives. But there should be written ICT objectives which are influenced by the decisions of teachers working according to state regulations, that give them broad methodological freedom and by the expectations of the faculty management (Török, 2008). Then, in order to realize those goals or objectives, a strong committed leadership is needed.

A leader in ICT integration has a major responsibility for initiating and implementing educational environments change through the use of information and communication technology and can facilitate complex decision to integrate it into learning, teaching and administration (Schiller, 2003). Leader should motivate all educators, provide material and maintain equipment, and plan technology based on the felt or articulated needs. Therefore, at least one leader is needed for ICT integration process. Akbaba-Altun (2004 & 2006) found that leadership is an important dimension in integrating ICT into education process by providing support as in motivation, technical skills, coach, etc. Moreover, technological leader role is one of the roles of the dean at the faculty of education. Although others expect to see the technological leaders in an official position, in practice technological leaders can be different person. This person should have technique knowledge, interaction and communication skills. Thus, the group could perceive him or her as a leader.

ICT integration started with an administrative need and led to instructional issues. In order to integrate ICT effectively to the instructional process, first of all, administrative process should address the issues related to technical, legal and administrative infrastructure. Instructional integration can then takes place and spread to other courses, departments, whole faculty even to the university. In this research, it was found that, in order to integrate ICT effectively, there should be leaders from different departments, mainly from the CEIT department. In addition, it was observed that CEIT department has a pioneering role in instructional integration.

ICT integration is not an easy process. It seems that when starting for ICT integration there can be some issues and problems that should be solved. Those mentioned problems are lack of resources and support from administrators, hardware and software related problems, equipment problems, lack of motivation, staff development problems and academicians' unwilling and resistance. One of the previous studies conducted by Akbaba-Altun (2006) also showed that ICT integration problems can be related to infrastructure, personnel, curriculum, administrators and supervisors. Ertmer (1999) and Sang et. al. (2010) mentioned two barriers restraining individuals using ICT efforts: external barriers and internal barriers. According to Sang (2010), external barriers are related to technology training and supports; internal barriers are related to individual's philosophy about teaching and learning. In order to overcome these barriers, certain support should be given from university to individuals. Since there is a continuous development in ICT, there should be continuous staff development or in-service training. Besides, infrastructure, support materials, hardware, and software support should be provided to encourage faculty members and students. Each faculty member has their own philosophy or policy to integrate ICT to their courses. They may have positive attitude but do not have technical skills to use ICT. They may need technical assistance. During this process, coordinators and facilitators can encourage, motivate and support them for their efforts.

This study proposes a model for ICT integration at the faculty level. Although a number of technology-integration models exists in the literature, most of them address the barriers of ICT integration faced by teachers or problems of introduction of new technology either into the classroom (Hinson et al. 2006; Friedrichsen et al. 2001; Whitehead et al. 2003) or into the curriculum (Wang and Woo, 2007). One of these models, for example, is proposed by Hinson et al. (2006). The researchers recommended that professional development planners use their five-step model of technology integration: planning, preparation, instruction, refinement, and evaluation (Hinson et al. 2005). Their model addresses the barriers that influence teachers' decisions to use technology, such as school culture and personal beliefs about teaching with technology.

Another model is proposed by Toledo (2005), who developed another five-stage developmental model of technology integration, which had Pre-Integration, Transition, Development, Expansion, System wide Integration. These stages contained themes of leadership, support, resources, and faculty and student technology use and integration.

Addressing the variables involved in an institution's decision to offer its educational program to its students, Collis and Wende (2002) suggested a model to study on these variables (Environmental Conditions & Settings, Policy, Implementation, Practice, Experience & Effects) which are ought to influence an institution's dominant approach to educational delivery and their use of technology. According to the authors, these variables form a complex system, where each variable has an influence on the other and has a major impact on an institution's general approach.

The findings of this study confirmed that ICT integration is a multifaceted and complex process with various stages involved. The data revealed various steps which started with informing shareholders and continued with raising awareness, need analysis, social networking or understanding social structure, breaking resistance, giving in service training, supporting implications, and finally, finished with sustaining motivation. Individuals must become aware of the new technology. As Rogers (2003) once stated when a person decides to use a new technology, s/he begins with establishing the knowledge base as the first stage. This occurs when an individual is exposed to technology and gains an understanding of how it functions. ICT integration process should be performed in a hierarchical order and steps of this process should follow each other for effective ICT integration.

A model of technology integration is required for the effective and systematic ICT integration process at a faculty level. There should be certain policies in order to guarantee the establishment of the necessary conditions supporting the continuous change processes (Tondeur, Keer, Braak & Valcke, 2008) and these policies are able to influence practice (Kennewell, Parkinson, & Tanner, 2000). Individuals involved in this process are able to manage the barriers to effective ICT integration (Lim, 2007). With this study, a top down and bottom up ICT integration model is proposed. In order to benefit from this model effectively and efficiently, the objectives and implications should go hand in hand. ICT practice and integration efforts at the faculty and university level should be carried out in bidirectional communication. The faculty should benefit from what kind of services and opportunities that university provides. At the same time, the faculty may have certain practices that the whole university can benefit from. For those effective best practices, there could be bilateral interaction opportunities, which can be coordinated by the coordination unit. In addition, there should be a coordination unit working closely with(in) the university, faculty and across departments. In this unit, one of the employees may be an ICT specialist. In this unit, there should be a coordinator with intellectual and technical leadership with effective communication skills. In addition, this coordinator should provide a common language among departments and individuals by organizing seminars and trainings, as well as maintaining the high motivation. Moreover, this unit should work through at least with a five-year technology plan with a certain budget allocated to perform this technology plan. Finally, students must be encouraged to integrate ICT to their education process as lifelong learners.

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INTERNET USE AND BREAST CANCER SURVIVORS

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ABSTRACT
A survey was administered to 400 breast cancer survivors at hospitals and support group meetings in Peninsular Malaysia to explore their level of Internet use and factors related to the Internet use by breast cancer survivors. Findings of this study indicated that about 22.5% of breast cancer survivors used Internet to get information about breast health issues. They had access to computer in their more personalized spaces such as at their home and in their workplace. Breast cancer survivors tended to use Internet to get information about cancer and treatment options especially on radiotherapy, chemotherapy, health management, treatment side effects and dietary practice. Majority of Internet users believed that information on the Internet were not useful to improve their knowledge about health care issues. Also, significant relationships exist between level of Internet use and five independent variables, including, age, education level, annual income, residence, and race/ethnicity. It is suggested that health care providers should realize how Web-based intervention programs can help breast cancer patients and then encourage patients to use Internet to get highly information to integrate them into their medical and psychological care.
Keywords: Internet use, education, breast cancer survivors, information, demographic characteristics

INTRODUCTION

One of the most common cancers among women and the second most important cause of women's deaths is breast cancer (Gopal, Beaver, Barnett, & Ismail, 2005). According to the Malaysian National Cancer Registry (NCR) 2006 report, there were about 3525 female breast cancer cases in this country (Zainal Ariffin Omar., Zainudin Mohd Ali., Nor Saleha Ibrahim., & Tamin., 2006). "A Malaysian women's cumulative risk of getting breast cancer during her lifetime is 1 in 19 with the highest risk being in Chinese women (1 in 14)"(Parsa, Kandiah, Mohd Zulkefli, & Rahman, 2008, p. 221). Approximately, out of 100 women who are afflicted with cancer, 30 of them will be breast cancer patients (Lim, Yahaya, & Lim, 2003). This data shows that breast cancer is a serious disease in Malaysian society.

According to Brashers, Goldsmith and Hsieh (2002) education is important for both the person who is ill, and also for his or her family. Education can increase patients' knowledge about their health problems and cure. Hence, they can be empowered to participate in decisions on their care (Gopal, et al., 2005). Some researchers such as Craigie, Loader, Burrows and Muncer (2002) believed that the Internet is an important information resource and can improve patients' knowledge regarding their health problems. In line with this idea, Fogel et al. (2002) stated that Internet has a potential to help patients to seek information about their specific type of cancer and to validate the recommended treatment. Gathering information for patients can increase their confidence in interacting with physicians, improve their understanding of health information, and reduce patients' stress, depression and loneliness (Othman, Blunden, Mohamad, Mohd Hussin, & Jamil Osman, 2010). Although online education is popular alternative compare with traditional method and provides an informative and supportive environment; limited research has been conducted in Malaysia on this issue. The current study is based on this pressing need and addresses the following questions:

1) What is the level of Internet use by breast cancer survivors for information related to breast health issues?
2) What is the relationship between the level of Internet use by breast cancer survivors for information related to breast health issues and selected independent variables (age, length of time since diagnosis of breast cancer, stage of breast cancer, educational level, income, race, and residence)?

Role of Internet on Breast Cancer Patients

The world's largest on line medical library is the internet (Harrison, Barlow, & Williams, 2007). Approximately, more than 1.5 billion Internet users worldwide (Steele, Mummery, & Dwyer, 2009) can access to over 100,000 health-related websites (Harrison, et al., 2007). According to Balka, Krueger, Holmes, and Stephen (Balka, Krueger, Holmes, & Stephen., 2010), "Internet based delivery of health information is often viewed as an optimal way to disseminate health information because it offers privacy, immediacy, a wide variety of information, and a variety of perspectives"(p. 389). One of the top three diseases that patients and their family frequently seek information on the Internet is cancer (Dolinsky, Wei, Hampshire, & Metz, 2006). As a group, breast cancer patients have been quick to adopt the Internet as a source of health information"(Dolinsky, et al., 2006). In a quantitative study about Internet usage among women with breast cancer, Pereira, Koski, Hanson, Bruera and Mackey (2000) found that 43% of the patients used the Internet to look for cancer-related information. Similarly, Chen and Siu (2001) reported that information seeking was common among cancer patients in Canada and these patients believed that media and the Internet are powerful means of medical information dissemination.

Regarding the advantages of Internet use for health and medical information, Ziebland et al. (2004) stated that breast cancer patients can access to a wide range of information and support needs. In other words, Internet has tangible and intangible effects on users' knowledge about health care matters (L. Baker, Wagner, Singer, & Bundorf, 2003). In fact, access to a wide array of information makes patients more comfortable or confident about their care (L. Baker, et al., 2003). Furthermore, "information gleaned from the Internet may improve patients' ability to interact efficiently and productively with health care professionals". According to Ziebland et al. (2004, cited in Foster & Roffe, 2009), Internet can help breast cancer patients "to increase awareness about particular conditions; to understand diagnoses; to access information about treatments, including complementary therapies; to learn about living with cancer; to tackle isolation by making social connections and gaining support from others; and to access other people's experiences". Also, the Internet especially can increase relationships (Rice, 2006). Online communities can provide better and different kinds of social capital (Rice, 2006). For example, "participation in online discussion forums can help people to stay in touch with friends and family, share their experiences and form new social networks by providing access to people online who they would not otherwise come into contact with" (Foster & Roffe, 2009, p. 15). It would seem that Internet is an important source in providing information for breast cancer patients and survivors regarding medical and psychological issues relevant to their illness and treatment (J. Fogel, Ribisl, Morgan, Humphreys, & Lyons, 2008). Using Internet not only can create a change in patients' thoughts about their health but also it can make subsequent health-related behavioral changes (Iverson, Howard, & Penney, 2008). Therefore, online information gathering can foster more patient engagement in health maintenance and care (Iverson, et al., 2008).

Factors Related to Internet use by Women with Breast Cancer

Demographic characteristics have caught the attention of many researchers and have been the subject of numerous studies in relation to Internet use for medical information (J. Fogel, et al., 2008; Pereira, et al., 2000). According to Rogers (2003), individuals' characteristics and the nature of the social system influence on adoption of an innovation. A research done by Pereira et al. (2000) to identify the level of Internet use among women with breast cancer depicted that women who had used the Internet to find cancer-related information were significantly younger, better educated, and less satisfied with the amount of treatment-related information given by caregivers than those patients who had not used the Internet to find cancer related information.

In addition, Mandle et al. (2000) carried out a survey to determine sciodemographic predictors of Internet use among 214 patients. They found that Internet use correlated with income ($r= 0.43$) and maternal education level ($r= 0.42$), and paternal education level ($r=0.42$). Also, they added that White patients were more likely to use or have access to the Internet and e-mail than were black or Asian patients, whereas those of Hispanic ethnicity were much less likely. However, in logistic regression models, which included race, Hispanic ethnicity, and income, only income was a significant predictor of Internet use.

METHODOLOGY

This descriptive research investigated the perception of 400 breast cancer survivors at different hospitals and cancer support groups in Peninsular Malaysia. A breast cancer survivor is defined as one that is diagnosed with the cancer. The research employed both quantitative and qualitative methods to obtain the required data. The quantitative method was in the form of a survey. The qualitative approach utilized a focus group interview. This paper is a part of a larger project and focuses on the quantitative part of the study. The instrument was developed from various sources: a review of literature, findings from focus group interview, and pilot testing. The development of the semi-structured focus group questions was initially guided by the "Health Belief Model" (HBM) (Breastcancer.org., 2009). The refinement of the focus group interview guide was also based on feedback from four breast cancer survivors before the actual focus group interviews were carried out. In the focus group interviews, the interview guide was used to ensure consistency in responses among groups while allowing flexibility for the informants to share their perceptions and experiences during the discussion. A total of five focus groups were conducted with 36 breast cancer survivors from cancer support groups in four states representing the East, Central, North, and South Peninsular Malaysia: Kelantan, Selangor, Penang and Johore. Each focus group was facilitated by two trained moderators and ran for approximately two hours. All focus group discussions were audio-taped and transcribed verbatim by a research assistant. For completeness and accuracy of the transcripts, another research assistant listened to the tapes and reviewed the transcripts. Finally, the focus group moderators reviewed the edited transcripts. For each focus group, the responses to each question were grouped together and read for emerging themes (Merriam, 2009).

The findings from the focus group interview were used for the development of the questionnaire. A panel of expert further examined the content validity of the questionnaire. The instrument was revised according to their suggestion. The reliability of the instrument was administered to 30 patients and the Cronbach alpha coefficient of this questionnaire was 0.81. The finalized survey form was submitted and approved by the research university ethical committee. In this study convenience sampling was used. Researchers assessed respondents who were breast cancer survivors at two locations, (1) hospitals where they do or follow up their treatment, and, (2) support group where survivors attend meetings or participates in the support group activities. At the beginning of data collection session, trained enumerators met with the breast cancer survivors. The purpose of the study and its potential usefulness was explained to the participants. Those who wish to participate were reminded to answer the questions honestly. They were assured of their responses confidentiality. Further, the enumerators briefed them on how to fill the questionnaire. They signed consent to participate form before filling the questionnaire themselves. The enumerators checked the questionnaire for completeness immediately upon return. A total of 400 survivors participated in the study. All the completed survey forms were used in the analysis. In this study descriptive statistics (frequencies, means and percentage) were used to describe and summarize the properties of the mass of data collected from the respondents (Gay & Airasian, 2000). By convention, an α level of 0.05 was established a priori for determining statistical significance.

FINDINGS AND DISCUSSION

The sociodemographic analysis showed that the highest number of the breast cancer survivors were from the Chinese ethnic group (46.50%; n=186) followed by the Malay (44.75%; n=179), and the Indians (7.75%; n=31). In term of religion, less than half of the respondents (45.3%) were Moslem, followed by Buddhist (35%), Christian (12.75%), and Hindu (6%). The women's mean age when they were diagnosed with cancer was 46.9 years. Yip et al. (Yip, Taib, & Mohamed, 2006) carried out a study about incidence of breast cancer from 1993 to 2004 at the University Malay Medical Center and found that the commonest age at presentation was between 40 to 49 years. Moreover, they reported that the mean age at presentation in Malaysia and other developing countries is lower than that in developed countries, where the mean age is 60 years. Furthermore, findings of this study showed that almost half of respondents had 3 to 4 children (41.3%) and majority of them (72.3%) had been survivors for less than five years. Most respondents came from urban area (64.75%) and the vicinities (25.25%). The women were moderately educated. Majority were unemployed (55.25%), fulltime housewives and had relatively minimal income (<RM5000/ year). Most of the survivors (59.5%) had first degree relative with cancer. Among the first degree relatives, in term of ranking, the highest was sibling (29.1%), followed by mother (18.44%) and father (11.73%). These results are consistent with Lynch and Eeles's (2006) arguments that a positive family history is a risk factor for breast cancer. According to Yip et al. (2006), "women who had their first full-term pregnancy after age 30 and women who never had a full-term pregnancy are at higher risk for breast cancer than those who gave birth earlier in life". However, the findings showed that very few women gave birth for the first time when they were above 30 years old. Most of the women (43.75%) breast fed for relatively shorter period (≤6 months).

Internet Use by Breast Cancer Survivors

The survey asked 5 main questions from 400 breast cancer survivors regarding use of Internet (frequency of Internet use, usefulness of information, Internet access, information content, and reasons for choosing Internet). A total of 90 (22.5%) of breast cancer survivors taking part in the survey stated that they used Internet often to get information about breast health issues. This finding is not consistent with Chen and Siu (2001) and Koski et al's (2006) studies which conducted in USA and Canada. In fact, level of Internet use in developing countries like Malaysia is lower than that in developing countries. This difference may be because of people's attitudes toward Internet, peoples' perceptions of cultural relevance of Internet in their society, lack of computer access, lack of computer competence, limited local resources, and language (Afshari et al., 2010; Afshari, et al., 2008). Also, findings of this study indicated that high percentage of breast cancer survivors who had used the internet to get cancer-related information were between 45 and 59 years old (57.8%), had secondary education (42.2%), came from urban area (73.3%), had annual income between RM 20001 and 30000 (22.2%), were in stage 2 of breast cancer (40%), and had been survivors for less than five years (80%).

The study results demonstrated that breast cancer survivors had access to computer in their more personalized spaces such as at their home (12.5%) and in their workplace (7%). In fact, patients' access to computer may change. Computer prices are decreasing, so computer access will increase. According to Mandle et al. (2000), "rates of access exceed rates of use"(p.511). Therefore, "if effective health care interventions are being provided via the Internet, provision of equipment or Internet service to the shrinking minority of patients without access may be cost-efficient and feasible" (Mandl, et al., 2000, p. 510).

Findings of this study indicated that breast cancer survivors used Internet to get information about cancer and treatment options especially on radiotherapy (22.5%), chemotherapy (22.5%), health management (12.8%), treatment side effects and dietary practice (respectively 12.0%). In response to this question "why do you choose Internet as a source of information?" about 15.2% of respondents indicated that they used internet to know more about their problem, 14.5% used it to get general information, 8.8% used it to find other solution to solve problem, and 6.8% used it to reduce anxiety. Furthermore, findings showed that most of the Internet users (81.2%) believed that information on the Internet were not useful to improve their knowledge about health care issues. In fact, this belief is a negative motivator for patients in using Internet. Also, it shows that breast cancer survivors did not understand the ability of the Internet in providing valuable information for breast cancer patients and "improving health care delivery and outcomes" (L. Baker, et al., 2003). According to Heller, Parker, Youssef and Miller (2008), Internet or interactive computer-based patient education programs can increase patients' knowledge level about breast cancer. Knowledge influences the patients' optimism about their options for treatment (Street Jr, Voigt, Geyer Jr, Manning, & Swanson, 1995). Moreover, it was reported that Internet is a more effective method than written educational materials to increase knowledge (Street Jr, et al., 1995). Ozanne and his colleague (2007) carried out a study about computerized decision aid for breast cancer prevention. Their findings showed that the level of patients' information competence that spent more time in using Internet was higher than patients who spent less time using this kind of services. In fact, Internet offers a number of attributes that can positively impact patients' autonomy, competence, and relatedness (Gustafson et al., 2008). Hence, health care providers should encourage breast cancer patients to use a credentialed Web site that is comprehensive and regularly updated by objective and unbiased experts to assist them in coping with their disease (Fogel., et al., 2002).

The Relationship between Internet Use and Independent Variables

The association between internet use and independent variables were explored by using the correlation analysis. The correlation matrix shows a number of significant relationships between Internet use and the independent variables (Table 1).

Table 1. Summary of the correlation matrix

Variable	Chi-square	biserial correlation	Sig.
Age		-0.12**	0.041
length of time since diagnosis of breast cancer		- 0.09	0.068
Stage of cancer	5.80		0.21
Education level	46.78**		0.000
Annual income	58.66**		0.000
residence	6.652**		0.036
Race	8.23**		0.043

As can be seen from Table 1, the level of Internet use by breast cancer survivors decreased with age. "This may well change in the future as computer-literate patients become older and computer availability and literacy increases"(Pereira, et al., 2000). Also, in this study, stage of breast cancer and length of time since diagnosis were not significant predictors of Internet use. This is supported by Fogel et al. (J Fogel, Albert, Schnabel, Ditkoff, & Neugut, 2002). They conducted a quantitative study to examine the potential psychological benefits of Internet use and how it varied as a function of race/ ethnicity among 180 white, African American, and Hispanic American breast cancer patients who used the Internet for medical information. They found that Internet use among African American, and Hispanic American was associated with greater social support. Furthermore, they stated that age, length of time since diagnosis, and breast cancer stage were not significant predictors of Internet use while increased income and educational level were significant predictors of Internet use.

Study results indicated that education level and annual income had a significant relationship with Internet use. It seems reasonable that the higher educational level and higher income; the more familiarity and more access an individual may have with Internet. “These patients may have been exposed to newer technology and have the comfort level to experiment with Internet” (J Fogel, et al., 2002). Hence, it can be concluded that Malaysian breast cancer survivors who have higher educational level and higher income can more likely use the Internet to look up information regarding their illness. This result is consistent with prior studies that higher educational level and higher income are associated with internet use and they are significant predictors of Internet use (J Fogel, et al., 2002; Mandl, et al., 2000; Pereira, et al., 2000). Similarly, residence was significantly related to Internet use. Majority of breast cancer survivor who had come from urban area (73.3%) and the vicinities (23.3%) stated that they applied Internet to get cancer-related information. This may be due to the fact that most data were collected at hospitals and cancer support meetings that had been located in urban area. These places were more accessible to survivors from urban area and vicinity rather than those from the rural.

Furthermore, the findings of this study demonstrated that there was a significant relationship between race/ethnicity and Internet use where Malays used the Internet more than Chinese and Indians. It would seem that Malay women with breast cancer feel more comfortable in using Internet than other ethnic groups (Chinese and Indians). This finding confirmed Fogel et al.’s (2002) study that Internet use is associated with increased social support and race/ethnicity.

Overall, this study supports findings of Mandle et al. (2000) that “patients with limited financial and lower educational level may be excluded from enjoying the benefits of medicine on the Web. Socioeconomic status, race, and health insurance have all been shown to determine social inequities in health outcomes”(Mandl, et al., 2000).

CONCLUSION

This study indicated that about 22.5% of breast cancer survivors used Internet to get information about breast health issues. They had access to computer in their more personalized spaces such as at their home and in their workplace. In fact, access to computer and availability of Internet may motive patients to go online and get information regarding their illness. Also, “basic education about Internet use will enable patients to exploit the access available to them” (Mandl, et al., 2000). Breast cancer survivors tended to use Internet to get information about cancer and treatment options especially on radiotherapy, chemotherapy, health management, treatment side effects and dietary practice. The study identified four reasons why women with breast cancer sought information on the Internet; 1) to know more about their problem, 2) to get general information, 3) to find other solution to solve problem, and 4) to reduce anxiety. Study results indicated that the majority of Internet users believed that information on the Internet were not useful to improve their knowledge about health care issues. It is clear that the importance of Internet “as a means to disseminate information about health and health care, enhance communication, and facilitate a wide range of interactions between patients and the health care delivery system”(L Baker & Wagner, 2003) has not been understood by breast cancer survivors. According to Perira et al. (2000), patients of the 21st century are not like patients of the past. Many of them like to get more and new information about their illness. In fact, internet as a means of sharing information can help patients to get cancer-related information in order to cope with their illness. Therefore, health care providers should realize how Web-based intervention programs can help breast cancer patients and then encourage patients to use Internet to get highly information to integrate them into their medical and psychological care.

Moreover, findings of this study indicated with increasing age, level of Internet use by breast cancer survivors reduced. Stage of breast cancer and length of time since diagnosis did not display significant relationship with the level of Internet use by breast cancer survivors. Also, significant positive correlations existed between level of Internet use and four independent variables, including, education level, annual income, residence, and race/ethnicity. Therefore, it can be concluded that breast cancer survivors who are using the Internet to get cancer-related information are significantly younger, better educated; have higher income and have come from urban area and vicinity.

This study had several limitations which may influence generalizability of the results. The current inquiry was part of a cross sectional research to identify level of Internet use by breast cancer survivors and relationship between demographic variables and Internet use. Measures of patients’ attitudes toward Internet, their knowledge and skill in using computer, and their cultural perceptions of Internet use were not included. Furthermore, method of sampling was a limitation. Due to limited access to breast cancer survivors, convenience sampling was used in this study. Although “this method is quick and easy to organize, there is no guarantee that the behaviors of these people represent behaviors of other groups.

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INVESTIGATING THE RELATIONSHIP BETWEEN CURIOSITY LEVEL AND COMPUTER SELF EFFICACY BELIEFS OF ELEMENTARY TEACHERS CANDIDATES[1]

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ABSTRACT
Nowadays, "lifelong learning individual" concept is gaining importance in which curiosity is one important feature that an individual should have as a requirement of learning. It is known that learning will naturally occur spontaneously when curiosity instinct is awakened during any learning-teaching process. Computer self-efficacy belief is defined as "individual's self-judgment related to computer using". In this context, this study is aimed to analyze the relation between elementary teacher candidates' curiosity level and computer self-efficacy belief who will raise the future information society. The study conducted with senior teacher candidates of Elementary Education Department - Mathematics, Science, Social Sciences and Elementary Education in Hasan Ali Yucel Education Faculty at Istanbul University in 2009 - 2010 academic years. "Computer Self-Efficacy Belief Scale" developed by Aşkar and Umay (2001) and "Curiosity Scale" adapted in Turkish by Demirel and Coşkun (2009) were used as data collection tools. SPSS 13.00 was used for whether there is a relationship between data.
According to gender variety, findings showed "Self-Efficacy Belief regarding to computer did not differ, female students' curiosity level was statistically higher than male students, and there was a connection between total score of "Self-Efficacy Belief Scale and Curiosity Scale" total score and Width Dimension Score, but there is no connection with Depth Dimension Score.

1. INTRODUCTION

The natural curiosity of human being resulted with developing of civilization and making scientific researches with huge acceleration (Berlyne, 1978; Loewy, 1998). Curiosity is the desire of receiving new information and experiences (Litman & Silvia, 2006). Besides, it has defined as motivation for an exploring behavior (Litman, 2005; Litman & Silvia, 2006).

People show signs of curiosity in their early ages. Piaget associates curiosity with the needs of children who try to make the world more logical (Loewenstein, 1994). Premise studies on curiosity have begun in 1960s. Primary Studies on curiosity centered on three points. Firstly, institutional framework of curiosity and underlying causes were intended to determine, then why different and interesting things awaken a person's curiosity was investigated and finally a couple of studies with limited experiments were held to show what were the situational determinants (Loewenstein, 1994).

Berlyne, whose theory finds wide acceptance on literature, did the premise studies on curiosity instinct (Reio, 1997; Ünal, 2005). Berlyne's theory (1960) explains curiosity in two types. These are perceptual and

[1]This study is extended and revised form of research called "The Relationship Between Curiosity Level And Computer Self Efficacy Beliefs Of Mathematics, Science, Social Sciences And Elementary Teachers Candidates" which is presented in International Conference on New Trends in Education and Their Implications (ICONTE 2010), 11-13 November, Antalya, TURKEY.

informational-epistemic curiosities. Perceptive curiosity contains (seeing, hearing) directed sensual conceptions which are used for getting information about complex or undetermined objects in kind a ways such visual inspection with awakening of curiosity (Berlyne, 1957 cited in Ünal, 2005). Epistemic curiosity examines the questions and proposition to get true information that is activated by conceptual undetermined or complex ideas such as (theories of knowledge, mental cross words (Berlyne, 1954 cited in Ünal, 2005). Schmitt and Lahroodi (2008) investigated value of curiosity with the scope of knowledge in their studies. They defend an appetitive account of curiosity, viewing curiosity as a motivationally original desire to know that arises from having one's attention drawn to the object and that in turn sustains one's attention to it. Distinguishing curiosity from wonder, they explore several sources of the epistemic value of curiosity. First, curiosity is tenacious: Curiosity whether a proposition is true leads to curiosity about related issues. Second, it is related to our field of interest. Last, and most important, curiosity is largely independent of our interests. It fixes our attention on objects in which we have no antecedent interest, thereby broadening our knowledge on it.

Curiosity is a concept that influences human behavior in both positive and negative ways at all stages of the life cycle. It has been identified as a driving force in child development (Stern, 1973; Wohlwill, 1987) and as one of the most important spurs to educational attainment (Day, 1982). Curiosity is accepted as a trigger of learning process (Demirel & Coşkun, 2009) and assumed has positive effects on learning (Malone & Lepper, 1987). It is known that when curiosity incentive is mobilized in any learning-teaching process learning will occur spontaneously (Demirel & Coşkun, 2009). Many of studies showed that curiosity triggers exploring behaviors and encourages cognitive, social, sensual, spiritual and physical development (Kashdan & Roberts, 2004; Loewenstein, 1994).

When we consider the human being in terms of information and technology we reached, it can be said that curiosity is on the basis of all studies. According to Fromm, the ability of curiosity means for an individual to deal with incompatibility and tension, to be directed to new changes, to be aware of his/her life and to react with his/her all ego (Davaslıgil, 1989). According to Maw and Maw (1986) a curios individual should have these features below:

- Reacts positively to new, different, mysteries and opposite demonstrations in his/her environment, affects them and uses them perfectly
- Shows passion of learning more about himself and environment
- Initiative new experiences and examines environment
- Investigate any topic and show persistence on examining (Köymen, 2002).

Curiosity is defined as the positive emotional–motivational system oriented toward the recognition, pursuit, and self–regulation of novel and challenging information and experiences. It is very important in the field of education, which pushes student to learn more as well (Kashdan & Roberts, 2004).

It is highlighted that people who show great effort to accomplish, never retreat when face difficulties and who are patient and insistent have high level of self-efficacy belief (Aşkar & Umay, 2001). Self efficacy is one concept of social learning theory which explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral, an environmental influences and people's judgments of their capabilities to organize and execute courses of action required to attain (Bandura, 1997). According to Bandura (1977) individual efficacy is not a feature of ego system or a determining feature, on the contrary it is dynamic way of individual capacities that consist of combination of success in jobs, self-motives, self regulation mechanism and self-system. Perceived self-efficacy is estimation of his own capacity and it affects performance and is affected by performance (Demirel, 2009).

Self-efficacy concept which was started to be discussed by Bandura in 1977 has been studied associating with many variations in many fields such as developmental psychology to science education, mathematics to computers. Bandura's self-efficacy belief has become one of studying fields of experts and professionals who works in teachers training and education. Evaluation of the self efficacy belief of teachers and teacher candidates in any field (science, mathematics, etc.) gives them opportunity to estimate their behaviors more accurately (Baki, Kutluca and Birgin, 2008).

Computer self-efficacy belief is defined as "estimation of computer using of an individual" (Delcourt & Kinzie, 1993; Compeau & Higgins, 1995; Khorrami, 2001). The studies in the field showed that individuals whose computer self-efficacy's level is higher that are more desire and interests in using computer and have higher expectations from kind of studies. In addition, when these individuals encounter difficulty in any of the computer; they can easily cope with (Karsten & Roth, 1998; Akkoyunlu & Orhan, 2003).

Computer technology has an essential role in modern education. In this context, it is expected from the teacher candidates to have higher levels of self-efficacy perceptions about using computers in education and higher curiosity for reaching the information. In the literature, there are limited number of studies on the elementary teacher candidates' perceptions of computer self-efficacy and scarcely any about the level of curiosity. Besides there is no study on examining the relationship between teacher candidates' curiosity and computer self efficacy.

2. PURPOSE OF THE STUDY

In this study, it is aimed to determine the relations between level of curiosity and self-efficacy beliefs of Mathematics, Science, Social Sciences, and Classroom teacher candidates.
Sub-problems of the study:

1- What is level of curiosity of elementary teacher candidates? Is there any relation between Curiosity Scale and sub-dimension scores?
2- Does elementary teacher candidates 'Curiosity' levels differ according to gender and the department variables?
3- Does teacher candidates' Computer Self-Efficacy differ according to gender and the department variables?
4- Is there any relation between level of "Curiosity" and "Computer Self-Efficacy Perceptions" of elementary teacher candidates?

3. METHODS

In the study relational survey method was adapted. Relational survey model is aimed to determine the presence of the covariance or the level of covariance between two or more variables (Karasar, 1998).

3.1. Population and Sample

Population of the study is the senior students of Hasan Ali Yucel, Education Faculty of Istanbul University and sample is 155 teacher candidates from department of Elementary Class (N:49), Social Science (N:23), Science (N:38), and Mathematics (N:45) teachers in Education Faculty of Istanbul University. The gender distribution of total students body has been approximately 71% of the students (N = 110) female and 29% (N = 45) is male.

3.2. Data Collection Tools

3.2.1. Curiosity Index

"Curiosity Index" which was adapted into Turkish by Demirel and Coşkun (2009) is used as data collection tool. The scale has two sub-dimensions named such breadth (27 items) and depth (20 items). Breadth of curiosity is the type where an individual may be interested in and examine a wide array of topics. On this dimension of curiosity, the individual wishes to face various encouraging experiences Depth of curiosity is the level of interest in a single topic, an individual is being curious about a subject, an idea or a person, and trying to learn continuously about them. On this dimension, the individual wants to enquire into a field or topic of interest in detail and to increase his gains (Fulcher, 2004 cited in Demirel and Coşkun, 2009).

"Curiosity Index" consists of 47 items. Answers are 6 point likert-scale 1. "Completely Agree", 2. "Mostly Agree", 3. "Slightly Agree", 4. "Slightly Disagree", 5. "Mostly Disagree", 6. "Completely Disagree". The reliability of 3rd version of Curiosity Index is .93 ($p<0.01$) . The reliability of this study was decided as .91 ($p<0.01$).

3.2.2. Computer Self-Efficacy Belief Scale

Computer Self-Efficacy Belief Scale which were developed by Aşkar and Umay (2001) to determine computer self-efficacy belief of students were used in the study. There are 18 articles which 7 of them were scored in the reserve direction in the scale. According to the scale answers are Likert scale type like, between (5) "Always" (1) "Never". Cronbach's alpha was calculated as 0,71 by Aşkar and Umay (2001) who surveyed on university students. Cronbach's alpha was calculated as 0,85 in the study.

3.3. Analyzing of Data

1) Group t-Test whether "Curiosity" and "Computer Self-Efficacy Belief" shows any difference by gender,
2) LSD Technique which is used for the times explaining situations and Variation Analysis (ANOVA) Technique whether "Curiosity" and "Computer Self-Efficacy Belief" shows any difference by departments,
3) To determine the relations between total scores of scales, which were used as data collection tools, and "Curiosity Scales' dimension scores Pearson Correlation Coefficient Technique were used in the study.

4. FINDINGS

In this section, statistics from scales were used to determine level of "curiosity" and Computer Self-Efficacy Belief of students of elementary department in Hasan Ali Yucel Education Faculty at Istanbul University. Results from Group t-Test, Variation Analysis (ANOVA), LSD and Correlation Coefficient Techniques were used to determine whether "curiosity level " and Computer Self-Efficacy Believes showed any differences according to several variables.

Tables related to the research problems are given respectively at below.

Table 1. Descriptive Statistics on Students' Curiosity Level

	N	Min	Max	$\bar{x}$	Ss
Curiosity Score	155	146,00	258,00	212,86	25,80

The highest score is 282, the lowest score is 47 at Curiosity Scale and expected score average is 165. According to analysis received from Curiosity Scale the lowest score is 146, the highest score is 258 and the average score is 212.86. According to the statistics, the level of curiosity of teacher candidates' average score is higher than normal average score.

Table 2. Descriptive Statistics on Curiosity Scale Sub Dimensions

Scale Sub-Dimensions	N	$\bar{x}$	Ss
Breadth	**155**	**118,20**	**13,96**
Depth	**155**	**94,66**	**13,89**

According to the curiosity scale sub-dimension statistics, teacher candidates' breadth dimension score average (X=118,20) is higher than depth dimension score average (X=94,66).

Table 3. Pearson Product Moment Correlation Analysis Results to Determine the Relationship between Curiosity Scale Total Score with Sub Dimensions Scores

Variable	*N*	*r*	*p*
Curiosity Scale Total Score Breadth Dimensions Scores	**155**	**0,927**	**0,000**
Curiosity Scale Total Score Depth Dimensions Scores	**155**	**0,926**	**0,000**

** Correlation is significant at the 0.01 level

As can be seen in Table 3, According to the Pearson product moment correlation analysis results, there is a positive relation statistically at the level of $p<.01$ between Curiosity Scale Total Score and dimensions scores. Curiosity Scale Total Score has relation with Breadth Dimension Score ($r=0.927$; $p<.01$) and Depth Dimension Score ($r=0.926$; $p<.01$

Table 4. Independent Simple t-Test Results to Determine the Whether the Scores Differ By Gender

	Gender	N	$\bar{x}$	S	Sd	T	P
Curiosity Scale Breadth Dimensions Scores	Female	110	119,94	13,52	153	2,472	0,015
	Male	45	113,93	14,25			
Curiosity Scale Depth Dimensions Scores	Female	110	96,66	13,66	153	2,866	0,005
	Male	45	89,77	13,37			
Curiosity Scale Total Score	Female	110	216,60	24,68	153	2,891	0,004
	Male	45	203,71	26,45			
Computer Self-Efficacy Scale Total Score	Female	110	60,00	11,56	153	-,618	0,537
	Male	45	61,20	9,00			

According to the Unrelated Group t-Test analysis results which aims to see whether there is a difference by gender indicate that there is a statistically significant difference between the mean scores of teacher candidates.

Female Teacher Candidates "Breadth Dimension" scores ($\bar{x}$ =119,94), “Depth Dimension” scores ($\bar{x}$ =96,66), “Curiosity Scale Total” Scores ($\bar{x}$ =216,60) and total scores ($\bar{x}$ =67,98) are higher than Male Teacher Candidates. However, Computer Self-Efficacy Scale score Scale is not a statistically significant according to the gender variable.

Table 5. One Way Variance Analysis (ANOVA) Results to Determine The Computer Self-Efficacy Belief Scale Scores According the Department Variable

Score	Sour. Var.	*KT*	*Sd*	*KO*	*F*	*p*
Science Education Department	Between Groups	1101,904	3	367,301	3,246	0,009
	Within Groups	17085,580	151	113,150		
	Total	18187,484	155			

Results of one way variance analysis (ANOVA) which aimed whether arithmetic mean of Computer Self-Efficacy Belief Scale indicates differences by department showed that there is statistically difference between departments’ arithmetic means. After ANOVA analysis LSD test was performed to determine which group shows significant difference. Science Teacher candidates' score average (63,76), is statistically higher than Mathematics Teacher candidates' score average (57,60), Classroom Teacher candidates' score average (58,83), Social Sciences Teacher candidates' score average (63,34).
Computer Self-Efficacy Scale arithmetic means is not a statistically significant according to the department variable.

Table 6. Pearson Product Moment Correlation Analysis Results to Determine the relation between Computer Self-Efficacy Belief Scale Total Score with Curiosity Scale Total Core and Sub Curiosity Scale Dimensions Scores

Variable	N	R	*p*
Computer Self-Efficacy Belief Scale Total Score Breadth Dimensions Scores	**155**	**0,174**	**0,031**
Computer Self-Efficacy Belief Scale Total Score Depth Dimensions Scores	**155**	**0,166**	**0,039**

As it is seen on Table 6, Results of Pearson Product Moment Correlation Analysis which aimed to determine whether there is relation between Computer Self-Efficacy Belief Scale Total Score, Curiosity Scale Total Score and Breadth Dimension scores showed that there is statistically positive relation at $p<.05$ level. According to this, Computer Self-Efficacy Belief Scale Total Score has been found related to Curiosity Scale Total Score ($r=0.166$; $p<.05$) and Breadth Dimension Scores ($r=0.174$; $p<.05$). After all, there is no connection between Computer Self-Efficacy Scale Total Score and Curiosity Scale Depth Dimension Score.

5. DISCUSSION AND CONCLUSION

According to the findings of this study, which aimed to determine level of computer self-efficacy belief and curiosity of elementary teacher candidates who will teach to future generation, teacher candidates’ curiosity level is above the median of scale and breadth dimension average score is higher than depth dimension average score. Demirel and Coşkun (2009) research supports these findings. Their study indicates that curiosity levels of university students is above the scale overall average point. This proves that university students have very high-level of curiosity. However university students’ high curiosity level does not explain the curiosity concentration direction alone. Having higher breadth dimension score than depth dimension score means that university students are interested in various fields that make them not to concentrate on specific field. It also shows that they can be curious about anything that they are open to interest in. In general, however being interest in learning is a positive characteristic of curiosity and it is discussed in two ways. Breadth of curiosity is the type where an individual may be interested in a wide array of topics. Depth of curiosity is the level of interest in a single topic, on this dimension; the individual wants to enquire into a field or topic of interest in detail and to increase his gains.

Findings by genders show that “Computer Self-Efficacy Belief” did not show any difference and female students have high-level curiosity than male students. The study has similar results with other studies in literature that computer self-efficacy belief does not change by gender (Akkoyunlu & Orhan, 2003). However, there are also other studies indicates that level of computer self-efficacy belief of male students is higher than female students

(Cassidy & Eachus, 2001; Işıksal & Aşkar, 2003; Berkant & Efendioğlu, 2010) and studies by Ekici and Berkant (2007) also show that level of computer self-efficacy belief of female students is higher than male students. These contradictory situations originated form expansion of computer use among both girls and boys. However, when the studies about curiosity level related to gender in the literature was examined; different results were obtained in different scales. Demirel and Coşkun (2009) study about comparing curiosity level showed the male students' level of curiosity was found to be higher than that of female students. At this stage curiosity should be shaped by culture, environment and other factors. Comprehensive studies about curiosity and its relationship with gender factor will clarify this finding.

Curiosity scores do not differ according to the department variation. Science teacher candidates' Computer Self-Efficacy Belief Scale scores are higher than Mathematics, Social Sciences and Classroom teachers. Morrell and Caroll (2003) indicated, science teacher candidates take many science courses and that increases their self-efficacy beliefs in their study. Curiosity scores show no difference according to the department is open to discussion and investigation.

Computer Self-Efficacy Belief Scale and Curiosity Scale Total Scores have connection to Breadth Dimension Score but there is no connection with Depth Dimension Score. According to the research of Demirel and Coşkun (2009), higher breadth dimension score average than depth dimension score average showed that students are not specific enough on their career interest and tendency.

Studies indicate that self efficacy belief affected by experiences and environments it was revealed that those affect qualification and continuous computer using. This two-way interaction is one of the guides to the regulation of the educational process. In this context, "lifelong learning individual" is becoming more important concept in today's education, take in consideration this is the first research that examine the teacher candidates Computer Self-Efficacy Belief and Curiosity Level and similar quantitative and qualitative studies should be carried out in the future. In addition, it is suggested that for enhance the teacher candidates' self-efficacy and curiosity level applied courses number should be increase beside the area courses. This research, conducted in only one university with elementary, social science, science and mathematics department students of education faculty. Similar studies should be carried with other elementary teacher candidates and investigated the relations by gender. Moreover, other studies should be done with different faculty students. It is believed that conducting studies describing the curiosity property of both higher education students and elementary as well as secondary education students, and demonstrating the relations with differing variables will contribute to the field literature.

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LIBRARY AUTOMATION DESIGN FOR VISUALLY IMPAIRED PEOPLE

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ABSTRACT
Speech synthesis is a technology used in many different areas in computer science. This technology can bring a solution to reading activity of visually impaired people due to its text to speech conversion. Based on this problem, in this study, a system is designed needed for a visually impaired person to make use of all the library facilities in Sakarya University. Certain number of books in the library is transferred in digital media via a scanner and they are transferred into their own server. A visually impaired person can use the system with the help of sound orientation of the program and the keyboard commands of the user. System will be developed according to new requests. So, the purpose of this study is to bring a solution to the social problem of visually impaired people.

INTRODUCTION
Speech is one of the methods for providing communication between people. The production process of human speech by an external computer or device according to the phonetic expansion of text or message is called synthezing (DUTOIT, 1997). Speech synthesis can be done by adding audio tracks to each other which is stored in the audio recording database. Phonemes r systems that use audio tracks as phoneme binaries have the opportunity to synthezing all kinds of words in a small amount of record using Lego logic (DUTOIT, 1996). However, these kinds of synthesis systems are very poor for intelligibility and naturalness. In this regard, the unit selection systems that use longer pieces of audio are used more widely today (KOMINEK, 2003) (J.ZHANG, 2004).

Turkish studies are still limited even though very large numbers of systems are developed for western languages. MBROLA (DUTOIT, 1996), FESTIVAL (DUBUISSON, 2009), MULTEXT (VERONIS, 1994), GENGLISH (DUTOIT, 2005), HTS (YAMAGISHI, 2007) have been developed for synthesizing more than one language. From these systems MBROLA is adapted for Turkish and a working system is developed (BOZKURT, B., 2001).

In this study, triple sounds which is the most frequently used in Turkish and an additive synthesis system which is developed by using double voices that were not covered by triple sounds is planned to use (YURTAY, 2010). This system is a simple system that works by taking string data in digital media and adding sound pieces in sound database as Lego and it is developed in Turkish-based.

In the study of TUBITAK, frequently mentioned 3000 triple voices are determined and it is seen that these voices represent Turkish 90%. By adding 383 double voices to the list which do not exist in the triple voices, a database is developed that is formed totally from 3383 number of pieces. (BICIL, 2010).

As is known, today visually impaired people cannot go to libraries to read books and they are deprived from this social activity except books read by very little number of volunteers or Braille books. In this study, solutions are developed with the help of technology to overcome these shortcomings.

Many studies have been done to facilitate the social lives of visually impaired people, provide their training and ensure their happiness. Chen, C. And Lin, S.Y. (2011) evaluated the effects of rope jump exercise on the visually impaired students and determined a difference in the flexibility and aerobic capacity for them. Vervaart, E., Janssen, N.M., Vervloed, M.P.J. (2005) have worked on a procedure is called in-sight that has been developed to screen higher levels of visual functioning related to educational process for around twelve years old visually impaired children. Fetton,E.A., Blenkhorn, P. (1986) have mentioned technological development about educational implication of communication and necessary to meet communication needs of visual impaired in different environments. Simsek, O. Altun, E., Ates, A. (2010) have talked about the difficulties experienced by visually impaired learner during developing information and communication technologies skills and they have suggested regulation for these people to develop their skills. Sacks,S Gaylord-Ross, R. (1989) have studied about comparison of peer-mediated and teacher-directed training packages for upgrading aspects of variety of social behaviours for visual impaired students. Bayir, S., Keser, H., Numanoglu, G.(2010) have researched that through the computer literacy trainings, freedom is provided for visual impaired in Turkey. In the study by Lisi, F. (2005), some methodologies used to encourage visually impaired at social integration in the world of work. Through these methods, they are seen more successful integrated. Owsley,C., McGwin, G., Phillps, J.M., McBeal, S.F., Stalvey, B.T. (2004) have studied over an educational program that allows to reduce rates of accidents caused by older drivers who have visual acuity deficit or slowed visual processing speed or both of them after a certain age.

In the system design, the visually impaired person who wants to take advantages of the library services after arrival in the library is directed to the designed system by a librarian. It is aimed to ensure the new book requests, book search and reading a found book from a requested page number with voice guidance and keyboard commands done by the visually impaired person.

It can be said that, visually impaired people can easily use libraries with the help of this system. The design of the system is fully applicable and after applying the processes mentioned in Section 2 and 3, it is planned to dedicate the system automatically and with the support of very few people to visually impaired people. The processes in implementation and application of the system can be examined in two main topics: Preliminary Processes and Application Stage.

PRELIMINARY PROCESSES

Hardware

In the design of the proposed system, a server and a computer with a minimum 2.53 Ghz processor, 4GB DDR2 Ram, 200GB hard disk are needed. Using the existing server to store books in digital media in the Sakarya University library is considered. The number of computers is limited to one as the initial number and then can be increased depending on the ratio of users.

Library staff must be convinced of using the system as an active and reliable way. Furthermore the system can also be used by visually impaired users who did not before. For this reason, the need for a monitor and a mouse appeared.

During the system work, visually impaired user will direct the system with an input device. At this stage, a choice must be done between two important input devices. These devices are a keyboard and a microphone. They have advantages and disadvantages among each other. In this sense, if the keyboard is selected by visually impaired person who knows to use the keyboard, it is seen to be more efficient and reliable. In the case of visually impaired person who selects to use the microphone eliminates the requirements of using the keyboard and even without using their hands he/she can manage the system. But today's speech recognition technology efficiency, most of the library environment is not completely isolated from sound and most of visually impaired person can use the keyboard. Because of all these reasons the keyboard will be preferred in this study. In addition, a scanner is required for digitization of printed documents in the library.

Software

In addition to serve for visually impaired person, the system must have the software infrastructures that must be compatible with libraries own automation systems. Thus, the proposed system and library hardware will be used more efficiently and they can be used like other computers in the library.

Paid or free software can be selected to use in the speech synthesis module. However in this proposed system, speech synthesis module that we have developed before will be used (YUCEL, 2010).

Most important parts of the system are voice guidance and management parts of the program used by the visually impaired person. At this stage, the developed software will guide the visually impaired person vocally and then management will be provided as a result of commands taken from the keyboard. A scanner will be used during the digitization of the printed documents and books in the library. While scanning the papers of the relevant document, they are converted to image format and an OCR (Optical Character Recognition) system to translate the photos into text format is needed. There is much commercial software developed to translate printed documents into digital media like Fine Reader, ReadIris, etc. For example, if Fine Reader is preferred, we can adapt easily the program to own developed system by using APIs presented. System requirements of this software can be summarized that 128 MB, 16 GB RAM for every additional processors (in case of multi- processors system), 250 MB empty disk space for typical program installation, 100 MB empty disk space for running the program, %100 TWAIN compatible scanner, digital camera or graphics card and a graphics unit (at least 800x600 resolution) with fax modem.(http://www.abbyy.com/sdk/,2011).

PREPARATION STAGE

In this stage, converting specific printed documents which do not exist in digital media into digital media process is done. The resources in the library can be simply separated into two groups:

- Digital Resources
- Non-digital Sources

Master's and doctoral theses in the library are in digital resources group. Copies of these documents in Acrobat Reader or other formats can be found usually in the digital medium. All of them are accessible for users. So, these sources can be transferred into the used system rapidly.

Non-Digital Resources are the only the resources referred to as ink printing in the library. Stories, novels, magazines, newspapers can be considered as examples of these resources. Speech synthesis can be done to the resources by translating them into digital medium with the help of a software support. In this sense, the system can be dedicated to the visually impaired users. The problem of resources that do not exist in the digital media (non-digital resources) is necessity of digitization.

Designed system aims to do this job as static firstly and then dynamically. At first stage, most popular books in the library by selecting the first 500 of them are planned for digitization with the help of hardware and software support. Transferred sources will be stored in PDF format. However, one or more people are needed to select books and then transfer in the designed system.

In this study, Microsoft MS-Project program is used to define project's activity, distribution of resource-task. Project is analyzed under the heading of scope, analysis/hardware/software requirements determination, design, development, test stage, documentation, application, dissemination and last revisions. Project's scope determination takes 3,5 days, analysis/hardware/software requirements determination takes 12,5 days, design of suitable and functional environment for the library and obtaining permits takes 7,5 days, development part includes supplying the using software and integrating this to the system takes 30 days, testing of the system takes 4 days, training process takes 6 days, preparing the help documentation takes 18 days, application takes 7 days, dissemination process takes 3 days and last revisions take 3 days. As a result, the estimated time opening the system to use was calculated and found 94,5 days approximately. Project management designed by using MS-Project program is shown in Figure 1.

Many people work in the designed project. They are management part for determining the scope, project manager for resource assignments, choice of software/hardware and following the project, analyst for the design of suitable and functional environment for the library and obtaining permits, developments for the software, tester for testing the system, trainer, technical service for the documentation process, and distribution team for the user opinions work. Resource assignments are made using MS-Project program is shown in Figure 2.

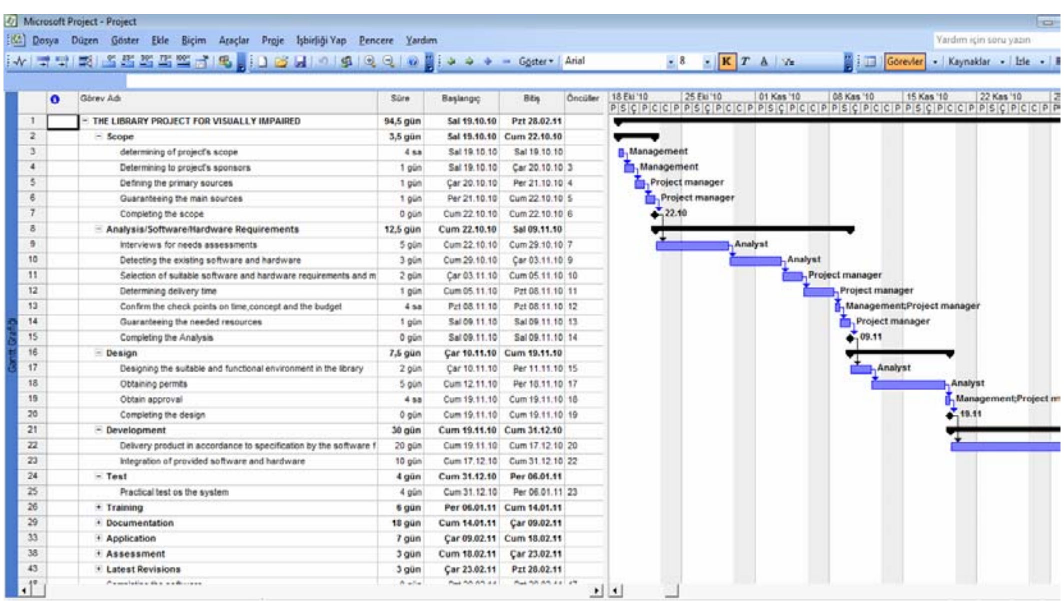
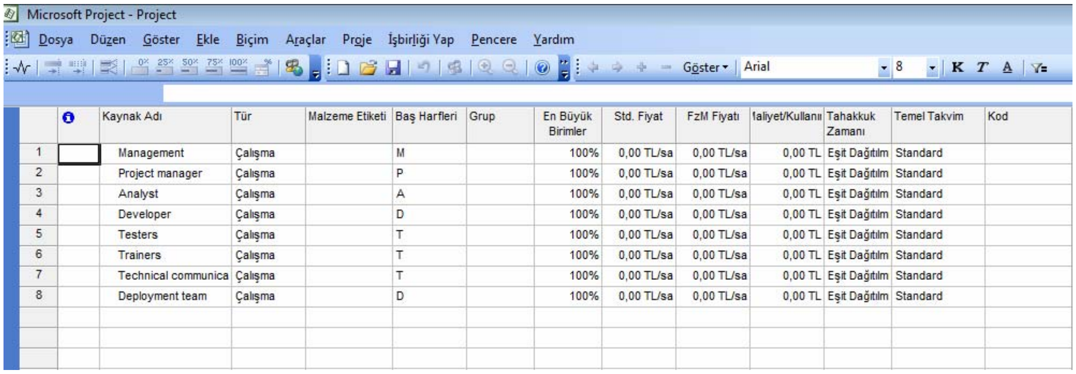


Figure 1: MS-Project work breakdown structure


Microsoft Project - Project

Dosya Düzen Göster Ekle Biçim Araçlar Proje İşbirliği Yap Pencere Yardım

		Kaynak Adı	Tür	Malzeme Etiketi	Baş Harfleri	Grup	En Büyük Birimler	Std. Fiyat	FzM Fiyatı	faliyet/Kullanı	Tahakkuk Zamanı	Temel Takvim	Kod
1		Management	Çalışma		M		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	
2		Project manager	Çalışma		P		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	
3		Analyst	Çalışma		A		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	
4		Developer	Çalışma		D		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	
5		Testers	Çalışma		T		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	
6		Trainers	Çalışma		T		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	
7		Technical communica	Çalışma		T		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	
8		Deployment team	Çalışma		D		100%	0,00 TL/sa	0,00 TL/sa	0,00 TL	Eşit Dağıtılım	Standard	

Figure 2: MS-Project resource assignments

APPLICATION STAGE

After preparation stage, while the designed system is continuing to serve to visual impaired people; it will continue to evolve according to their wishes. In this stage, system will not need an active care like in preparation stage. Only the new requested ink printing books will continue to transfer to system. In this way, the system will run more efficiently.

PERFORMANCE OF THE SYSTEM

The synthesis duration of TTS module in performed with hardware requirements is shown in Table 1 and Table 2 below.

Table 1: Test data for our TTS Module

Text No	Text
1	Istanbul
2	Cehalet erdemdir.
3	Yaratıcılığın yüzde doksanı terlemektir.
4	Sanatsız kalmış bir milletin hayat damarlarından biri kopmuş demektir.
5	Metinden Konuşma Sentezi çoklu-katman işlemleri içerir. Önemli bir ön katman metinin tamamen harflerine ayrılarak “normalize“ edilmesidir; kısaltmaların tam metin karşılıklarıyla değiştirilmesi, tire ve belirsiz noktalamanın temizlenmesi, sayıların harflere dökülmesi ve aksanların uygun sembollerle değiştirilmesini içerir. Bu ön işlem dil bağımlıdır ve her dil için gramerine, yazılışına ve sözlüğüne dayanan özelleşmiş kurallar gerekir. MTRD bu amaçla Türkçe için bir ön-işlemci geliştirmiştir.
6	Toplumumuzun yaşam kalitesinin artmasına ve ülkemizin sürdürülebilir gelişmesine hizmet eden, bilim ve teknoloji alanlarında yenilikçi, yönlendirici, katılımcı ve paylaşımcı bir kurum olma vizyonunu benimseyen TÜBİTAK, akademik ve endüstriyel araştırma geliştirme çalışmalarını ve yenilikleri desteklemek, ulusal öncelikler doğrultusunda Araştırma-Teknoloji-Geliştirme çalışması yürüten Ar-Ge enstitülerini işletme işlevlerinin yanı sıra, ülkemizin Bilim ve Teknoloji politikalarını belirlemekte ve toplumun her kesiminde bu farkındalığı artırmak üzere kitaplar ve dergiler yayınlamaktadır.
7	Özgürlük ve bağımsızlık benim karakterimdir. Ben milletimin en büyük ve ecdadımın en değerli mirası olan bağımsızlık aşkı ile dolu bir adamım. Çocukluğumdan bugüne kadar ailevî, hususî ve resmî hayatımın her safhasını yakından bilenler bu aşkım malumdur. Bence bir millete şerefin, haysiyetin, namusun ve insanlığın vücut ve beka bulabilmesi mutlaka o milletin özgürlük ve bağımsızlığına sahip olmasıyla kaimdir. Ben şahsen bu saydığım vasıflara, çok ehemmiyet veririm. Ve bu vasıfların kendimde mevcut olduğunu iddia edebilmek için milletimin de aynı vasıfları taşımasını esas şart bilirim. Ben yaşabilmek için mutlaka bağımsız bir milletin evladı kalmalıyım. Bu sebeple milli bağımsızlık bence bir hayat meselesidir. Millet ve memleketin menfaatleri icap ettirirse, insanlığı teşkil eden milletlerden her biriyle medeniyet icabı olan dostluk ve siyaset münasebetlerini büyük bir hassasiyetle takdir ederim. Ancak, benim milletimi esir etmek isteyen herhangi bir milletin, bu arzusundan vazgeçinceye kadar, amansız düşmanıyım.

Table 2: Test times for our TTS Module

The initialization time of the TTS Module: 0.131243						
Text No	**Text Normalization**	**Selection of Logotoms**	**Creating the Wave File**	**Audio Player Initialization**	**Total Synthesis Time**	**Generated Audio File Time**
1	0.000001	0.000082	0.000054	0.000005	0.000141	0.850341
2	0.000001	0.000140	0.000089	0.000003	0.000232	1.290039
3	0.000002	0.000300	0.000224	0.000003	0.000529	3.228515
4	0.000002	0.000515	0.000336	0.000003	0.000855	5.57373
5	0.000017	0.003525	0.002086	0.000004	0.005632	39.115234
6	0.000010	0.004233	0.002174	0.000004	0.006421	47.38208
7	0.000015	0.007109	0.003109	0.000015	0.010248	80.46997

As shown in Table 2, with the number 7 texts has 138 words and has been synthesized approximately 0.010248 seconds totally. Based on this, if we assume that one book has approximately 500 words in each page, approximately 0.037130 seconds are needed to synthesize 500 words of one page.

Text Normalization Process and the Challenges of Mathematical Notations

In this study, one of the problem is faced during the synthesizing speech is Turkish non-text format mathematical notation and images. One of the processes to be done is text normalization before synthesizing speech, for example number of 269 as two hundred and sixty nine to read as. Normalization can be used for using of some mathematical notations easily. Such as "% = percent", "°C = Celsius degree", " a^3 = a cube", "$\sqrt{7}$ = square root of seven ".

However, normalization of longer mathematical notation is more difficult. Therefore, creation of clear, understandable and simple standard is necessary. After a standard is created, training and promotion are required for visual impaired. As a result of these, long and complex mathematical notations will be understood in sound format by visual impaired easily.

DISCUSSION AND RECOMMENDATIONS

If a server has been installed in a library and the system is integrated with this server, each computer do not have to require individual large hard disks and by this way hardware requirements can be minimized. So that, many people might be able to use the system at the same time.

Although speed and clarity of our developed speech synthesizer is enough, the need of natural speech synthesizer is great. Because the concentration and productivity of visual impaired people may fall in the face of monotonous speeches. However, studying of natural speech synthesis is still continuing and this is very difficult field of study.

If the system is adapted over the internet, visual impaired do not need to come to the library for requesting a new book. And this way there can be more effective and easier usage. Especially, in the digital medium data is suitable for this usage.

CONCLUSION

In this study, a simple and working system was designed needed for a visually impaired person to make use of all the library facilities in Sakarya University. A visually impaired person can use the system with the help of sound orientation of the program and the keyboard commands of the user. When the specified requirements are provided, a system can easily be established in the library, so visually impaired people can benefit facilities of the library. Also a standard is needed for longer mathematical notations.

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MOBILE LEARNING: AT THE TIPPING POINT

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ABSTRACT
Mobile technologies are interfacing with all aspects of our lives including Web 2.0 tools and applications, immersive virtual world environments, and online environments to present educational opportunities for 24/7 learning at the learner's discretion. Mobile devices are allowing educators to build new community learning ecosystems for and by today's students using smart phones, iPads, tablets, and iPod devices to stay connected. The use of simulations and virtual environments to build learning spaces that provide connections to students globally and how these 21st Century digital interfaces will challenge our educational institutions to create a more rigorous, immersive, and differentiated learning environments will be explored in an attempt to answer the question: Mobile learning, are we at the Tipping Point?
Keywords: mobile learning; tipping point, 24/7 learning; smart phones, cell phones, mobile devices, digital citizens

INTRODUCTION

> *Never before in the history of the planet have so many people – own their own – had the ability to find so much information about so many things and about so many people.*
> *Thomas L. Friedman, The World is Flat, 2005, p. 178.*

Second Life, Twitter, Facebook, Flickr, 'smart phones', robot pets, robot lovers, what do these have in common? Thirty years ago, none of us had heard of them! And thirty years ago, we were asking what will we use the computer for? Will it replace us? Now, thirty years later, technology promises to let us do anything from anywhere with anyone (Turkle, 2011, preface).

Now the question is what is it we don't use them for? We communicate, create, navigate and build a persona around who we are based on a technology provided to us through technology. Our digital technologies, like our buildings (Winston Churchill noted that our buildings shape us.) are shaping who we are and what we know and believe. Technology has become the architect of our lives (Turkle, 2011). We are technologically mobile with technologically mobile personas, which are not bound by time and place.

Before we start, let's establish some definitions so that when having this conversation, you and I are thinking about similar information.

Mobile learning – learning that happens anywhere, anytime.

Mobile devices – devices such as cell phones, smart phones, netbooks, laptops, tablets, iPods, iPads, e-readers such as the Kindle, Nook, etc., palms, Treo, and other devices that are typically lightweight, portable and connect to the internet.

Learners – all known people (not dependent on age, gender, race, ethnicity)

Social networks – "social structure made up of individuals (or organizations) called "nodes", which are tied (connected) by one or more specific types of interdependency, such as friendship, kinship, common interest, financial exchange, dislike, sexual relationships, or relationships of beliefs, knowledge or prestige" (Wikipedia, http://en.wikipedia.org/wiki/Social_network, 2011, para. 1).

Apps - also known as an **application** or an "**app**", is computer software designed to help the user to perform singular or multiple related specific tasks. Examples include enterprise software, accounting software, office suites, graphics software and media players. Many application programs deal principally with documents" (Wikipedia, http://en.wikipedia.org/wiki/Application_software, 2011, para. 1).

Because the term *mobile technology* is broad in meaning, it useful to distinguish between different types of mobile devices. We used the term *highly mobile device* to refer to cell-phone sized devices that can fit in a pocket: feature phones (supporting cell and SMS service only), smartphones, and other devices like Flip cameras. *Very mobile devices* include slates, pads, and netbooks. Finally, the category *mobile device* refers to larger devices such as laptops. While this might appear to be splitting hairs, the degree of a device's mobility determines the ways it is best used in learning: a smartphone is much more mobile than a laptop, and this high degree of mobility makes it indispensible in some contexts but a liability in others.

Why Does Mobile Matter?
Always on – always on you is the mantra for today's learner. "With more than 6 billion mobile subscribers worldwide, 85 billion text messages sent per month, mobile texting usage is up 450% over the last two years, it's clear that mobility will overtake the internet and television as the most ubiquitous form of communication" (Mobile Matters, 2011, para. 1). What does it mean to be mobile?

1. Like your car keys and your wallet, the mobile device is always with you including the ability to communicate in real-time, anywhere, anytime
2. There is an every present audience by the use of Twitter™ and Facebook™
3. Personalization is the name of the game – 'one size does not fit all'; direct and personal, takes little time to send a message or respond
4. User has the option to 'opt out' so it is permission-based
5. Messages on your cell phone tend to stay (stick) and can be forwarded to others at the chosen time and place
6. Interactive on a 1:1 basis with the user deciding who, when, where and why to communicate (Mobile Matters, 2011, para. 3)

Over the past year in particular, we have seen a huge increase in mobile learning – leveraging small, portable devices to facilitate anytime, anywhere, un-tethered learning. This has been fueled by the use of netbooks and laptops in our educational systems that have been used in our K-12 and higher education classrooms, the drop in price for netbooks making computers almost disposable and the added fact that people own smart phones! These lower price drivers in the smart phone industry have shaped a new paradigm of mobile computing.

What Is A Tipping Point?
The tipping point is an idea – it is the best way to understand the emergence of fashion trends, the ebb and flow of stardom, the rise of teenage smoking, and the emergence of the cell phone as the communication device of choice by most of the world. Being mobile is an *epidemic*, like ideas, products, messages and behaviors that spread just like viruses; mobile technologies appear and disappear daily from our lives.

Principles of Epidemics
When thinking about tipping points, there are several principles of how such an event occurs to keep in mind.

Principle 1: When a large number of people in a small number of situations start behaving differently, the behavior begins to spread to others. In other words, we become infected and it happens rapidly. Who remembers My Space? Now My Space has been replaced by Facebook (Gladwell, 2002). What about that flip phone? Now we all want an iPhone or Droid.

Principle 2: There are all kinds of things that are contagious, for example, yawning. Yawning is a powerful thought. As you read this and think about yawning – many of you will yawn. When someone sees you yawn, they often yawn too or if you see someone yawn, you may yawn. As humans, we are socialized to think about cause and effect. Just as in the yawning discussion, where we had some people yawn, the epidemic of being *mobile* is a geometric progression. There is no proportionality to this thing we are calling *mobile learning*, big changes can occur from small events (cell phone) and they happen rapidly (1.1 million cell users in 1998 – 85 billion cell users in 2011) (Gladwell, 2002).

"The idea of sudden change is at the center of the idea of the Tipping Point" (p. 12) and is one of the most difficult ideas for educators to grasp. The Tipping Point is the movement of critical mass to a point when everyone is involved. This actually happened with the cell phone in 1998; at that point the cell phone became a viable device for communication and everyone wanted one (Gladwell, 2002). We now have parents purchasing cell phones for their 6 year olds.

The educational paradigm, however, is one of *gradualist*. Educators are at heart *gradualist*. Educators like for progress to be steady; we want time to study the impact and examine outcomes. The world of the Tipping Point is a world "where the unexpected becomes expected, where radical change is more than possibility. It is – contrary to all our expectations – a certainty" (Gladwell, 2002, 13-14). As educators we are missing the Tipping Point of mobile learning.

The Horizon Report 2011 (http://net.educause.edu/ir/library/pdf/HR2011.pdf), presents further evidence that mobile learning is at the tipping point whether, as educators, we like it or not. Each year, the Horizon Report describes six areas of emerging technology that will have significant impact on higher education and creative expression over the next one to five years. The areas of emerging technology cited for 2011 are:

Time to adoption: One Year or Less

- Mobiles
- Electronic Books

Time to adoption: Two to Three Years

- Augmented Reality (*noted in 2010 to be seven years away*)
- Game-based Learning (*noted in 2010 to be seven years away*)

Time to adoption: Four to Five Years

- Gesture-based Computing
- Learning Analytics (Horizon Report, Educause 2011, http://net.educause.edu/ir/library/pdf/HR2011.pdf, p. 5-6).

As educators, we are in the midst of an epidemic, the tipping point has been reached and mobile is here!

The Complexity of Mobile Learning

Mobile learning brings a number of complexities to the educational arena. Today, we will examine three of these complexities: pedagogical; communication; and infrastructure. The first complexity is the **pedagogical** complexity of bringing mobile learning to the learner within a classroom or at a distance. Educators in general are somewhat resistant to the idea of an open system or world in which a student can *reach out and touch him/her* which is the direction that mobile learning and cell delivery of content takes the learner in a world in which 24/7 access makes locating experts, in this case faculty, for questions, discussion and collaboration an easy task. Our students can quickly through the use of their mobile device *fact check* a class lecture, *find people* who may know more about the topic than the faculty, *find people* who have completed the assignment last year and ask them for help – or *copy* intellectual property directly -- and *facebook* or *tweet* (becoming verbs) how bad/boring your class is – all while attending your lecture.

Are You a Mobile Educator? *(Do you let students use laptops during your class?) (Do you make student turn off cell phones when entering the class?) *(Do you let students use their cell phones to find information during class?) (Do your students facebooking during your class?) *(Are your students texting during your class?) **Used in Poll Everywhere during presentation.*

The *Poll Everywhere* exercise provides a context for the second complexity, **communication**. Communication may be the most complex of all the issues surrounding mobile learning. Communication is the one area where learners are in control and are already ahead of educators in using mobile communication to connect, discuss, learn and identify others with the same ideas or divergent ideas.

Finally, there is the hardware and software **infrastructure** aspect of mobile devices many of which require constant upgrades. Ericsson, one of the leading manufacturers of mobile devices, states that by 2015, 80% of the world population will have access to the internet by a mobile device (Educause Review, 2011). Verizon, a leading phone and internet delivery company, suggests by 2015, all cell phones will be 'smart phones' with the capability to access the internet, download, upload and implement mobile apps for education, entertainment and social activities (M. Williams, Verizon, personal correspondence 2010).

Each of these complexities will now be examined through the lens of mobile delivery of content for teaching and learning.

Complexity #1: Pedagogy and Mobile Learning
How Does Learning Change?

Mobile technology in a learning environment does not change the essential aspects of how people learn. Learning does not occur passively and research shows that there is greater learning when students engage in active learning (as cited in McKinney, 2011; Meyers & Jones, 1993). Active learning involves students in talking and listening, reading, writing, and reflection all possible through the use of a mobile device. These devices are small, already owned by most university students and have more capabilities than clickers and easy to use on a desk in a classroom or outside the classroom.

But let's back up a second, we know that these devices are owned by many if not most of our university students but as educators, we need to realize they are becoming owned by learners of all ages. Parents are seeing these devices as ways to educate their children. We are becoming a world of *Free Agent Learners* (Speak Up 2010, p. 1) "who seek out online learning resources on their own, follow a passion for a topic and fully explore it on the web, self-remediate when necessary, and are tapping into the power of educational games inside and outside of school" (Speak Up 2010, 201, p. 1).

This is the present situation in the US for children with access to technology.

Table 1: Personal Access to Mobile Devices

Device	K-2	Gr 3-5	Gr 6-8	Gr 9-12
Cell phone (without internet access)	21%	29%	51%	56%
Smart phone	16%	19%	34%	44%
Laptop	37%	42%	60%	67%
MP3	37%	55%	79%	85%
Tablet device (iPad)	10%	8%	13%	10%

Project Tomorrow, 2011, p. 5. Retrieved from http://www.tomorrow.org/speakup/pdfs/SU10_3EofEducation_Students.pdf

Cell phone purchases for those ages 6 and up increased 40% last year in the US and worldwide 32% (Speak Up 2010, 2011). Parents driving from work, school, and running errands are using the cell phone to entertain their children whether it is the parent's phone or child's phone. Children's mobile apps are being used on the cell to teach informally by parents. The iPad2 and other tablets are changing our focus in education due to its design and tactile experience they provides in the classroom. The larger size makes it easier to read than your phone. Computing is made easier to have discussions and collaborate and allows users to manipulate and 'own' the content created.

No learning does not change, what changes is the delivery of the learning. Which brings us to the new **3 E's for Education**: **Enabling, Engaging, and Empowering,** whereby learners through the use of mobile learning, blended learning, and e-textbooks in socially-based, un-tethered, and digitally rich learning are being educated without us as the *TEACHER*.

These 3 E's suggest that we as educators need to realize that learning must…

- <u>Enable learners</u> to reach their potential through increased access to educational resources and experts that extend learning beyond the capacities or limitations of their school or community.
- <u>Engage learners</u> in rich, compelling learning experiences that develop deeper knowledge and skill development especially in problem-solving, creativity and critical thinking skills so highly desired in the workplace.
- <u>Empower learners</u> to take responsibility for their own educational destinies and to explore knowledge with an unfettered curiosity, thus creating a new generation of lifelong learners (Speak Up 2010, 2011, p. 3).

In building mobile content, educators often create lessons that are little more than exercises in sitting, listening, and/or reading – just like the lecture class he/she used to teach. Learning requires intellectual engagement and interaction with the context of the learning outcomes. Mobile learning must provide the following if we are to enable, engage and empower our learners:

- **Individualized Experiences**. This not just about working alone, working in groups or working at one's own pace. Content must be designed to meet the needs of each student with the instruction he/she needs. Although this seems impossible for a large group, with careful thought individualized instruction can be adapted to individual needs by providing more practice for those needing it and allowing students to move on to the next stage of learning when he/she demonstrates mastery.
- **Free to make mistakes**. Most of us do not like to "look stupid" in front of our peers, the same happens with mobile learning. With mobile learning, the space for learning must be considered safe by students for making mistakes as every single interaction is judged, scored and reported by the device or website being used.
- **Continuous Access.** Most content is built in conjunction with the needs of particular group of students and disappears after the 'class' or learning episode. Often students need to return to this content to re-learn a particular skill or review information for knowledge building. Continuous access is needed to review, reference, and relearn as the needs of the student dictates (Edwards, 2011).
- **Transform and transcend the current learning model** through the use of Wifi and 3G/4G to do internet research (68%) un-tethered to the university network or physical space of school.
- **Communicate and collaborate** with peers, teachers and content experts (53% use text messaging for this)
- **Create and share documents** (video, podcasts, text files - 37%) and **record lectures or experiments to review later** (35%) (Speak Up 2010, 2011, p. 5).

How Are Learning Environments Changing Pedagogy?

Millennials are the first generation to have no understanding of the phone as being attached to the wall of their home. This group sees the phone as a mobile device sporting a camera, media player, and computer capability all to be held in the palm of their hand. Digital tools are seen a linked together, i.e., text messaging, music, games, photos and interactive tools have come together and are accessible on one device. This presents and interesting case in which there is an expectation of free information and the conflict of intellectual property rights.

This generation believes in social networks, collective intelligence, data and visual mash-ups, video on demand, diversity of collaboration and mobile broadband. Digitals think, work and communicate differently building relationships (sometimes very superficial relationships) around their social networks such as Twitter, Facebook, Second Life and LinkedIn (Franklin, 2010, p. 192).

Presently, 90% of the college population owns a mobile phone and see this phone as their single most important form of communication. They link learners in new ways to other learners and information. This constant access to information offers learners new ways to party, dream, play, and learn in ways never before visualized (Franklin, 2010, p. 192).

This always-on communication has led to a millennial language with 76% using instant messaging/text messaging and 15% logged on 24/7. President-elect Barack Obama's campaign immediately distinguished itself by sending out campaign messages, using Facebook to reach thousands of potential supporters through connecting Facebook 'friends' with the then candidate. The allowed the campaign to reach and target social networks targeting African-Americans, Asian, Latino, gay communities and faith-based communities. Each of the presidential campaigns used some sort of social networking on the major social networking environments: Twitter, Facebook, MySpace, Flickr, LinkedIn and Eons – for those not of the digital age (Franklin, 2010, p. 193). Taking a note from the social networking sites, people of the world are using Twitter and Facebook to stoke the fires of change and revolution.
[*The above section, How Are Learning Environments Changing Pedagogy? is from an excerpt from Chapter 9 and provided here with permission form the author, Dr. Teresa Franklin, APA Reference/Citation: Franklin, T. (2011). Mobile school: Digital communities created by mobile learners, In Wan, G. & Gut, D. (EDS), Bringing Schools to the 21st Century, Norway: Springer Publishing*.]

How do 21st Century Learning Skills go Mobile?

As educators, we like to have a 'catchy name' for everything -- case in point – 21st Century Skills. Haven't we always been teaching and at least attempting to teach the skills needed for the next century? The Partnership for 21st Century Learning states these skills are a "holistic view of 21st century teaching and learning that combines a discrete focus on 21st century student outcomes (a blending of specific skills, content knowledge, expertise and literacies) with innovative support systems to help students master the multi-dimensional abilities required of them in the 21st century. As educators, we have always tried to take a holistic view of teaching and learning and prepare our students through a combination of skills, knowledge and dispositions. What is different is that now as educators we have competition in the form or devices that can deliver content quickly, access experts, and connect to anyone, anywhere. This adds to the complexity of what we are doing in the classroom. What the Partnership for 21st Century Learning does acknowledge that has not been acknowledged in the past is the there must be student outcomes and support structures in place for 21st Century learning to occur.

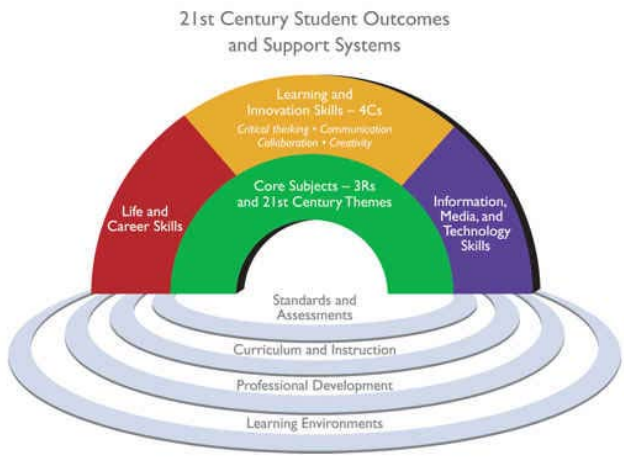

Figure 1: 21st Century Student Outcomes and Support Systems, The Partnership for 21st Century Learning, http://www.p21.org/index.php?option=com_content&task=view&id=254&Itemid=119, para. 1)

These outcomes noted in the arches and the support system that is below the arches in Figure 1 suggest that as educators, we must be very aware of the literacies and future implications of all technologies but especially mobile technologies. The Core subject areas and 21st Century themes (Global awareness, Financial, economic, business and entrepreneurial literacy, Civic literacy, Health literacy, and Environmental literacy) must be more fully realized in math, science, technology and engineering (STEM) to bring to fruition the learning and innovation skills, information media and technology skills and life and career skills each student will need to successfully participate and contribute to society in the future. The following links will navigate those interested in carefully examining the Partnership for 21st Century Learning and student outcomes:

1. **Core Subjects and 21st Century Themes**
2. **Learning and Innovation Skills**
   - Creativity and Innovation
   - Critical Thinking and Problem Solving
   - Communication and Collaboration
3. **Information, Media and Technology Skills**
   - Information Literacy
   - Media Literacy
   - ICT Literacy
4. **Life and Career Skills**

These links (URLS) provide a framework for educators as they move to create more engaging content, more mobile content, more communication and collaboration, more critical thinking and problem solving in the classroom.

How Does Virtual Immersive Learning Impact Pedagogy?

Second Life, a virtual world environment, goes even further in creating a social network which includes a game and fantasy world in which presence and communication is through an avatar acting as a persona of the individual. Second Life is a virtual 3-D software created by Philip Rosedale and now owned and operated by Linden Labs. It is probably more accurate to say that Second Life is 3-D online, digital work created and owned by the residents of the world. In Second Life, virtual property can be purchased, built, changed and 'lived' within this metaverse. It is the individual's virtual life (Rymaszewski, Wagner, Wallace, Winters, Ondrejka, Batstone-Cunningham, 2007).

In this virtual world, the residents are avatars representing the individual who creates the avatar and is participating in the online environment. As an online environment, the world is accessible to anyone connected to the internet. Residents of the world can make the rules, play games, roam the environment, fly, and interact with other avatars – only limited by the design of the virtual world. These 3-D virtual worlds are being explored for meetings, college instruction, simulations and games for middle school students and general social interaction opportunities for building collaborations. This is the new frontier for learners in which the workplace is mobile, virtual, social, and allows for the building of knowledge in cyberspace (Franklin, 2010, p. 196).
Many universities are experimenting with the use of virtual environments for teaching and learning and recruiting today's digital learner. From the recruiting aspect, several schools in the US are not using virtual campuses to invite future students to talk to advisors, meet the people in registration, and organize class schedules all within this virtual world (Hughes, Designing Digitally, http://www.3dvirtualcampus.com/3dvctdemo/ March, 2011).

The Ohio University National Science Foundation project, Science and Technology Enrichment for Appalachian Middle Schoolers (STEAM) has created a number of virtually designed science lab simulations and games aimed toward teaching the 'difficult to teach and difficult to learn' concepts of middle school science. Middle school students visit the Science Teen Island in Second Life and 'play' games designed to teach standards-based science concepts. This virtual world can be accessed from the school, home and any other location with an internet connection. Within the GRID Lab at Ohio University, *serious gaming* is occurring through the development of a virtual world to train firefighters in the rescue of people in a fire and to identify the safety concerns of firefighters. (http://vital.cs.ohiou.edu/) (Franklin, 2010, p. 196).

Dartmouth University is in the process of creating a virtual world to train community emergency respond teams in which "volunteers learn how to cope with a range of emergencies by experiencing simulated, 3D disaster areas while engaging others – virtually – to deal with unfolding events" (Educause Learning Initiative, 2006, p. 1). Harvard University has created *River City* within the virtual environment of Active Worlds to help student in K-12 learn about the spread of disease while also learning the inquiry process of science. The University of British Columbia has developed a virtual world for archaeologists in which students can use contemporary techniques to re-create the structures of time (Educause Learning Initiative, 2006) (Franklin, 2010, p. 196).

And as a final example, you too can do your banking in a virtual world (http://www.hypergridbusiness.com/2011/04/hp-rolls-out-virtual-banking-with-avayas-web-alive/) or even build your own world (http://www.dreamlandmetaverse.com/). I remind you again, that the agile *Free Agent Learner* will be the one to capitalize on these types of open source, open and virtual worlds not only as learning spaces but for entrepreneurial endeavors as well.

Why is this significant? These virtual environments have the potential to foster constructivist learning in which learners take ownership for their own learning processes. Digital learners are already comfortable with gaming and mobile communications. Virtual worlds bring together learners and challenge them to collaborate in problem-solving activities without explicit learning objectives and assessment. For many learners the avatar-to-avatar experience may seem as real as a face-to-face conversation. Opportunities arise for meaningful engagement in learning across a broad spectrum of students around the world. A virtual world as an educational medium requires reflection on how education has been conducted in the past. The virtual world allows for more interaction and more engagement for some students (Franklin, 2010, p. 196).

Today's games are complex and require collaboration with others and are part of the modern world. Sixty-five percent of college students state they play online games on a regular basis. Games are very much a part of their mobile environment with games being played on laptops and smartphones all the while multitasking by visiting with friends, listening to music or completing assignments. Many are "immersive virtual worlds that are connected to a more complex external environment that involves communities of practice, the buying and selling of game items, blogs, and developer communities" (Oblinger, 2006, p. 1). These are very complex learning constructs. Games are often not looked upon favorably because the non-game player (the teacher in the classroom) has not had direct experience in the immersive virtual world. "It is important to emphasize that games and play may be effective learning environments, not because they are fun, but because they are immersive, require the player to make frequent, important decisions, have clear goals, adapt to each player individually, and involve a social network" (as cited in Oblinger, 2006, p. 2; Franklin, 2010, p. 197).

The increased gaming experiences of digital learners may prove to be a motivating factor in learning within virtual worlds. "Many kids can sit and play 'World of Warcraft' for hours, yet can't stop fidgeting during a 30-minute lesson. Interactive educational games…help kids become more engaged and persistent. They allow students to say 'what if' and explore. They also allow one to make mistakes – an important part of learning" (as cited in Kerslake, 2008, p. 8; Franklin, 2010, p. 196).

[The above section, How Does Virtual Immersive Learning Impact Pedagogy? is and excerpt from Chapter 9 provided here with permission form the author, Dr. Teresa Franklin, APA Reference/Citation: Franklin, T. (2011). Mobile school: Digital communities created by mobile learners, In Wan, G. & Gut, D. (EDS), Bringing Schools to the 21st Century, Norway: Springer Publishing.]

How Does Pedagogy Support Learners?
Every learner will need to be able to create and manage his/her progress in an age-appropriate personal learning plan that includes his/her goals for content knowledge and skill acquisition inside school (classes and class work) and outside school (after school, employment, extracurricular). Learners will need to become more self-directed in their learning to be successful in this new mobile environment as this mobility allows an individual to be agile in meeting demands in the learning and in the workplace. The jobs of the future will belong to the *Free Agent Learner* that has the ability to:

- *Learn how to learn* and self-monitor and improve his/her learning progress across all subjects;
- Be an active collaborator in the teaching and learning process (e.g., students act as co-creators of knowledge along with other students, teachers and education leaders); and
- Able to identify and complete meaningful capstone projects and other inquiry-based learning experiences that involve mentors and research (Speak Up, 2010).

Does the Pedagogy Impact Textbooks and Apps?
Educators love their textbooks and many teach directly from the textbook without any reflection upon how they might actively engage learners. Digital books or e-books change the way learners interact with books by adding a layer of hardware, the reading software, and ecosystem, such that the content can be tailored to the reader. This does "require that readers fundamentally change the way they interact with the book's content" (Oblinger, 2011, para. 4). Which is the reader doing, reading causally or studying the materials in the text? This makes a great difference in how the reader approaches reading. Digital readers are lightweight, some are easily read outside in sunlight, and have the capability of bringing a larger audience to the learning environment as they can read the text to the less capable reader, less-sighted reader or a more auditory learner.

The faculty in educational institutions, as textbook authors, have a different perspective on the e-books than the administration and students. While as educators and technologists, we understand the move to digital books, we also see learning outcome issues. Moving to e-books allows the publisher to divide your book into sellable chapters such that the reader can purchase one chapter, 4 chapters or the entire book – which does not really make sense to educators. Doesn't a student need the entire book to actually be able to understand and learn the content? Does this ability to single out chapters for purchase change how I write the content? Resistance to the publishing industry abounds in education. Publishers and in the United States, the government, is pushing for more affordable access to textbooks and the way to make them more affordable is to make them e-books.

What about Open Textbook Publishing? The open resources model is the result of several factors: 1) the high costs of textbooks, e-book readers coming down in price, 3) publishers moving to electronic media and finally, the need for up-to-date content that is of high quality. Faculty develop content to be distributed to their classrooms that is peer-reviewed by others in the field and placed in repositories that are open on the Web. At times, the faculty are compensated by departments, universities, foundations, etc., but the real belief of the individual is that content needs to be available to others. The copyright issues are solved by having the content placed under the Creative Commons license which allows the author to specify when, where and how the content may be used. This flexibility puts high-quality content in the hands of many learners. Another thought is that open texts will allow the learner to become a contributor or author to the text as well. This is a new collaborative model not seen in publishing before now. Faculty and learners can move beyond passive learners to designing content for courses and learning activities which are 'just-in-time' choosing from video, audio, text, webpages, articles found online and readings (Educause, 2011).

Once texts and most books are electronic, the next question becomes which e-reader? There is the Kindle, Nook, E-Fun Netbook-3, Cruz Digital Reader, the Kobo Digital Reader, Pandigital Reader, and the Sony Digital Reader, some with 3G capability others with just Wi-Fi. How do we decide which to use and none are cross-compatible unless in some cases you use PDFs as your document to read? And PDFs are not always formatted to fit the screen on some of these devices nor do they all allow for the reading of the text to a student that may be sight impaired – thus making the content available to a larger audience.

Publishers of e-books and cell delivery systems will need to come to a *standard* such that books can be transferred from one type of reader to another type of reader and also cell to cell without fees and additional costs once the book or chapters are purchased. We as technologist and educators must pressure publishers to come to this standard if we are to have a broad base of content and affordable content for ALL people. An interesting thought to the cross-compatible dilemma may be that many of these devices will disappear as cells and smaller tablets become more adapt at accessing the web in a larger number of markets that are isolated and rural, thus, forcing e-books not aligned with a cell company out of business. It may actually be the cell phone companies that decide for us as educators the products we will use.

As researchers, it is up to us to examine open publishing and e-books, how we can use them in teaching and learning, and which provide best practices for learning. We do not want to allow business to make this decision for us. [*reminds me of what one of my professors, Dr. Mitias, from Egypt once said to me when I was a doctoral student – the keeper of the content, keeps control of the ideas and the people*.] I think as educators, we want to make sure the content is open and free for all people.

And, what about all those applications which we refer to as Apps? Small, agile programs known as apps are making an appearance on cell phones, tablets and some computers (in particular the Apple Macintosh commonly called the MAC). These applications are for all ages, and are pennies in price compared to many of the larger software applications we place on our computers. They are created by companies, university, middle and high school students, parents, businessmen, and programmers. Available especially for the Blackberry, Droid and iPhone, these little programs are having a major impact. Some are free, some cost as little as 99 cents and having higher costs, all are at your fingertips at iTunes or the Market Place to own in an instant.

These apps can teach you a language, math, find your location, help you find a location, find a friend, connect you to your social networks and bring your content from your Learning Management System such as Blackboard to your computer to complete you assignments. Powerful is the only word for these little apps. With only the imagination to limit the development of apps, there will be an ever increasing number of these for our learners. These apps allow our *Free Agent Learner* to by-pass us as educators and identify and learn content without us. The ITunes University has a wide variety of open content for anyone interested in almost anything. You can even learn how to build apps on ITunes University!

Does Mobile Learning Impact Digital Citizenship?

Increasingly, the web, news, newspapers and magazines are reporting misuse of digital content in the form of downloading music illegally, plagiarism, cheating using a cell phone on tests, YouTube videos of unauthorized recordings and cyberbullying of students though the use of email, social networking sites and text messaging. With the wide availability of the internet in many locations, devices that interface with the internet and a digital native population, a critical need appears for an understanding of what it means to be a *digital citizen*. According to Ribble, Bailey and Ross (2004a), digital citizenship can be defined as "the norms of behavior with regard to technology use" (p. 7) Franklin, 2011, p. 198).

If society is to continue the use of technology with an open platform for connectivity and collaboration, digital citizenship must be the ethical underpinning of our use of technology with digital natives. Six topics can be used to build a case for the need for digital citizenship in today's mobile society. These six topics are:

1. Digital Access
2. Digital Communication
3. Digital Rights
4. Digital Security
5. Digital Commerce
6. Digital Safety
7. Digital Responsibility (as cited in Ribble & Bailey, 2004, p. 14-15b; Franklin, 2011, p. 198)

Digital Access. Equitable access in a digital society is necessary in order for human intellectual capacity and growth to occur. While digital inequity may occur due to socio-economic, personal decision, and/or social position, the responsibility for providing accessible internet connectivity rests with providing the resources needed to participate as a digital citizen. These resources include technology equipment such as cell phones, computers, and software and internet connectivity including low cost cell phone connectivity for formal and informal learning opportunities within a mobile society. The issue of economics is a critical one as many people are without adequate income to maintain mobile connectivity. Society must provide access. Without society's pressure to provide adequate connectivity for all of its citizens, equitable opportunities for learning and improving human capital do not exist for all citizens (as cited in Ribble & Bailey, 2004b; Franklin, 2011, p. 199).

Digital Communication. Discussions on the use of mobile technologies as a means of communication are long overdue. Teachers, parents, school administration and higher education communities have to date, danced around these discussions largely due to concerns over personal rights and ownership of mobile technologies. Little effort has been taken to establish a set of standards for communication etiquette within a digital society. When should the mobile phone be silenced, vibrated or ringing? When is the use of the mobile phone acceptable within the community? No one can say they have not been annoyed by the loud ringing of a cell phone or the unintentionally overheard conversation due to the cell phone user standing next to them in a store, classroom, or office. IPods with volume set on high are loudly played and can often provide a disturbing undercurrent of sound in a classroom. Game play in the classroom on cell phones and PDAs does not often provide the backdrop for learning in a classroom in which the teacher is presenting content. Finally, what form of communication is best presented by use of mobile technologies? In most personal conversations, face-to-face communication are often seen as the best way to convey the information while mobile technologies provide an efficient means for conveying basic information (Ribble & Bailey, 2004b). Helping digital natives to determine when, where, why and how in using cell phones for communication is needed in the development of digital citizens (Franklin, 2011, p. 199).

Digital Rights. Basic rights are expected by every citizen including digital citizens. In a digital community, the rights of free speech, private property and privacy when using technology must be maintained and supported. Local, state, regional and national governments must take the responsibility of helping educational institutions provide opportunities to learn how digital rights are violated or protected when using cell phones, PDAs and the internet (as cited in Ribble & Bailey, 2004b; Franklin, 2011, p. 199).

Digital Security. In the same way we protect our money by placing it in a bank or safety deposit box, digital natives must protect their mobile devices and the information found within those devices. The use of passwords when connecting to the internet, sharing information and accessing web-based sites must be protected. Virus protection and firewalls can provide needed 'machine-based' security but the need to remain vigilant in not sharing passwords and logins by mobile uses is paramount to maintaining a secure web presence for personal data. The need to backup secure information in the case of hackers is not unheard of in the mobile phone industry. Contact information from the contacts list of most mobile phones can provide a hacker with a wealth of information on addresses, phone numbers, and identities (as cited in Ribble & Bailey, 2004b; Franklin, 2011, p. 199).

Digital Commerce. Shop until you drop is no long the mantra -- but rather -- shop until you need to charge the phone, may be the more realistic mantra for the digital citizen. The buying and selling of goods on eBay®, purchased on Amazon® and electronic stores such as Apple® and Best Buy® are merely a button push away on mobile devices. While right versus wrong does not change in a mobile environment, decisions concerning whether an item can be purchase legally may bring about consequences for not doing so. The digital citizen must know and understand the implications of shopping online and privacy, identity theft and credit card protection strategies. Just because one is mobile does not mean that the purchaser's identity cannot be compromised (as cited in Ribble & Bailey, 2004b; Franklin, 2011, p. 200).

Digital Safety. Who thinks about the many ways in which one twists their body to hold the cell phone, drive and eat while in a car or at their desk at work? Increased use of mobile devices such as cell phones, laptops and iPods has caused many to worry about the electromagnetic waves and ergonomics of using such devices. While to date, no conclusions can be made on the electromagnetic impact of mobile devices, ergonomics research does provide several interesting concerns for the digital user. Users must be aware there are some inherent safety issues with mobile technology use including eye strain, repetitive stress syndrome and possible hearing impairment. And in turn, society must remain vigilant in researching these and other ergonomic issues surrounding digital devices and implementing needed changes for improved health (as cited in Ribble & Bailey, 2004b; Franklin, 2011, p. 200).

Digital Responsibility. Ethics remain a huge issue in the use of digital devices both inside school and outside school. As a digital community, society must work both within educational institutions and the workplace to demonstrate the ethical use of all forms of digital content, information, music, and data. Hacking into a computer system, which includes today's smartphones, stealing or sharing information which is private cannot be tolerated. Plagiarizing, distributing viruses, Trojan Horses, and other malicious software to mobile devices are unethical acts both in and out of school. Harassing other users through websites containing slanderous content, email with threats and vulgar content are equally unethical and has both legal and personal consequences (as cited in Ribble & Bailey, 2004; Franklin, 2011, p. 200).

The 21st Century digital world requires that ethical and unethical behavior and appropriate use and inappropriate use of digital devices be at the forefront of education in this technological age. The leadership today may not be as technologically savvy as the digital natives that will lead in the future. This demands that dialogue concerning digital citizenship occur now if a productive citizenry is expected to participate in a global community. "The old adage seems quite appropriate when gauging the importance of digital citizenship education: 'If not here (schools), where? If not now, when? If not you, who?'" (as cited in Ribble & Bailey, 2004b, p. 15; Franklin, 2011, p. 200).

[*The above section, How Does Mobile Learning Impact Digital Citizenship? is an excerpt provided from Chapter 9 and is provided here with permission form the author, Dr. Teresa Franklin, APA Reference/Citation: Franklin, T. (2011). Mobile school: Digital communities created by mobile learners, In Wan, G. & Gut, D. (EDS), Bringing Schools to the 21st Century, Norway: Springer Publishing*.]

Are You a Mobile Educator?

(Do you use an LMS like Blackboard, Moodle or Sakai?)
*(Do you have the ability to go to the site through a mobile app?)
*(Do you send coursework to your students through your cell?)
(Is your internet service on campus reliable?)
(Is your internet service on campus fast?)

**Used in Poll Everywhere during presentation.*

Complexity #2: Infrastructure and Mobile Learning
Access to the Internet is an on-going challenge – we have the devices and need the Web. Often University and PK-12 budgets are strained not just by the economy but the ever present need to implement a new technology or up-grade systems. Cross-compatibility continues to be an issue. Students arrive at the university with a wide variety of tools: iPhones, Droids, iPads, Zooms, Dells, Toshibas, Lenovo, HP, Kindles, Nooks, Xbox, PlayStations and many, many other items all requiring increasing bandwidth, electricity, and the staffing to help students when the devices do not work.

Students arrive with many levels of expertise in the use of technology. This puts an extra burden on faculty and staff at the institution in helping some students catch up in learning to use the technology while trying to keep other students from *hacking* the university's systems. Internet security and on-site versus off-site access adds strain as educators try to go mobile with their learning. Learning management systems (LMS) like Blackboard, Moodle, Angel, Drupple, and Sakai can add to the stress on the bandwidth as e-learning and mobile applications (apps) are used by students to obtain content to meet course learning outcomes.

What is an institution to do when 3/4ths of all students on campus have mobile web-enabled devices or plan to purchase one as soon as they can afford the data plan? When does trying to control the devices used become a lost cause?

Key questions many institutions are asking themselves as mobile devices flood their institutions are: *How can we let go of the device and build for innovation and the contributions of the digital citizen? Can we innovate in the use of IT tools and the IT tools themselves?*

This leads the institution down a path in which the community becomes a source of identifying and creating apps of value to the community. This innovation test approach allows the community to determine the value of the mobile apps by the *vote* of use. Institutions are moving to the only stipulation in the use of mobile devices is that they be web-enabled. IT management is instead creating app mark-up code (http://mwf.ucla.edu) to basically sanitize all web pages, apps and content such that when the app comes to the mobile website, it is runs through the coding invoking CSS definitions and functions in which the app becomes appropriately presented on all devices. This allows for a "broad range and diversity of edge-layer services that can be deployed locally but presented institutionally" (Davis & Ricchio, 2011, para. 5). This frees the IT staff to create content and mobile apps to increase the learning environment on campus.

There some troubling infrastructure issues that relate to mobile learning that should be considered and are often not part of the 'going mobile' discussion. Few faculty and staff receive financial support for mobile communications needs with only 10% of the faculty and 25% of the staff provided with any support. Institutions are slow to use the "technology for official non-emergency communications" (Sheehan, 2009, p. 3). Only 1 in 7 text messages on campus by campus IT, faculty or administration are used to communicate with students or faculty (Sheehan, 2009). Finally, email volume continues to be a problem. With the ability to use your email services as a storage site for online assignments, student emails and administrative emails, faculty, staff and students are overusing the typical email system of most institutions. Limiting email space is not the solution! However, outsourcing to Google or Microsoft Live may be the storage space needed to not only support mobile learning but to maintain records for future decisions.

Are You a Mobile Educator?

(Do you have a Twitter account?)
*(Do you have a Facebook account?)
(How often do you log onto facebook?)
(Have you built a blog using WordPress for your students?)
(Have you built a Wikispaces for your students?)
(Have you used a discussion board with your students?
(Have you built an online course?)
*(Did the building of your online course involve a team of educators in the process of building the course?)
(Does your online course use RSS feeds to send out reminders and information?)

**Used in Poll Everywhere during presentation.*

Complexity #3: Communication and Mobile Learning

In today's world, mobile is necessary for content delivery opportunities. It should be readily apparent to the higher education and PK-12 education that mobile learning will be your greatest competitor for students. The quality of online courses, and especially of those attached to 'brick and mortar' schools is becoming in some instances of greater quality than the actual lecture/classroom presentation of the same material. A blasphemous statement, many educators would state [and many of you in the audience will note with anger my statement] but in the real picture of higher education and PK-12 education, online courses are being carefully designed typically by a team of content SMEs, instructional designers, multimedia specialists, and evaluators, are more regulated, are more open to scrutiny and have required on-going evaluation. This is not the case in most higher education classrooms and PK-12 classrooms. We as classroom-based educators go into our room, close the door and teach – no one would dare enter and appear to evaluate our teaching every class in the same manner in which an online course would be monitored and evaluated.

The two major problems with online learning are 1) students that are sometimes not mature and organized enough to work in an online environment and believe that working in an online environment is easier (which it is not) and 2) the fact that many in higher education think that creating an online course is easy and can be done alone, when in fact the instructional design approach (team approach) to online course building is what makes an online course superior. The marriage of online content and mobile devices presents a setting in which a PK-12 course, and a college or university can literally meet the learners where they are.

Mobile learning brings two communication issues to the forefront in our institutions: 1) the devices used (iPads, iPhone, iPod, Blackberry, Droid) and 2) the faculty/teacher-student interaction. Communication within a mobile learning environment may be as simple as email or as complex as blogging, receiving an RSS feed, creating a wiki for journaling, tweeting, using a social networking site or collaboration in a game environment.

Communication complexity exists because the device, the infrastructure, the support, and faculty development have to all coincide with the use of a mobile device. People and their habits add complexity. As educational technologist, technicians and online course designers, one must think about the skills that are needed to navigate these open spaces for communication (e.g., wikis, Facebook, blog, Twitter, Farmsville) (Evans, 2011).

How will mobile content and information from your university and PK-12 school be managed? Here are some practical and phased approaches to mobile delivery.

1. Build your first mobile site as a foundation for more sites to come. Start by matching up what your learners want with content you already have.
2. Call you colleagues at other institutions and see what they are doing. It is OK not to know everything about how to do this. Higher education is more collaborative than industry and much more willing to share what is known about this process.
3. There is more than one way to deliver mobile. If you have a budget, hire a consultant. If you have a great design and technical team, there are some rock-solid open source tools for mobile. The enterprise system on your campus may also have mobile products.
4. Keep it simple! The mobile interface must be clean and practical – realize your learners are looking at other apps and sites so you need to be attractive too! Your audience is using fingers and thumbs – not a mouse – design accordingly
5. Use metrics/analytics to see what is going on with your mobile content.
6. What devices are being used? Droid (30%); iPhone (40%) and then others. Build the mobile site to use multiple iOS.
7. Use RSS feeds for news, blogs, and events to stay current.
8. Think about how an app can do this work once you have a mobile site built and have tested it for a year (Evans, 2011, p. 1-2).

Mobile delivery of content is just beginning and there are a small number of universities and colleges and even fewer PK-12 schools using this delivery. Mobile content delivery will be required for your institution to stay competitive. Institutions of higher education and eventually PK-12 have to establish a strategy ***now*** and make the necessary decisions to take advantage of this communications opportunity. The enrollments of your institution depend upon it.

The Role of the Educator in the Future

In many P-12 schools, filters are a limited barrier to using the Internet or technology in the classroom. Learners are using their mobile devices with and without teacher knowledge as creative and adventurous teachers bring mobile devices into the learning environment. Learners are comfortable with their own devices and have mastered their use as we educators continue to struggle in making them work 'correctly'. Apps a the P-12 and university level can provide a level of accommodation to those needing more support and information on the activities on campus for those seeking to participate in events. According to the Speak Up survey, students are already using a variety of technologies as part of their school day or to complete their homework assignments. The use of mobile technology is a logical 'next step' for them (Speak Up, 2010).

We are in a world in which there can be a global educational exchange for exponential change in our educational systems. Educators must prepare their students for a unknown new environments upon graduation for P-12 or higher education. Our current educational system is obsolete and we as educators will become obsolete if we do not realize that we must embrace the changes that are upon us in how, where and why students learn.

Our mandate is to prepare students life in the workplace. The present brick and mortar school, textbooks, lectures, worksheets, high-stakes tests must shift to learning anywhere, anytime – whenever learning can occur best. "**How you do** your daily tasks as an educator is changing; **what you do** stays the same: help students learn relevant skills, knowledge and attitudes, behaviors they will need to be good and productive citizens" (Jukes, McCain, & Crockett, 2011, p. 21).

"Learners need encouragement and timely nonjudgmental feedback. They must be given opportunities to make mistakes, authentic audiences for presentations and a wide variety of contexts and audiences to demonstrate their learning. They need to be encouraged that for some problems – there is no one 'right' way and that exploration of the mobile devices, mobile environments and techniques will improve their learning and understanding of the world in which they live" (Jukes, McCain, & Crockett, 2011, p. 21).

What are the Faculty and Student Concerns in Developing Mobile Learning?

We are still in the early days of mobile learning and its application. Students can play a major role through the development of apps that become institutional resources and part of the institution's infrastructure. Most of the time, students are pioneers in forcing us as educators to change. However, once the student work becomes part of the university infrastructure, the apps may be outsourced just like the university website and other centralized IT work of the university.

Mobile devices increase the opportunity for student/faculty interaction. Text messages, Skype calls and constant email can become a 24/7 event for the faculty member. The expectations of a mobile-based learning will have to be negotiated such that both faculty and student are not invading each other's social and private spaces and time. Cell phone use, laptop use, social networks in the classroom will also have to be negotiated. "Student empowerment is a faculty member's threat." (Mobile Learning, 2010, p. 5).

Mobile devices have the potential of increasing faculty workload. Mobile technology and learning adds a complex layer in which the faculty member has to juggle websites, content, design, implementation and execution of technologies and the cloud. How does my content look on a mobile device? The answer requires repackaging of content, time to prepare and staff support that is often not available.

While there is often resistance to mobile technologies from faculty, students are not necessarily ready to move forward either. Mobile technology may be in the hands of students but it is primarily used to listen to music. Older adults returning to school may have no understanding or expertise with the technology – much less mobile technology.

Finally, research by Dr. Sherry Turkle (2011) asks the following question: Why do we expect more from our technology than we do from people who are using the technology. Those who love the technology and are engaged with the technology and who study the technology must never forget that there is a human side to technology. Never forget that people are at the base of society and are who will maintain the humanity in how we teach, treat each other and live together as productive citizens of a global society.

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PERCEPTIONS OF STUDENTS WHO TAKE SYNCHRONOUS COURSES THROUGH VIDEO CONFERENCING ABOUT DISTANCE EDUCATION

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ABSTRACT
The objective of this study is to determine how students who are taking synchronous distance education classes via video conferencing perceive distance learning courses. A qualitative research approach was used for the study. Scale sampling was also used. The study's subjects consisted of a total of nine students comprised of 2nd and 4th grade students engaged in a course via synchronous distance education. For the study, the case method, a qualitative research method, was used, and research data was obtained via semi-structured interviews and observation results. Data was analyzed by means of the descriptive analysis method. Findings obtained at the study's conclusion indicate that students' perceptions of the course changed during and at the completion of the course. It was generally seen in the descriptions students made about the environment before taking synchronous distance education that they did not have advance information or that they had a prejudice due to their misinformation. It is seen in the conducted interviews that these prejudices start to be eliminated thanks to the opportunities provided by synchronous distance education through this process. It appears, from students' descriptions of the course environment prior to taking the course, that they did not have enough information or had preconceived ideas. As the course progressed, student perception changed and they were able to perceive more clearly the opportunities that synchronous distance education can provide. In this study, the most important problem in synchronous distance education was determined to be disconnection and sound problems. In this study, a significant problem was the hardware – i.e., sound, speed and connectivity issues. As well, students became bored after some time because of limited camera angles and cameras. It was concluded that this situation prevents the continuity of the course and so leads to distraction. On the other hand, it was observed that students start to get bored of the course after a while due to the fixedness of the camera angle and the small quantity of cameras. We also noticed that the fixed camera angle, small number of cameras and problems occurring in the images affected student perceptions. Besides these technical problems, the researchers observed, and the students expressed that the factors of teacher, environment, distance, course type and duration also caused the students' perceptions to change.
Keywords: Video Conference-Based Lecture, Student Perceptions, Distance Education

INTRODUCTION
Developments occurring in Internet-based technologies, in recent years, have enabled the e-learning model to be a significant factor in distance education (Aşkar & Halıcı, 2004). E-learning, defined as an education based on electronic tools and media via Internet and network technologies, offers an alternative education model, bringing together teachers and students from different environments (Driscoll, 2002). The e-learning model is implemented using two different methods, synchronous and asynchronous.

The synchronous model enables a teacher and student to communicate in real time, though different spaces. The asynchronous model is defined as an e-learning model in which the student and teacher do not have to communicate in real time, and provides an opportunity for the learner to complete his/her education at his/her own learning speed and time (Horton, 2000; Rosenberg, 2001). Synchronous distance education is considered more advantageous in terms of real time discussion and brainstorming, offering an environment closer to the traditional class environment and allowing instant feedback. Delayed feedback in asynchronous distance education lowers interaction levels and can cause decreased levels of student interest and engagement. One way of solving this dilemma, in synchronous distance education, is to allow the student to establish visual and voice communication with the teacher with video conferencing based educations. Thus, an environment closer to the traditional class is created. (Reinhart & Schneider, 1998; Gillies, 2008).

Video conferencing is defined as interactive and synchronous voice, video and data transfer conducted between two or more points via communication lines (Gough, 2006). This system reduces the cost of education by connecting students and teachers who are in different locations. In addition, it offers a connected environment where students can relate their experiences to each another; and a feeling of togetherness is created, along with the benefit of expert instruction. As discussed by Hackman and Walker (1990), rapid comprehension in this environment, where students are able to express themselves comfortably in a, enables better teacher-student communication. Video conferencing is more developed compared to other methods of distance education, in terms of real-time interaction, relationship, motivation and collaborative learning (Brown & Liedholm, 2002; Wheeler & Amiotte, 2004; Bates, 2005; Wheeler, 2005). The quality of video conferencing systems varies according to the technology used, and the bandwidth, and it impacts the quality of education and student-teacher interaction level (Martin, 2005). Besides, fostering active student participation in the process is very important for ensuring an effective education and training environment. However, these studies determined that the students were not sufficiently encouraged in regard to learning during the video conference practices (Motamedi, 2001; Watkins, 2002; Newman, 2008).

A frequent error in assessing video conferencing practices is to equate the environment visually with the face-to-face traditional class environment and use it in this way (Hearnshaw, 1998; Anastasiades, et al., 2010). While video conferencing practices do provide opportunities for synchronous watching, listening and communication with other participants, the human interaction is not as effective as in the traditional education process (Bonk, et al., 1998; Schweizer, et al., 2003). Studies that have been conducted in order to evaluate the efficiency of video conferencing in education indicate that the expectations of the participants still cannot be met adequately (Motamedi, 2001; Knipe & Lee, 2002; Delaney, et al., 2004). This situation affects student perceptions and their learning depending on the perceptions. The perceptions are accepted as one of the determinants for the development of knowledge (Şimşek, 2008). Students stated that the applied technologies, the locations of the devices, technical problems such as sound, image and connection problems, the interaction inside and outside the class, the teachers' use of body language and the durations of the courses were the factors that affected their viewpoints about distance education (Martin, 2005; Koppelman & Vranken, 2008; Gillies, 2008; Marsh, et al., 2010).

Countries that put distance education in their educational policies are carrying out significant studies on this subject. In Turkey, many distance education centers and distance education programs are opening in order to keep up with this innovation. In a review of the scholarly literature, no detailed research into student perceptions of synchronous distance education in Turkey could be found in spite of all of these developments. The present study examines undergraduate students' changing perceptions of video conference-based lecture via distance education. "What are the undergraduate students'" perceptions of distance education acquired through a video conference-based lecture?" is the study's main question. "What are the opinions of students about distance education before taking a video conference-based lecture via distance education?", "What are the opinions of students about distance education after taking a video conference-based lecture via distance education?", "What impacts the students' perceptions of distance education during the educational process?" comprise the study's sub-problems.

LITERATURE REVIEW

In the study, "The Quality of Teaching and Learning via Videoconferencing", Knipe and Lee (2002) examined the quality of teaching and learning activities performed via video conferencing. The study was conducted with 66 students. 45 students participated in traditional, face-to-face courses and 21 students participated in distance education. After the study, the students participating in the course via distance education felt alone and as if they were not a part of class when they could not make eye contact with other students and the teacher. This situation impaired the concentration of these students and made a negative impact on their learning.

The study conducted by Umphrey et al. (2008) studied the impact of interaction, class communication experience and the relational features displayed by an instructor when engaging directly with students, compared to student perceptions in regard to video conferencing education. According to the research results, students believe that face-to-face education is more positive than video conferencing, in terms of the teacher's proximity, understanding the teacher, mutual communication in the classroom, success and quality. From these results, it seems that the most effective video-conference courses would include interaction and in-class engagement.

A study carried out by Marsh et al. and titled "Interactive Video Technology: Enhancing Professional Learning in Initial Teacher Education" (2010) investigated the benefits of taking the live implementation of learned theoretical information via video conference. The research took place between 2005-2007 with the cooperation of Sussex University and 6 schools. The video conference technologies provided a way to overcome the limitations of the learning center's physical site. Teacher trainees could access various class applications and practice with the instructor. Course records aided the trainees by refreshing their memories about subjects they forgot.

Martin's article "Seeing is Believing: The Role of Videoconferencing in Distance Learning" (2005) examined Northern Irish students' study of the Constitution of the United States of America as explained by an American congress member. The students from Northern Ireland stated that the opportunity to interact with famous American politicians and to see them without traveling long distances from the places they lived enabled them to evaluate distance education via video conference in a positive way.

Gillies published a paper in 2008 titled "Student Perspectives on Videoconferencing in Teacher Education at a Distance". It was focused on the experiences of students who took courses via video conference for one year within the scope of initial teacher training. After the interviews, the students stated that the technical problems that occurred in the sound, the image and the connection caused them to feel as if they were not real students. Moreover, interviewing with the teacher during a certain time period is regarded as a deficiency. Live interaction with the teacher, creation of a feeling of affinity and receiving simultaneous answers to questions were situations frequently mentioned by the students.

In the study titled "Experiences with a Synchronous Virtual Classroom in Distance Education", Koppelman and Vranken (2008) aimed to determine the viewpoints of the teachers and 10 students in synchronous computer technologies education. The students stated that they liked the courses given in short and frequent intervals and they had no problems with concentration. In addition, they noted that the applied technologies prevented the waste of time it would be to travel for lessons with a distant technician. While the students evaluated the sound quality quite good, some students stated that they did not like the delays.

THEORETICAL FRAMEWORK

The theoretical foundation for this study stems from Rogers' diffusion of innovation research since, in the framework of the theory; the current study seeks to find out students' views about the video conference-based lecture as a new application that they encounter and to determine the students' adoption processes.

Rogers defined an innovation as "an idea, practice or object that is perceived as new by an individual or other unit of adoption" (Rogers, 1995, p. 11). Diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995, p. 5). The innovation-decision process is the "process through which an individual passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision" (Rogers, 1995, p. 20). Thus, diffusion of an innovation occurs depending on communication channels, time and social systems.

Perhaps, the most important factor in the spread of innovations is the potential advantages that individuals or societies could gain. Generally, people are in favor of the innovations when they are more advantageous. Another factor for the spread of innovations is compatibility. The compatibility is the degree of overlapping of existent values, experiences and requirements. The innovation highly adopted by society is less ambiguous for the potential adopters. An innovation can or cannot be in harmony with socio-cultural values, beliefs, previous notions previous innovations, and requirements of the target group. Therefore, the higher rate of compatibility of an innovation means a higher rate of adoption (Rogers, 1995).

The diffusion of an innovation is more than an instantaneous event. Rather, it requires a period of time. No matter how new or old it is, an innovation has to pass through decision-making processes. The researcher states that diffusion of an innovation occurs through a specific process including the stages such as Knowledge, Persuasion, Decision, Implementation, and Confirmation (Rogers, 1995).

1) Knowledge: person recognizes an innovation and has some opinion about its functions;
2) Persuasion: person has a good or bad attitude toward the innovation;
3) Decision: person manifests his own view on adoption or rejection of the innovation via activities in which he is involved;
4) Implementation : person starts to use an innovation;
5) Confirmation: person finalizes his decision regarding the adoption or rejection of the innovation.

This adoption process of innovation is generally realized in the diffusion of almost any innovation, however, new stages can either be added or some can be removed depending on time and environment. Some kinds of communication channels are necessary in diffusion of innovations so that it conveys the innovation to the target group and allows them to share. Right decisions in choosing and using communication channels usually play a crucial role in diffusion of innovations.

Social system is defined as a set of interrelated units that contributes to the problem solving process so as to accomplish a common goal (Rogers, 1995). Since it refers to the medium in which the diffusion of innovation occurs, the social system is of great importance.

The current study tries to determine factors affecting the diffusion of an innovation by investigating the students' adoption process of a video conference-based lecture during a semester.

METHOD

Research Design

A qualitative research approach was used in this study. The qualitative research approach is sensitive to the natural environment, the researcher has a participating role, there is an integrated approach, flexibility in the research design, it enables perceptions to be revealed, and it has an inductive analysis (Yıldırım & Şimşek, 2006). Within the framework of these features, the research design used was the case study. Case study was preferred in this study as the case study model allows more detailed, rich and in-depth data collection about a phenomenon or event (Hagan, 1993; Yin, 1994; Champion, 1993; George & Bennett, 2005).

Sample of the Research

In selecting samples for this research, focused sampling was applied within the scope of the research design in order to obtain greater and in-depth data. Accordingly, interviews were conducted with a total of nine people from two different undergraduate levels from Karadeniz Technical University (KTU). These students were participating in a course via synchronous distance education during the 2008-2009 academic year, spring semester. These students were chosen in order to determine how undergraduates perceive class via synchronous education by means of video conferencing. Students taking part in this study had not previously participated in a synchronous distance education experience. Names of the participants were not used, in accordance with research ethics. Students participating in the research were coded as "P1, P2, P3, P4, P5, P6, P7, P8, and P9", while the assistant was coded as "A". Information relating to the participants is presented in Table 1.

Table 1. General Characteristics of Participants

Participant	Gender	Class	Interaction in Classroom
P1	Female	4	Active
P2	Male	4	Passive
P3	Female	4	Passive
P4	Male	4	Active
P5	Female	2	Active
P6	Male	2	Active
P7	Male	2	Passive
P8	Female	2	Passive
P9	Male	2	Passive

Researchers' Role

Researchers and participants existed in the same environment for a term. Researchers were able to observe all of the courses by being with the participants from the beginning of the term. As a result of this engagement, a warm relationship was established between the researchers and participants. Researchers and student participants also had informal conversations during breaks and before/after classes. In this more intimate setting, richer data was obtained. During the interviews, researchers avoided leading questions and maintained an objective and unbiased stance. Subjectivity of the researchers, and their opinions, are given in the Conclusion and Suggestions section.

Ethical Rules of Research

A "Participant Permit", indicating the objective of the research, was prepared after the research objective was determined. Participants were given details of the research to be conducted. Participation was on a volunteer basis. Participants were given a guarantee of confidentiality and anonymity, and a guarantee that this data will not be used for any purpose other than the stated purpose. In addition, the researcher maintained objectivity during the collection and evaluation of the data.

Validity and Reliability of the Research

Validity and reliability indicators are used for quantitative research. In qualitative research, indicators are credibility, transferability, consistence and verifiability.

Credibility is crucial in qualitative studies. In this study, credibility was ensured through continuous participation, source triangulation and participant control. The researchers' constant presence in the environment and the inclusion of participants with different characteristics is also important in order to determine multiple realities by revealing different perceptions and experiences. In addition, the researcher's presence enabled opportunities to engage with the subjects outside of the interviews, and to discuss and examine the subject matters in question. In this way, the researcher was able to examine, in more depth, the participants' view of the process and subject matter. The data obtained from interviews was given to the participants after the interviews, in order to confirm and verify their responses.

First, data was cleared of bias as much as possible to ensure consistency, and deductions were supported with both quotations and raw data. Moreover, data in the study were coded from beginning to end by two different researchers and the consistency of these two data sets was examined. To ensure consistency, triangulation was used, with the addition of a third researcher examining the data.

A focused sampling method was preferred to ensure transferability of the research and the research process explained to the reader in as much detail as possible. During the data analysis, raw data, findings, conclusions and suggestions were recorded and checked several times in order to ensure verifiability criterion of other researchers.

Data Collection Tools and Data Collection Process

Semi-structured interviews and observations were used as data collection tools in this research. In this way, the researchers attempted to determine some unobservable mental perceptions, reactions, opinions and comments of individuals about the research. Interview questions regarding the sub-problems are shown in Table 2.

Table 2. Binding sub problems with interview questions

Sub Problems	Related Interview Questions
1) What are the opinions of students about distance education before taking synchronous course via distance education?	What did you think about distance education before taking education via synchronous distance education? Why?
2) What are the opinions of students about distance education after taking a synchronous course via distance education?	What first comes to mind when you hear the expression "distance education"? Did you change your opinions about distance education after taking course via synchronous distance education? Why? To what degree do you think student – teacher interaction can be ensured in synchronous distance education? How did the presence of the teacher in an environment different from the class affect your interest in the course? Why? What are the pros and cons of synchronous distance education? What kind of courses do you think should be given via synchronous distance education?
3) What impacts the perceptions of students about distance education during the educational process?	Did you have any trouble within this process? If any, what are they? Which element did you like most in synchronous distance education? Has there been any change in your opinions about distance education during the process in which you studied? If the answer is yes, what were the factors that lead to this situation?

In the data collection process, an interview form was prepared by the researchers first. A final version of the form was created by taking the opinions of experts in order to determine content validity of the interview form; in this way, the form was made ready to be implemented. Following this stage, interviews were begun. Interviews were recorded with a voice recorder with the permission of related people in order to prevent data loss and ensure the validity of data.

Data Analysis

The descriptive analysis technique was used in analysis of data obtained through interviews. Cassettes recorded during the interviews were transferred to the computer environment by the researchers, and the transcripts were made. Within the framework of the interview questions, transcripts of each participant were coded by repeatedly reading them and forming themes. In addition, themes were supported through reflecting striking views by means of quoting directly from opinions of the participants. Code names given by the researchers (rather than real names of the participants) are in quotations.

Synchronous Distance Education Environment

The synchronous distance education environment is an environment where students are in a distance education center and interact with an instructor in a different environment using technological instruments like video conferencing devices, document cameras and a smart board. In addition, there is an assistant coordinating the students in a distance education center, in the environment where this study is conducted. The synchronous distance education environment is summarized in Figure 1.

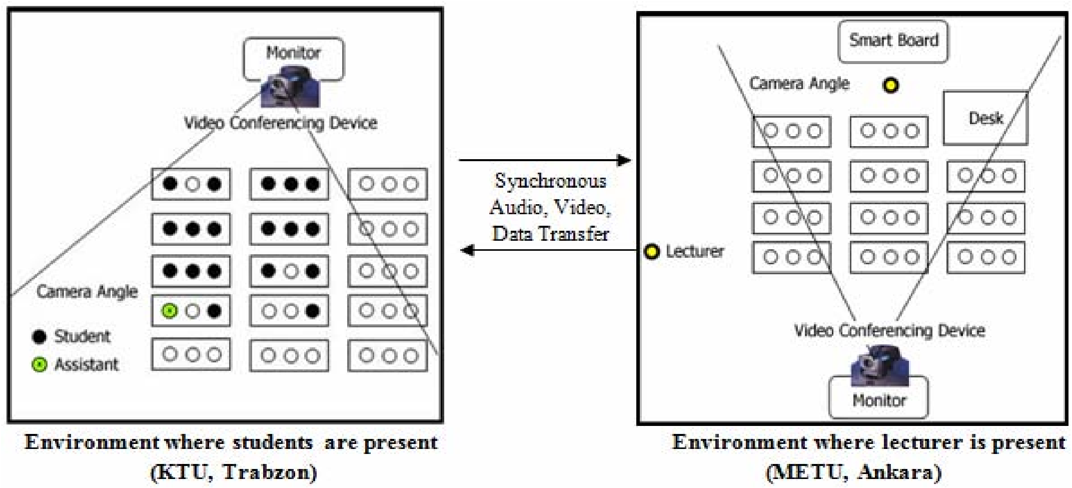

Figure 1. Synchronous distance education environment

FINGDINGS

This section presents the findings about undergraduate students' perceptions of synchronous distance education via video conferencing and the factors that caused these perceptions to change. Research questions were examined and analyzed meticulously within the framework of participants' viewpoints. Themes and opinions about each sub-problem, as well as data relating to the courses, were observed in the research process and are presented below, in observation forms.

Data relating to the questions "What are the opinions of students about distance education before taking a video conference-based lecture via distance education?" and "What are the opinions of students about distance education after taking a video conference-based lecture via distance education?", asked in relation with the first and second sub-problems, are presented in Table 3.

When Table 3 about the opinions of participants about distance education before taking a synchronous course by means of video conferencing, it appears that the majority of the participants thought that synchronous distance education was transmitted solely through a web camera or educational CD; and only two participants mentioned that synchronous distance education is a simultaneous and interactive education conducted via the Internet. Comments, below:

— *The first thing coming to my mind was vitamin CDs☺, but I would not like vitamin CDs, either. I used to buy them, but they would remain at home without me using them. (P2)*
— *The teacher would see me via web camera on the computer. We would also see the teacher individually. I thought his / her speech would be transmitted. (P7)*
— *I think of it as learning via internet. Its synchronicity stems from simultaneous education and distance mutual interaction. However, I had never experienced such a thing.(P9)*
— *I had a friend taking that type of course in another university. I heard from him/her that it is a class in which sound and video are conveyed simultaneously. (P6)*

Since a majority of the participants do not have an accurate concept of synchronous distance education, they believe that they will experience connectivity issues that may prevent them from learning or cause boredom, possibly even causing them to fail the course. Comments below:

— *First, I looked for answers to many questions like "Since I am a 4th grade student, how will I pass this course?" or, "How will I establish communication with this teacher?"(P2)*
— *I did not encounter this type of learning and so I did not think it would be very efficient. (P3)*
— *There would definitely be a lack of communication, and I thought I would get bored in the course.(P4)*
— *We take a course called SPSS in which we do practice exercises on the computer. When the electricity fails, our course work is deleted. In the same way, I was anxious that we would not be able to continue the course when connections failed. (P7)*

Although most participants had the biases mentioned above, they also noted that they were excited and wondered about the environment when they heard that they would take courses via synchronous distance education. One participant mentioned that he/she felt uneasy due to his/her biases. Comments below:

- *When we heard it, we said "Did KTU have that?' We wondered what kind of a thing it was?" (P1)*
- *Of course, I got excited since I would take such a course for the first time. Then, I wondered how it would be? (P7)*
- *Technological developments, devices caused me to be surprised. I was somewhat taken back ☺. (P9)*
- *I felt some unease due to certain questions in my mind like "How will that course take place?, Will I understand it?, How will I take notes?, What if I cannot understand?, and Will I be able to hear the sound?" (P8)*

After taking a course via synchronous distance education, participants defined this concept as a method of learning realized through a bidirectional communication between teacher and student in different spaces at the same time. Some participants mentioned that even though this education was different from the videos recorded on YouTube, it is not the same as face-to-face education in terms of communication. Opinions of participants follow, below:

- *It refers to conducting the course simultaneously and reciprocally, in a studio with technological equipment, when it is impossible for teacher to come here. (P1)*
- *It is kind of an education in which this spark in the eyes in individual communication can never be realized (….). It is absolutely different from the videos on YouTube. This is because there is just on –way flow in videos on YouTube as you cannot establish communication with the other part. As for this education, there is a bidirectional flow since we try to convey something to the other participant. (P2)*
- *I did not think there would be so much one-to-one communication. After taking the course, I came to see that education continues in a more one-to-one way and it is processed in the form of discussion and question/ answer.(P3)*
- *Synchronous distance education refers to teacher responding simultaneously to my comments. However, there is distance between student and the teacher. (P6)*
- *In synchronous education, dialogues are not the same as they are with face-to-face education. For instance, I know that you can start a dialogue with the teacher through a word or a sentence in face-to-face education; however, here we may have to repeat the word or sentence a couple of times to enable our voice to be heard. (P5)*

Participants noted that synchronous distance education had advantages in terms of being able to participate in a course from experts in a different space, learning new information in technology-intensive, interesting and comfortable environments, providing time savings for the teacher, compensating for a staff deficiency in the university, learning new ideas, being able to listen to the course records again, providing interactive environments and ensuring rapid access to information:

- *Being able to learn from teachers who are experts in their fields, but who might not be on the staff of our university, is very advantageous for our profession. New things can be learnt from different teachers. (P1)*
- *I did not think it would be one-to- one so much. After taking the course, I came to see that education continues in a more one-to-one way and it is processed in the form of discussion and question/answer. I think this is the greatest advantage of synchronous distance education. It provides quick access to the new information.(P3)*
- *In synchronous distance education we can access better data more rapidly. It enables us to learn new ideas from experts in different spaces. (P4)*
- *I can more easily make up missed classes because classes are recorded. There is no question of not reaching the specialists. That is to say, distance and travel pose no problems. (P6)*
- *It is nice to take course in such a technological class. I listen to the course more comfortably here, while I am careful about my behavior in a normal course. (P8)*

In spite of all of these advantages, participants mentioned that in synchronous distance education, teacher/student communication is weak. They also feel that it is more difficult to get motivated, since the instructor is not physically there, establishing eye contact, etc. Teachers do not get to know them as well, as they are not spending the time together that teachers and students spend in face-to-face learning situations. Also, technical problems can weaken the instructor's command of the class, and therefore students display behaviors not relating to the class:

- *To talk about disadvantages, I can mention lack of motivation, and the problem of eye contact. In this education, teacher just gives the lesson, and we ask our questions. We cannot spend much time with the teacher. Teacher does not even know our names completely.(P1)*
- *I consider the weakness of communication as a great deficiency.(P2)*

- *To talk about disadvantages, we can mention the weakness of teacher's control.(P4)*
- *When the camera does not shoot closely, face of the teacher seems more like a silhouette. Feeling the teacher here is another emotion, I think "This is the greatest disadvantage of synchronous distance education."(P5)*
- *Technical problems make up the greatest disadvantage. In addition, since teacher cannot see us easily, we message each other via cell phones and we can talk to one another easily.(P7)*

Table 3. Student opinions about distance education before and after taking synchronous courses

	Their Opinions Before Taking the Course			Their Opinions After taking the Course		
	Ideas	**Emotions**	**Expected Education Style**	**Positive Ideas**	**Negative Ideas**	**Existent Education Style**
P1	-	• Bewildermen t • Curiosity	-	• Benefiting from experts • Making up the staff deficiency • Learning new information	• Communication deficiency • Eye-contact problem • Weak teacher control • Not knowing the students • Failing to reach every time • Not feeling together • Lack of motivation	• Different spaces • Conversation • Synchronous • One-to-one meeting
P2	• Anxiety about passing a course	-	• Education in the form of education CDs	• Benefiting from experts • Sound and video are clear • Making up the teacher shortage • Learning new information	• Communication deficiency	• Bidirectional flow • Different from the videos on Youtube
P3	• Inefficient course	• Curiosity • Uneasiness	• Open education	• Benefiting from experts • Learning new information • Rapid access to information • Interactive	• Communication deficiency • Being able to behave not related to the course • Time limit	• Synchronous • One-to-one meeting
P4	• Sound problem • Boredom • Communication gap	• Curiosity	• Asynchronous education	• Interest in the course • Different views • Rapid access to information	• Weak teacher control • Being able to behave not related to the course	• Synchronous • Mutual Education
P5	• Connection problem	• Curiosity	-	• Obtaining a different viewpoint • Course records • Continuity of the course • Bringing distant places closer	• Visual problem • Not feeling together	• Not like face-to-face education
P6	-	• Bewildermen t • Curiosity	• Mutual transmission of sound and image	• Benefiting from experts • More motivation • Course records • There is no distance problem	• Impossibility of face to face • Weak teacher control • Not knowing the students	• Mutual Education

P7	• Anxiety about failing a course	• Curiosity • Excitement	• Education via web-cam	• Benefiting from experts • Making up the teacher shortage • Feeling relaxed • Taking a better course • Course accessibility • Course records	• Visual problem • Impossibility of face to face • Technical problems	• Synchronous Distance Education
P8	• Inefficient course	• Uneasiness	• Education via web-cam • Education in the form of education CDs	• Technology intensive class • Paying attention completely to the course • Comfortable environment	• Communication deficiency • Eye-contact problem • Not knowing the students	• Different spaces • Mutual Education
P9	-	• Bewildermen t	• Education via Internet	• Benefiting from experts • Course records • Question-answer possibility • Feeling relaxed • More motivation	• It decreases sociability • Connection problem	• Synchronous distance education • Conversation • Visual education

The students' opinions about the synchronous distance education via video conference before and after taking the course are summarized in Figure 2.

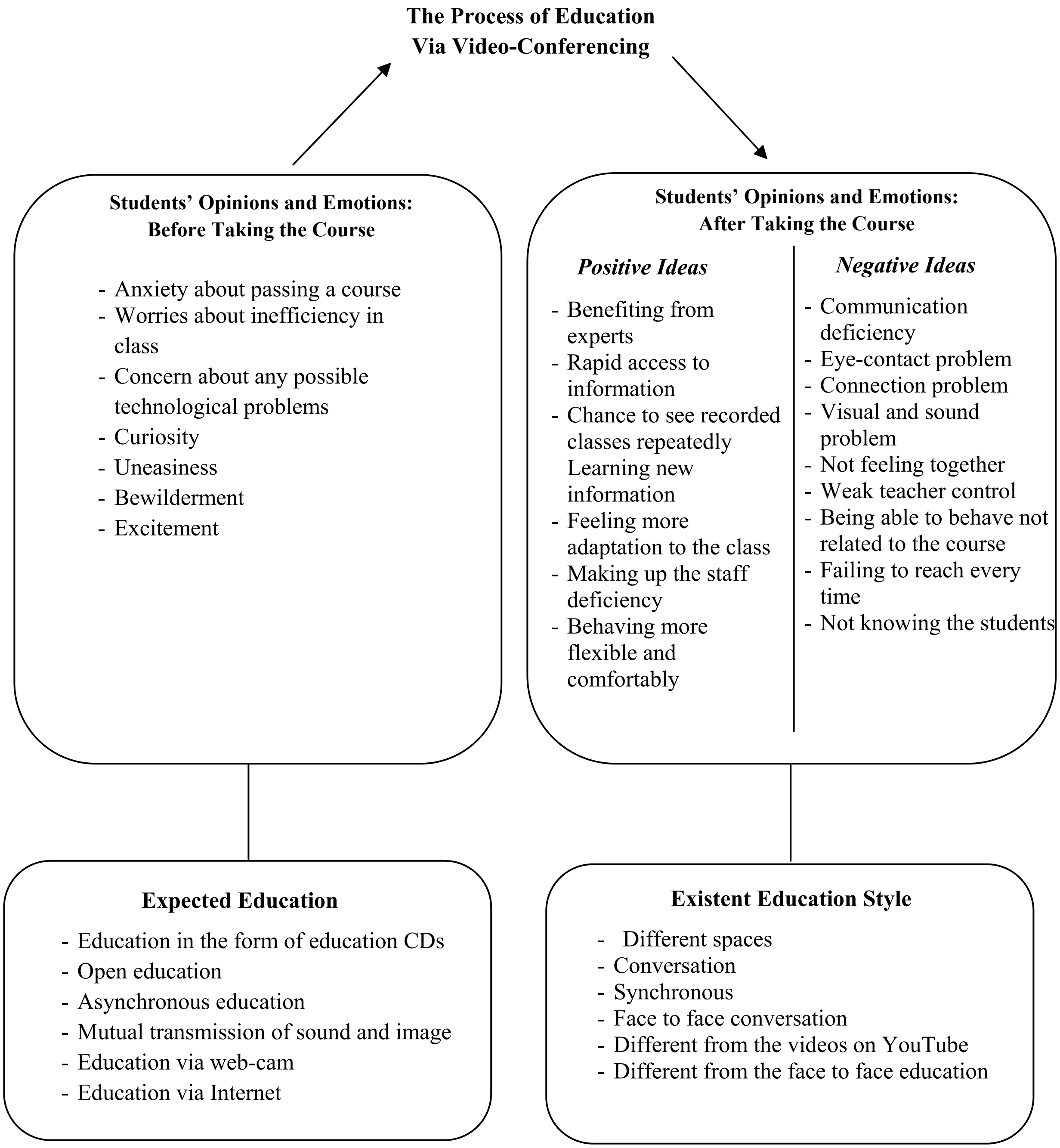

Figure 2. The opinions of the students taking synchronous distance education via video conference

Data relating to the question "What impacts the perceptions of students about distance education during the educational process?" (answering the third sub-problem questions) are presented in Table 4.

Table 4. Factors influencing perceptions of synchronous distance education

	Technical Problems	Teacher	Medium	Type and Duration of the Course	Distance
P1	• Sound problem • Connection problem • Unable to see teacher in detail	• There is no interaction after the course • The in-class interaction is insufficient • Lack of classroom control • Unaware of student needs	• The technologies used (Smart Board, Document Camera..etc.)	• Long term course • Appropriate for the verbal courses	-
P2	-	• There is no interaction after the course • Type of expression of the course	• Comfortable environment • Design of the environment is appropriate (order of seating, illumination etc.)	• Appropriate for the verbal courses	• Comfort of being in a different space
P3	• Voice interrupt	• The in-class interaction is good	• Lack of camera • The technologies used	• Appropriate for the verbal courses	• Feeling relaxed
P4	-	• Partial in-class interaction • The class control is inadequate	-	• Long term course • Appropriate for the verbal courses	• Comfort of being in a different space
P5	• Sound problem • Eye-contact problem	• The in-class interaction is good • There is no interaction after the course	-	• Appropriate for the verbal and numerical courses	-
P6	• Audio echo • Connection problem	• There is no interaction after the course	• Screen is too high • The technologies used	• Appropriate for the verbal courses	• Feeling relaxed
P7	• Audio echo • Connection problem	• Partial in-class interaction	• Camera angle problem • The technologies used	-	• Not being under stress
P8	• Voice interrupt • Connection problem	• The in-class interaction is very low • Lack of classroom control	• Place of the camera • The technologies used	• Appropriate for the verbal and numerical courses	• Paying attention completely to the course
P9	• Sound problem • Visual problem	• Partial in-class interaction • There is no interaction after the course	• Design of the environment is appropriate • The illumination is sufficient	• Appropriate for the verbal and numerical courses	• Paying attention completely to the course

Technical Problems

By examining the table presenting the factors that affected the participants' perceptions of distance education during the synchronous course, it was determined that they faced a communication gap because of connection problems that caused cuts in the sound and image. It was also observed that the teacher did not recognize the drop in his/her students' attention and continued the class for long periods oblivious of the communication gap. Furthermore, the students stated that they encountered problems such as not seeing the teacher clearly and not making eye contact. The participants' opinions about these issues are given below.

- *There were disconnections from time to time. In addition, since the teacher was not directly together with us, we were sometimes distracted. Another point is that the volume levels of the equipment meant that sometimes we could not hear the teacher or the teacher could not hear us. (P1)*
- *Making eye contact with the teacher was not possible. For me, eye contact is important in class. (P5)*
- *In the first weeks, the camera and sound were constantly cutting off. For that reason, we could not adapt to it.(P8)*
- *There were problems with the screen image quality and the sound during the course. This situation distracted me and made me dislike the classes. (P9)*

Teacher

The participants noted that the in-class and out-of-class communication were weaker than the conventional training, and as a result their social relations were insufficient. Observations also revealed that the teacher-student communication was weak in the first weeks; however, communication improved in the later weeks. Besides, the fact that the teacher cannot address his/her students' needs causes them to lose control of the class. The opinions of the participants about this issue are as follows:

- *According to me, the teacher should easily recognize when students are distracted but somehow is unable to realize when this occurs. (P1)*
- *First of all, I did not think that the interaction at that level could be provided. Teaching the lessons by discussions, questions-answers contributed to the in-class interaction.(P3)*
- *We can count the teacher's weak control as a disadvantage.(P4)*
- *We do not see the teacher after the course. In my opinion, distance education is not effective enough in terms of social relations. (P5)*

Medium

The participants liked the design of the synchronous class environment and availability of technological devices such as the smart board. They are satisfied learning new information from the specialists in a more comfortable environment than the conventional class environment. Besides, there are some difficulties faced in the one-to-one interaction because of certain environmental factors such as order of seating, the height of the curtain, the number and the angle of the cameras. The opinions of the participants are as follows:

- *I liked the smart board. (P1)*
- *You are more comfortable than in the (regular) class. I like it. You learn new things from people expert in their fields. In the simplest terms, even design of the environments is very different. One feels inspired to take lessons in this environment. (P2)*
- *It would be better if there were cameras in several places. This is because since we have a limited angle of view, we can not understand how much the instructor can see and we could not sense his/her body language.(P3)*
- *I saw new technology. (P7)*
- *The locations of the cameras were different for the first weeks. The instructor could not see us at all. This situation affected the interaction. (P8).*

Type and Duration of the Course

The participants stated that the type of course affected learning in the synchronous distance education via video conference. While five of the participants noted that the verbal courses should be taught via synchronous distance education, three of them suggested that the numerical courses should be taught via synchronous distance education. In addition, they expressed how negatively they were affected by courses that continued for long periods:

- *As for me, not all the courses should be given via distance education. The courses depending on practice rather than verbal courses should not be given via distance education. (P1)*
- *Listening to these lessons for long periods creates boredom. (P4)*
- *As well as verbal courses, numerical courses can be taught. (P5)*

Distance

Some of the participants stated that their teachers' location in a different environment made them feel comfortable and increased their attention:

— *Since there is no one always controlling and judging you, you are more comfortable. In this type of education, the teacher's pragmatic and informative identity comes to the forefront. (P3)*
— *You are more comfortable here and you can listen to the lessons better. This situation absolutely increased my interest in the course. (P4)*
— *The teacher in a different place enabled us to feel more comfortable. Synchronous distance education increased my interest in the course. (P7)*

In the light of the findings above, the factors affecting students' perceptions of distance education via video conference can be summarized in Figure 3.

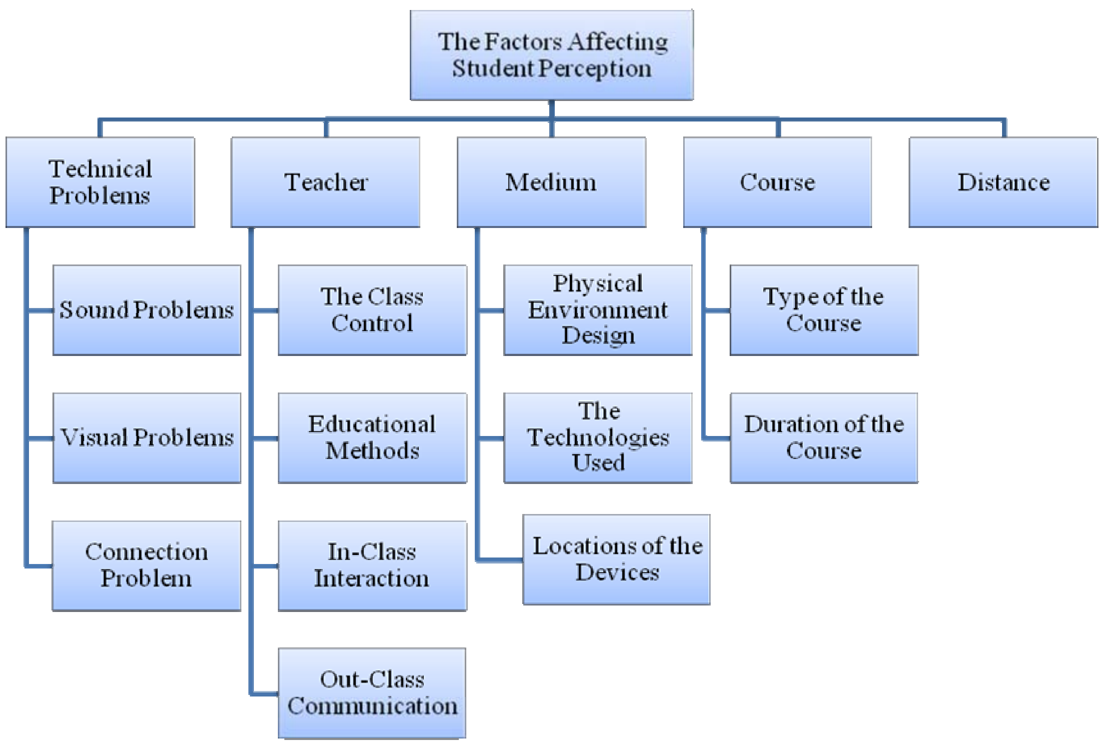

Figure 3. The Factors Affecting Student Perception

The researchers had the opportunity to observe all courses taken by the participants by staying in the environment from the beginning of the term. The observation data obtained in this process is presented in Table 5.

Table 5. Data relating to the observation findings

Themes	Codification	Weeks									
		1	2	3	4	5	6	7	8	9	10
Technical Problems	Audio	X	X			X	X		X		
	Video		X	X					X		X
	Connection problem	X	X								
Teacher	The Class Control										
	Providing the Silence			X		X		X		X	
	Realizing the Needs of the Students				X	X			X		
	Noticing the Tardy Student							X			

	Noticing the Misbehavior				X		X				
	Educational Methods Used										
	Expressional Method	X	X	X			X		X		
	Question-Answer Method		X	X	X	X		X		X	X
	Discussion Method				X	X			X	X	X
	In-Class Interaction				X	X		X	X	X	X
Medium	The Technologies Used										
	Smart Board		X	X	X	X	X	X	X	X	X
	Document Camera			X			X				
Course	Duration of Course										
	50min+ 40min	X	X	X			X	X			X
	60min + 30min				X	X			X	X	

It was determined during observations that there were more problems related to sound and video in the first weeks. However, in later weeks, these problems decreased by changing the video conference venue and arranging other changes. As a result of those changes, teachers were better able to determine which students were arriving to class late. However, both the camera angle and the inability of the teacher to monitor the class from afar were factors in enabling student behaviors that had nothing to do with class. Also, the visibility problems stemming from the low image resolution caused the teacher to neglect some of the students' needs. In spite of all of these negative situations, the teacher tried to increase the in-class interaction by making the students participate in the class with question-answer and discussion methods. However, it was observed that the in-class participation was not realized adequately because of the technical problems and the students' recessive behaviors. It was detected that the teacher benefited from the smart board technology for presentations and making drawings. In addition, the document camera was used for sharing the notes in the printed documents. The duration of the classes were generally 50 minutes+40 minutes, while for other classes the duration was 60 minutes+30 minutes. Nevertheless, another observation was that students were distracted after a while in these long lessons.

CONCLUSION AND DISCUSSION

Interpreting the findings obtained with this purpose, the following results can be reached. The objective of this study was to discover how undergraduate students perceive learning through taking courses via synchronous distance education by means of video conferencing, and their opinions on this and distance learning.
We observed that the students had prejudices about the synchronous distance education in the definitions they made before they took the courses because they generally did not have knowledge about the program or they had false information. However, it was clear from the interviews that these perceptions began to change with the opportunities provided by the synchronous distance education.

In light of the research data, there are five main factors causing student perceptions of synchronous distance education to change. These factors are defined as: technical problems, the teacher, the environment, the course and the distance.

In this study technical problems take the lead among the factors affecting the students' perceptions. Students had negative perceptions about technical faults such as cuts and echoes of the sound, the freezing of the image and communication cuts that distracted them during classes. Gillies (2008) stated that faulty technology caused students to feel as if they were not real students. This conclusion is in compliance with the study carried out by Koppelman and Vraklen (2008). In addition, another result obtained is that since the screen image quality was not very high, students had difficulty in making eye contact with the teacher and therefore lost their motivation. This factor negatively affected their opinions about distance education.

In the Gillies' study (2008), the students regarded the impossibility of seeing the teacher outside of specific time periods as an insufficiency. The same results were obtained in the present study. Students stated that the insufficiency of interaction outside the class prevented being closer and intimate with the teacher. Moreover, the students noted that in-class interaction with the teacher provided more pleasant courses and depended on the teacher's phrasing methods. In the end, it was determined that interacting with the teacher affected student perceptions positively for those students taking courses via synchronous distance education. Students also stated that they took the class more seriously when the teacher exhibited good control over the class, realized what was happening and responded appropriately. Otherwise, some students might misbehave because they would think that the teacher could not see them.

An educational environment consisting of technologies such as the smart board and document cameras designed according to the contemporary understanding of education holds the students' attention and increases their desire to take lessons via these environments. In the research of Martin (2005) and Marsh et al. (2010), it was also observed that students liked the educational environments in which the new technologies were used. In addition, the locations of the devices in the class environment are important for the students. In the interviews, participants noted that classes were adversely affected if the teacher could not see them exactly because of improper camera positioning.

It was found that while the teachers' location in a different environment (distance factor) affects some students positively, it affects others negatively. Some students stated that they were better motivated by their long-distance teacher and that they listened to lectures without feeling under stress. However, some students noted that this situation affected them negatively and they were distracted by things unrelated to the course.

Most of the students think that the courses with special contexts are more appropriate for the synchronous distance education. They noted that these kinds of courses could be given easily with discussions and questions-answers. Long lectures also affect the students negatively. In the observations, it was also seen that the students became bored and distracted when the classes continued for long periods. In a study carried out by Koppelman and Vraklen (2008), the students stated that the classes lasting for short periods and with frequent intervals were more effective and thus they had no problem keeping their concentration.

When the findings were evaluated within the frame of Rogers's Theory, students' perspectives on the video-conference based course which can be regarded as an innovation for the students and their adoption process to this innovation were shown. According to Rogers, the adoption process of an innovation consists of five stages. When the findings were evaluated within the scope of these stages;

In the *knowledge* stage, the question of how a video-conference based course would be handled, first appeared in the minds of students, then they had knowledge of the innovation primarily via both sensations gained from the environment and research carried out by themselves.

In the *persuasion* stage, it was observed that students started questioning what kind of benefits a video-conference based course would provide. At this stage, a person was convinced as to the use of this innovation via both their course experiences and considering the benefits of video-conference based course (easy access to experts, quick access to information, etc). It was identified that after taking a video-conference based course, the loss of anxiety which existed before, acted positively in persuasion.

In the *decision* stage, a person should decide to use the innovation. At this stage, a person either adopts the innovation and uses it or rejects it. When the findings were examined, it was observed that some of the interviewed students considered the innovation as useful, convenient and worth trying and *adopted* it; the rest could not adopt the innovation enough and *rejected* it since the inconveniences experienced in the implementation process (technical problems, etc.) caused a disadvantage.

SUGGESTIONS

When examining the factors affecting the students' perceptions of synchronous distance education via video conference, we hypothesize that there will be positive changes in the opinions of the students about distance education and more fruitful courses will be offered on condition that the factors causing negative perceptions are minimized. For this reason, the following suggestions may be taken into consideration:

- ✓ It is thought that introducing the system to the students before they take a synchronous course via video conference will reduce students' prejudices and misunderstandings before the course begins.
- ✓ Since network technologies provided for the synchronous course via video conference have wide bandwidth, it may be possible to minimize problems such as screen freeze, break in sound, echo and the eye contact problem resulting from low screen resolution. .

- ✓ A technician present in the distance learning classroom could deal with the technical problems of connection cuts, thus reducing the time of the cut and keeping the lesson going before students become too distracted.
- ✓ The teachers giving synchronous distance education should prefer educational methods and techniques in which they can activate the students and interact with them rather than using only the expressional method.
- ✓ The institutions organizing the synchronous distance education should not be content with only getting the students and the teachers together. These institutions should provide the students a way to meet the teacher outside the course hours in order to ask any questions and chat with the teacher.
- ✓ The teacher should make the students realize that he/she maintains authority in the class by warning them rather than ignoring misbehavior, noise and latecomers.
- ✓ The students' interests and motivations will be sustained on the condition that the video conference-based lectures are taught in short periods with frequent intervals.
- ✓ The visual materials should not dominate the lesson, and teaching verbal courses using a context of discussions and questions-answers will be more beneficial.
- ✓ It is hoped that this study will be a significant and quality source for future studies.

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PRE SERVICE TEACHERS' USAGE OF DYNAMIC MATHEMATICS SOFTWARE

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ABSTRACT
Aim of this study is about mathematics education and dynamic mathematics software. Dynamic mathematics software provides new opportunities for using both computer algebra system and dynamic geometry software. GeoGebra selected as dynamic mathematics software in this research. In this study, it is investigated that what is the usage of pre service mathematics teachers for teaching and learning mathematics concepts. Qualitative research methodologies were used in this study. First participants learned basic commands about GeoGebra. During lessons pre service teachers of mathematics used dynamic worksheets. Data were collected by participants' works and opinions on dynamic mathematics software. According to responses of participants, pre service teachers want to use dynamic mathematics software for teaching mathematical concepts. Their works on GeoGebra showed that participants want to offer interactive dynamic mathematics worksheets on internet to the students for mathematical concepts.
Keywords: dynamic mathematics software, mathematics teaching, mathematics learning

INTRODUCTION

Understanding the factors about teachers' use of technology for teaching and instructional purposes is important (Teo, 2009). Teachers' usage of computer depends on their knowledge and experience about technology. Teachers integrate technology for teaching in different ways such as presentation purposes or allowing students to use a full range of technology resources (Teo, 2009). According to content of teacher education programs, pre service teachers can be able to use technology for educational purposes. Şahin and Toy (2009), reported that student-centered teaching methodology, expertise in computer use, and a high level of technology integration in teaching expressed more pre service teachers' positive attitudes toward using computer applications for instructional purposes.

On the other hand, pre service teachers of mathematics need to improve technological skills in order to use Information and Communication Technologies (ICT) in classrooms. Programs for teacher preparation in Turkey have computer courses. Pre service teachers are able to learn basic commands and usage about operating systems, word processing, presentation preparation, and internet. However, pre service teachers must know how to use ICT for teaching and learning.

Also, mathematics curriculum emphasize on using dynamic geometry systems (DGS) for teaching geometry concepts (MoNE, 2006). For this reason, teachers should learn use DGS in mathematics classrooms. According to curriculum reform in Turkey, students' role and teachers' role has changed (Bulut, 2007). Mathematics teachers must know usage of DGS for preparing lesson activities with it. So, some courses about using DGS offered to pre service teachers of mathematics in Gazi University. During these lessons, they can learn both how to use DGS and how to develop dynamic worksheets with DGS.

Computer Algebra Systems (CAS) improves students' conceptual understanding and problem solving abilities (Aksoy et al 2007, Bulut et al 2007). Dynamic mathematics software offers opportunities for using both computer algebra system and dynamic geometry software (Hohenwarter et al, 2009; Hohenwarter & Lavicza, 2009). Pre service teachers of mathematics need applications of dynamic mathematics software, while learning and teaching mathematical concepts (Jones, K, 2009).

In this study, it is investigated that what is the usage of pre-service mathematics teachers for teaching and learning mathematics concepts. Because of facilities of GeoGebra, it was selected as dynamic mathematics software in this research.

GeoGebra is an interactive geometry software which offers algebraic possibilities like entering equations directly (Hohenwarter, 2003). It is a useful software for students and teachers. The program encourages students to experiment the mathematical ideas. For example, by its dragging tool users can explore the relationship between the circle's graph and its equation. Students may also manipulate the equation directly from the algebra window and see the changed circle in the geometry window.

The basic objects in GeoGebra are points, vectors, segments, polygons, straight lines, all conic sections and functions in x. With GeoGebra dynamic constructions can be done like in any other dynamic geometry system. These constructions may be altered dynamically by dragging free objects. Also, it is possible to enter coordinates of points or vectors, equations of lines, conic sections or functions and numbers or angles directly (Hohenwarter, 2002).

GeoGebra is multilingual both in its menus and also in its commands. For example, the English command "Area" becomes "Alan" in Turkish.

Preiner (2008) described the features of Geogebra tools as follow;
Toolbar: The toolbar consists of a set of toolboxes in which GeoGebra's dynamic geometry tools are organized. Tools can be activated and applied by using the mouse in a very intuitive way. Just like Move, New Point, Line through Two Points, Perpendicular Lines, Polygon, Circle, Ellipse, Angle tools it is possible to build the geometric constructions directly. In the right corner of the toolbar the Undo and Redo buttons can be found, which enable the user to undo mistakes step-by-step.
Graphics window: The graphics window is placed on the right hand side of the GeoGebra window. It contains a drawing pad on which the geometric representations of objects are displayed. The coordinate axes can be hidden and a coordinate grid can be displayed by the user. In the graphics window, existing objects can be modified by dragging them with the mouse, while new objects can be created using the dynamic geometry tools provided in the toolbar.
Algebra window: The algebra window is placed on the left hand side of the GeoGebra window. It contains the numeric and algebraic representations of objects which are organized into two groups: Free objects can be modified directly by the user and don't depend on any other objects. Dependent objects are the results of construction processes and depend on 'parent objects'. Although they can't be modified directly, changing their parent objects influences the dependent objects. Algebraic expressions can be changed directly in the algebra window. If not necessary, the algebra window can be hidden using the View menu.
Input field: The input field is placed at the bottom of the GeoGebra window. It permits the input of algebraic expressions directly by using the keyboard.
Menu bar: The menu bar is placed above the toolbar. It provides a wide range of menu items allowing the user to save, print, and export constructions, as well as to change default settings of the program, create custom tools, and customize the toolbar.
Spreadsheet window: The spreadsheet feature in GeoGebra has all the regular Excel-features. Apart from manipulating numbers and formulating you can also manipulate all GeoGebra-objects in the spreadsheet view.

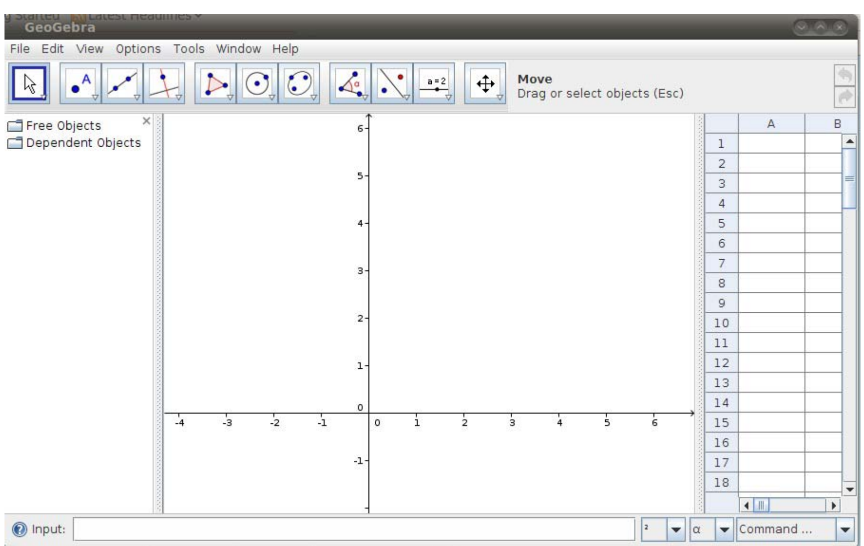

Figure 1. Geogebra Features

In Figure 1, left hand side shows the algebra window, middle side shows the graphic window and right hand side shows the spreadsheet window. The input window is located at the bottom of screen.

THE STUDY

Qualitative research methodologies were used in this study. First 47 second year student participants learned basic commands about GeoGebra. During lessons pre service teachers of mathematics used dynamic worksheets. Data were collected by participants' works and opinions on dynamic mathematics software. Interviews administered to randomly selected participants.

FINDINGS

According to responses of participants, pre service teachers want to use dynamic mathematics software for teaching mathematical concepts. There are some intercepts from interviews:

Pre service teacher of mathematics (PTM-1) stated that: *"…Mathematical proofs can be learned easily by using Geogebra. Students can discover relationships between mathematical concepts through different types of representations such as geometric, algebraic and graphical…"*

PTM-1 preferred to construct geometric figures and prove with dynamic worksheets as shown below:

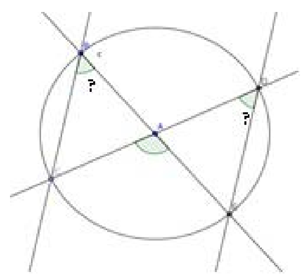

Figure 2. Investigation of relationship between angles in a circle by using GeoGebra

Their works on GeoGebra showed that participants want to offer dynamic mathematics workheets on internet to the students. Participants learned basic commands of GeoGebra during lessons. After that they prepared activities for mathematical concepts. Their dynamic worksheets on internet were interactive learning environment for learners. There some examples from preservice teachers' works:

PTM-2 was used other materials pictures such as Turkish patchwork for teaching geometric concepts in primary mathematics such as rotation, symmetry, translation and reflection. PTM-2 stated that: *"…I am looking everywhere by mathematical point of view. I can adopt real situations and images to Geogebra. In my opinion, geometry should be thought by using GeoGebra…"*

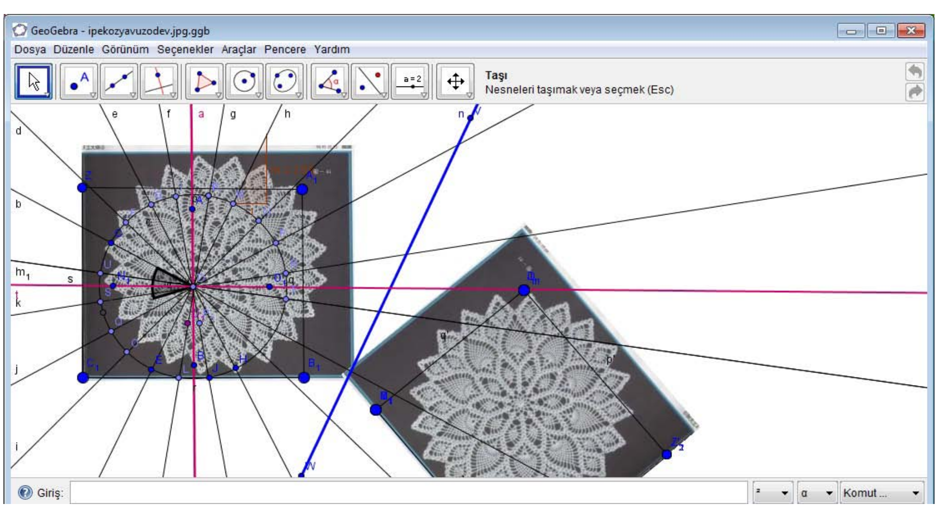

Figure 3: PTM-2's work about symmetry, rotation, translation and reflection

Some pre service teachers used GeoGebra for establishing real life examples with an international perspective from all over the world. For this reason PTM-3 was used a stadium picture from Riyad and PTM-4 was used Pisa tower. PTM-3 stated that:

"…GeoGebra enables using real-life examples for teaching and learning mathematical concepts. During preparation of worksheets I investigate interesting buildings from different cultures and countries. Their common point is usage of mathematics in life…"

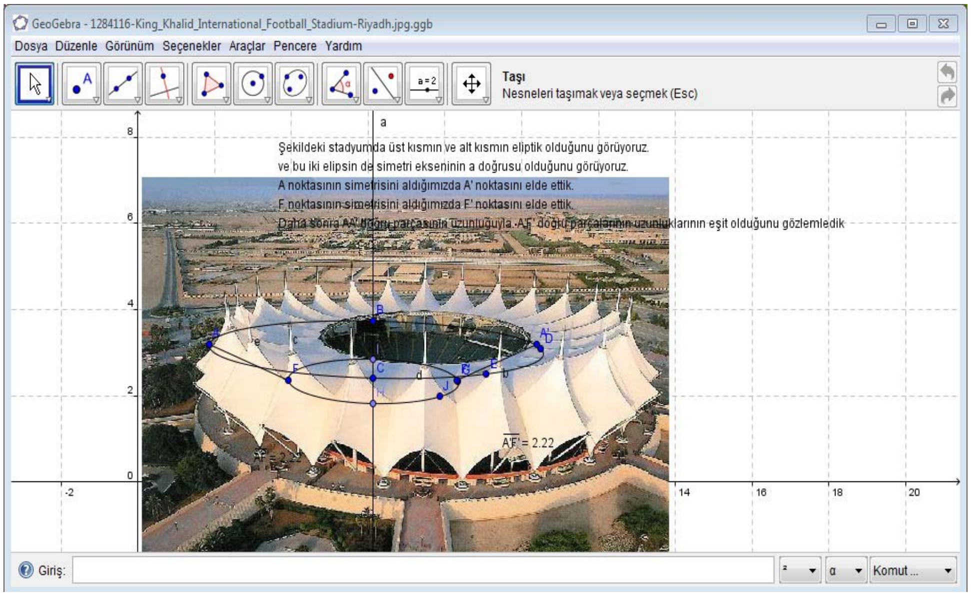

Figure 4. PTM-3's real- life example from Riyad

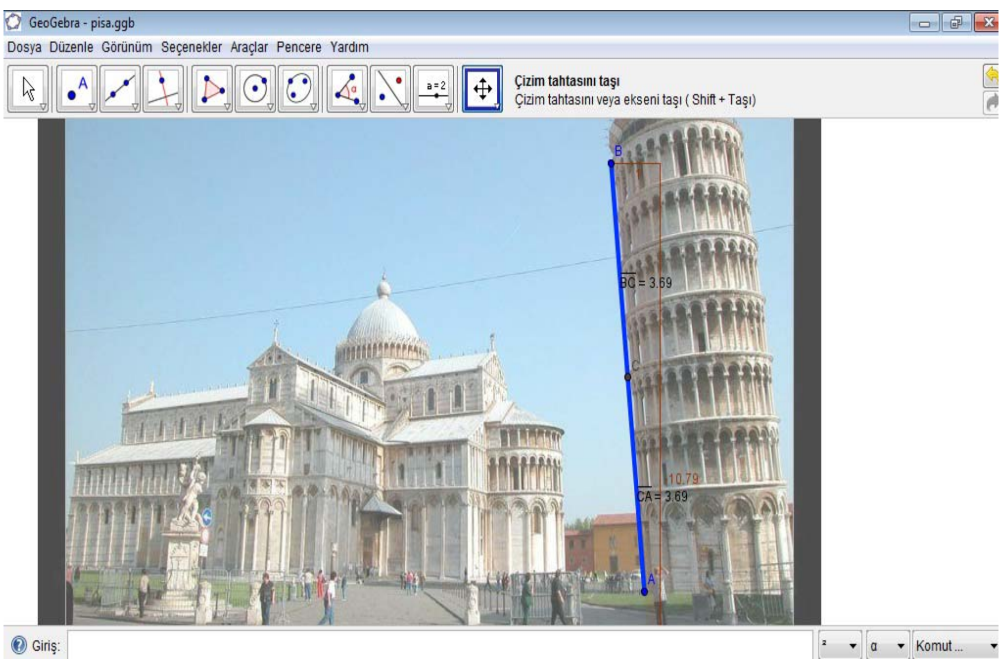

Figure-5. PTM-4's real life example from Pisa tower.

PTM-4 stated that: *"…I can do problem posing by using real examples from touristic places. So I can interrelate my lesson with social studies or other disciplines. According to math curriculum, interdisciplinary approach should be used during teaching of math, so I think it is useful to develop activities by using GeoGebra…"*

GeoGebra offers web-publishing opportunities for mathematics education. Some of PTMs were used these tools for building interactive web pages. PTM-5 and PTM-6 created dynamic worksheet web-pages for teaching mathematics. PTM-5 stated that: *"…In nature, there are some examples of mathematical subjects like fractals and its If I publish these webpages to internet my students can enter whenever they want and they can discover by trying each time. This website was an interactive learning environment for learners of mathematics…"*

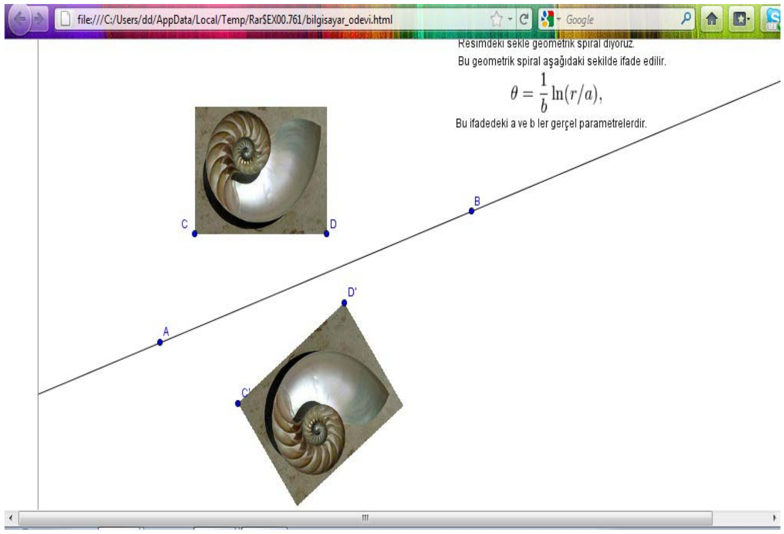

Figure 6. PTM-5's interactive dynamic worksheet extracted from GeoGebra as a website.

PTM-6 said that: "…most important part is discovering concepts both in Algebra and Geometry windows in GeoGebra…."

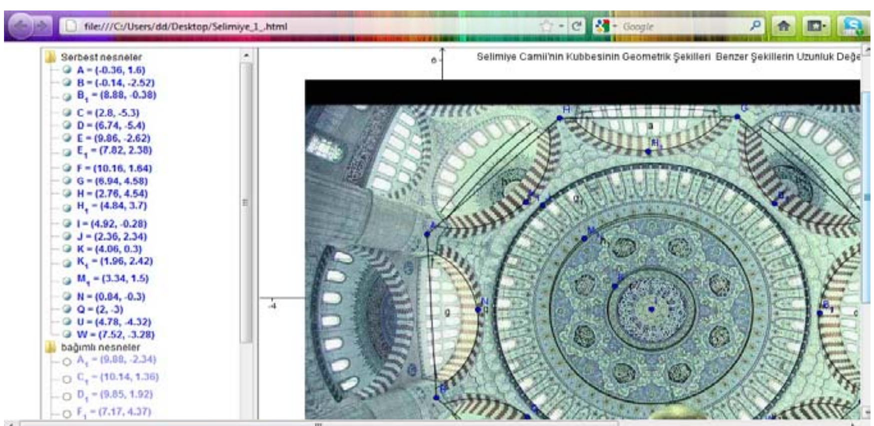

Figure 7. PTM-6's interactive dynamic worksheet extracted from GeoGebra as a website.

CONCLUSIONS

Most of the PTMs (%97) were using successfully basic computer facilities because of computer courses taken before. So they can easily use mouse and keyboard for entering commands input. Also PTMs know basic algebraic and geometric commands of Geogebra for constructing geometric figures. In addition they stated that they were able to design web pages with Geogebra applications for interactive dynamic worksheets.

On the other hand PTMs preferred to use integrate pictures to background of worksheets for connect geometry to real life examples. Also PTMS stated that they use Geogebra for writing exam questions, building web pages, calculating algebraic expressions. Findings revealed that, PTMs want to use technology with real examples in a discovery-based learning environment.

PTMs expressed that in Geogebra it is possible to have multiple representations of mathematical concepts such as geometric, algebraic, and spreadsheet. By this way, PTMs had the opportunity to construct their mathematical knowledge in different ways.

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PRELIMINARY STUDY FOR TECHNOLOGY ENHANCED LEARNING: COMPARATIVE STUDY OF ENGLAND AND NORTHERN CYPRUS

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ABSTRACT
The purpose of this paper is to present the preliminary study findings from an ongoing PhD study. In this paper, the researcher presents the preliminary study that was carried out with a number of schools in England and Northern Cyprus in order to identify the background or big pictures of each country in terms of available ICT tools that are being used by teachers in their teaching, trainings and Continuing Professional Development (CPD) and support that they have received and their integration stage of ICT. A survey method was employed for this preliminary study. A sample of 117 teachers out of 198 was participated to this study. The researcher of this study developed a questionnaire. A descriptive analysis of data reveals that the two countries are very different in their use of ICT and training and support that they have received.

INTRODUCTION

Information and communication Technologies (ICTs) are believed to be an important set of tools for improving teaching and learning in education and their integration in school teaching has been championed in developed countries for at least two decades (Haddad and Draxler, 2002, UNESCO, 2003; Isman et al., 2007). After the announcement of National Grid for Learning (NgFL) in 1997, schools in the UK has been started to classrooms with a range of ICTs in the belief that this would lead to benefits for learning. Many other countries have taken similar initiatives to provide ICT to schools as a means of improving the quality of education. However, the impact of these policies on learning is hard to demonstrate for a number of reasons (Pilkington, 2008). In particular, barriers to integration of instructional technologies in teaching are shifting from access to ICT to basic ICT training and once this basic ICT training are provided, then it shifts to appropriate use of instructional technology in the classroom by using suitable pedagogy to help with subject teaching and enhance student learning (ibid). However, developing countries are still in their infancy period and if technologies are used by teachers in the classroom, it is due to limited infrastructure and the basic ICT training which is high costs of access.

In Northern Cyprus, similar efforts like the UK government have been undertaken by Turkish Cypriot government but the lack of financing and understanding of the benefits of ICT in education are preventing the integration of technology into all schools. Only a few research studies have been conducted to demonstrate that educational technology, as a tool, would improve the quality of education in Northern Cyprus; those specifically related to areas such as science and maths. Northern Cyprus is a developing country where ICT is less frequently used in the secondary schools. Similar to other developing countries, Northern Cyprus is experiencing problems related to technology readiness and integration of technology. A question remains as to whether these problems can be seen simply as a development lag with all the same issues that developing countries have experienced or whether differences in specific local cultural contexts and technological advancement mean that a different set of problems and strategies for dealing with them are arising. To address this problem, the Turkish Cypriot government aims to extend the use of ICTs into schools to raise standards in teaching and thus provide students with high quality education.

In this paper, the researcher presents the preliminary study because preliminary study is most helpful to understand ‘background’ or ‘big picture’ of each selected secondary schools in two countries. An understanding of ‘background’ or ‘big picture’ is important: to justify the selection of secondary schools; to identify the infrastructure readiness of the selected two countries’ secondary schools, levels of use of ICT and trainings that teachers have received; to define the population of main study more clearly and to establish hypotheses for investigation. Therefore, this preliminary study yields a research project that works well and provides the overall picture that is essential for a successful main study.

STATEMENT OF THE PROBLEM

The role of ICT widely considered as a core element in the education of students. Countries all over the world have identified the significant role of information and communication technology (ICT) in improving education (Pelgrum, 2001; Kozma & Anderson, 2002; Goodison, 2003; Kangro & Kangro, 2004; Hennessy, Ruthven, & Brindley, 2005), and have invested heavily in increasing the number of computers in schools and in the networking of classrooms (Pelgrum, 2001). Furthermore, many researchers have predicted that the importance of educational technology in the classroom will continue to increase (Becker & Ravitz, 2001).

Within the [England] National Curriculum, students are now required to become familiar with a range of technological applications and developed the necessary skills in using these within their everyday learning environment. The UK Government has invested £5billion in schools' ICT since 1997. As a result, the UK has the highest levels of embedded technology in classrooms in the European Union with one computer for every three pupils (inside government, internet, 2009). Furthermore, educational technologies have been in use in the UK for more than two decades. As a developed country, the British government has already extended its use of ICT over many years. Despite substantial investments in ICT, there is little data about how schools are using computers and other ICTs. This problem of lack of information on ICT usage in education is not isolated in developed countries. It is more severe in least developing countries where most education data are unreliable. Buchmann and Hannum (2001) noted that there is a lack of qualitative educational research in developing countries and Fuller (cited in Buchmann and Hannum, 2001) presented that while researchers in Europe have explored factors that affect learning such as the use of ICT, developing countries have not yet charted similar research avenues.

In view of the problems identified above, this research study will investigate the problem of lack of documentation regarding the extent of ICT usage in Turkish Cypriot secondary schools. While the government initiatives indicated national commitment to ICT in education, they do not know whether existing computers in schools are being used for educational computing. Hence, the extent to which Turkish Cypriot schools are using ICT is largely unknown. Also, this study will examine the pedagogical issues in Northern Cyprus and England regarding to use of ICT in the classroom and using 'Modify Delphi Technique' a good scenarios of use of ICT in teaching will be created by both countries teachers together. Without data of this kind, there is little basis for policy formulation in the education sector. As a result, ICT equipment tend to be purchased without proper terms of reference and are distributed indiscriminately.

RESEARCH QUESTION

For this preliminary research purposes, the following questions have been formulated.

The questions for this preliminary study are as follows:

1. What technologies are being used by secondary school teachers?
2. Where do teachers generally use ICT resources for their teaching?
3. How many minutes do teachers use computers/ICTs in their teaching activities in each week?
4. What types of CPD training have teachers had?
5. What type of ICT related support do teachers have in their school?
6. What is the stage that best describes teachers' level in terms of ICT adoption/integration?

Definition of 'ICT'

Kumar (2008) defines Information and Communication Technology (ICT) as an umbrella term that applies to a range of digital communication devices and applications such as 'digital television, radio, internet, network hardware and software, videoconferencing, and distance learning' (p.1). Lever-Duffy et al. (2005), however, report that some 'educators may take a narrower view' and are likely to 'confine educational technology [ICT] primarily to computers, computer peripherals and related software used for teaching and learning' (pp. 4-5).
In this review the term 'ICT' will be applied to any computer based technologies, whether networked or standalone, including both hardware and software, which can be used for teaching and learning purposes.

Technology Readiness

The phrase 'technology readiness' describes the behavioural processes that lie behind the adoption of technological products, services (Parasuraman and Colby, 2001) and infrastructure. Technology readiness can be broken down into two components: the infrastructure readiness of the schools and the ICT readiness of teachers, i.e. their acceptance of technology (Seng and Choo, 2008).. However, in this preliminary study physical and technological infrastructure were examined.

Physical and Technological Infrastructure

Effective ICT integration in schools depends on the available sufficient physical and technological infrastructure (UNESCO, 2004). Several researchers such as Williams et al. (2000) and Pelgrum (2001) had identified that there is not enough computers in the schools which is a key problem of integrating ICT in education. According to Baskin and Williams (2006) physical infrastructure includes learning areas such as classroom, computer labs, dedicated ICT resource rooms and libraries: in short, all of the space and furniture required for an ICT enhanced school environment. Technological infrastructure includes computers, broadband internet access and the various other technological resources used in education (Baskin and Williams, 2006). Therefore, schools need to provide at least basic physical and technological infrastructure if they want to integrate ICTs effectively into their teaching process by their teachers. In other words, the basic barriers and enablers of technology use in the schools is infrastructure: computers and other technologies, computer labs and internet access among others. Just having physical and technological infrastructures are not enough. Teachers are likely to have beliefs about teaching and learning with ICTs. Teachers' beliefs about the use of ICT might be an important aspect for the successful integration of ICT in teaching and learning. Thus, teachers must first accept the use of technologies.

Teachers Acceptance of Technology

Venkatesh et al. (2003) developed a technology acceptance model which is called 'unified theory of acceptance and use of technology (UTAUT)' by reviewing and integrating eight different models (Diffusion of Innovations, Technology, Acceptance Model, Theory of Reasoned Action, Theory of Planned Behaviour, Combined TRA & TPB, Motivational Model, PC Utilisation Model and the Social Cognitive Theory) used by former study to explain technology usage behaviour. It aims to give explanation about the user intentions to use a technology and the subsequent their usage behaviour. The study theorised four constructs that are determinants of user acceptance and usage behaviour: performance expectancy, effort expectancy, social influence, and facilitating conditions.

In this study, it is important to understand teachers' beliefs because teachers' set of beliefs is likely to determine whether teachers accept innovative changes in education such as use of ICT in the classroom. For that reason, teachers' acceptance of ICT use will be examined to determine two different countries teachers' beliefs about the use of ICT in the classroom. These factors formed the basis for questionnaire design (i.e. their age, years of experience and use of computers) and will also be taken into consideration while interviewing teachers on technology use in order to find out secondary school teachers' beliefs regarding the use of ICT.

RELATED RESEARCH

ICT has been introduced into schools during the last two decades, particularly in developed countries such as the UK. In addition to the necessary infrastructure, hardware and software, the teacher's experience in using ICT as a prerequisite to the effective use of these resources in the teaching and learning process (Balanskat, 2006).

Most studies show that teachers' enthusiasm for using ICT to support learning is increased by their own use of ICT. The study of ITU (2004) reveals that the teachers who participated in the project had more positive attitudes towards technology use than those who did not. In the UK, the British Educational and Communication Technology Agency (BECTA) evaluated the Department for Education and Skills' initiative of the first year of the Laptops for Teachers (LfT) initiative, which was launched by the Department for Education and Skills in 2002, which aimed was to launched to increase teachers' and head teachers' access to computers. The study found that teachers' positive attitudes and confidence were increased by having their own laptop computers (BECTA, 2003). The teachers who took part in the IWBs project (Higgins et al. 2005), were persuaded that using technology in lessons improved teaching and learning. However, Higgins et al. (ibid) argue that for the use of IWBs to be justified 'it must be used in ways which promote more effective learning above and beyond that which is possible when teaching with other kinds of projection technology or with ordinary white boards' (p.8).

Using technology could also help teachers to increased plan and prepare their lessons efficiently in planning and preparation of teachers' work by facilitating allowing collaboration between other teachers (Higgins, 2005). There were different opinions about efficiency savings brought about by using ICT amongst teachers, where they stating that they do not have enough time to integrate ICT into teaching (Underwood, 2006). Other studies, such as the ICT Test Bed project, suggest the opposite: that teachers using ICT can save their time in the medium and long term through reuse and collaborative sharing (Smokeh et al., 2006). This strongly suggests that there is a need to show teachers how they can use ICT to save their time.

Although a study of e-learning in the Nordic countries suggests that teachers are very positive about technology in general and believe that using ICT does not waste their time once they achieve a certain level of competence, most of teachers in the study did not report a positive impact of ICT on workload and they found that teaching time was wasted as a result of trying to use ICT in school (Ramboll Managment, 2006). In the study of ITU (2004), however, stated that technology provides more differentiated learning thus enables students to work more independently. Therefore, teachers have more time to prepare lessons that meet the needs of individual students (ibid). Another impact of ICT on teachers is that ICT provides a means of cooperation between teachers by sharing curricula and lesson plans with their colleagues, saving individual preparation time (Higgins et al., 2005). The same result is reported by Harrison et al. (2002) and Comber et al. (2002): the use of ICT makes lesson plan preparation more effective and efficient in saving time. Teachers will also the opportunity to share and encourage good practice.

Most of the studies on the impact of ICT on teaching state that there is no infrastructure problem, particularly in developed countries, but more training is needed by teachers to support innovative pedagogy (Smokeh et al., 2006). In other words, studies state that there is not a problem with ICT in terms of putting it in place but there is a lack of support in terms of facilitating conditions and particularly training in ICT. Schools do, however, vary in the ICT resources they have available. Schools in richer and more urban areas tend to benefit from faster broadband speeds and those in more affluent areas will tend to have more modern computers than more rural and poorer areas (International Telecommunication Union, 2003, Underwood et al., 2005).

Over the last twenty five years, in the UK, the government has encouraged schools to adopt ICT as a main part of the structure of the curriculum. For that reason, UK government have launched number of initiatives to put computers and other computer technologies into schools for teachers to integrate them into their teaching. Use of ICT is considered as an important skill in this modern world as most companies in the world seek this skill this is the reason why UK government encourage schools to adopt the technology. As Michael Heseltine (1995) who was the UK Deputy Prime Minister stated:

> 'These new technologies, and the way they are used, will have a profound impact on every one of us. It will lead to real progress in helping learners throughout their lives and hence help with the vital task of keeping Britain competitive in the 21st Century.' (cited in Watson, 2001,p.252)

Also likewise in 1997 Tony Blair who was the UK Prime Minister noted:

> 'Technology has revolutionised the way we work and is now set to transform education. Children cannot be effective in tomorrow's world if they are trained in yesterday's skills. Nor should teachers be denied tools that other professionals are trained to take for granted. Standards, literacy, numeracy, subject knowledge—all will be enhanced by the Grid and the support it will give our programme for schools improvement.' (Tony Blair, UK Prime Minister, launching the National Grid for Learning, 1997, p.252)

Currently not all countries are able to benefit from the developments that technology can offer to them. Significant barriers have been identified by many researchers why some countries cannot take advantage of technological developments, including limitations in ICT infrastructure facilities, the high cost of developing infrastructure, teacher support and training process, and unaffordable internet connectivity at the higher bandwidths are some key limitations faced by a developing country such as North Cyprus. Even when the physical facilities and resources are made available to schools there may still be various problems in using ICT faced by countries, especially developing countries ones, , problems related to a resistance towards using new technology and changing the pedagogical approach.

In North Cyprus, most of the public institutions still use the traditional method of instruction in which the teacher delivers lectures and students listen passively; teachers are said to be reluctant to use ICT in their teaching (Isman et al., 2007). The reasons for the overall lack of integration of technology into Turkish Cypriot schools are mixture of access to ICT, teachers' training and beliefs on technology use and the relationship between the available technologies and preferred pedagogy. The Turkish Cypriot government provided ICT resources such as computers, overhead projectors, printers and CDs to schools but there is not enough training in how these technologies can be used in teaching. Training in North Cyprus focuses more on technical skills than on educational use. Many Turkish Cypriot teachers use ICT to support traditional learning methods, for example, students are 'passive consumers and receivers' of information which provided by teacher instead of 'active producers' of new information.

METHOD

Population and Sample

The population of the study consists of England and Northern Cyprus secondary school teachers. The sample of this study was drawn from two English and two Turkish Cypriot secondary schools. The questionnaires were distributed to 4 secondary schools teacher in England and Northern Cyprus. The sample of the study consist of 93 English and 105 Turkish, 198 in total, secondary (year 7-8-9) schools teachers working with state schools. The number of questionnaires returned was 117.

Procedure
A survey based approach has been adopted for this preliminary study to examine establish the nature of the IT resources available to teachers, its location/accessibility, and state of repair, as well as the availability of technical support, the teachers' use of ICT and the training of staff in the school.

The sections of the questionnaire were as follows:
Section 1: Personal information
Section 2: Availability and accessibility of Information and Communication technologies
Section 3: Continual Professional Development (CPD) training and competence level of teachers
Section 4: Other Comments

The personal information questions were included the name of the school, the gender, age, years of experience of the teachers, and the subject that teacher teaches. The question about the availability and accessibility of ICT were included the types of ICT tools (i.e. hardware, software and network) are being used in the school, how teachers believe about the support that they get from school in terms of maintenance and the use of ICT, where they use ICT resources, over what time (minutes) they use ICT, how they describe their particular level of ICT skill, and what type of ICT support they have in their schools. The section three CPD training questions were included the types of training teachers received, how many hours of training, their evaluation of competence level (self-assessment), and how they would describe their use of ICT level. Section four was for any other comments that teachers might wish to make.

The results of the questionnaire demonstrated the background, 'broad/big picture' within each of the schools in the two countries, explain and justify the selection of selected schools and the selection for the interviews of teachers who had the confidence and belief that they should integrate ICT more in their subject teaching, as well as some teachers who were less confident.

Data Analysis
The first step of data analysis is data coding. The data was coded into a format with numerical codes using the Microsoft Excel® program.

As advised by Mertens (1998), a fresh copy of the questionnaire was made and the responses were coded on that copy. Also, as suggested by Robson (2002), the following numerals were used to represent the options for closed items; for instance, '1' and '2' were used to represent male and female. The researcher was not get any responses for the open-ended items, thus open=ended items were not analyse

Further, descriptive statistics were used to show demographic data of the participants and also to evaluate:

- What types of ICTs were there?
- Were there enough computers in their schools?
- How many minutes or hours per week did they use ICTs?
- What types of ICT-related training and support did they have in their schools?
- How did the selected teachers evaluate their stage of adoption/integration of ICT level into their teaching practice?

numbers and percentages are used to show the results.

The results of the questionnaire were also used to select participants for the interviews. 3 teachers from each selected schools whose competence (self-rated) level was high, medium and low and who indicated in the questionnaire that they would be happy to participate in the interview process were selected to participate.

RESULTS
Findings reveal that the two countries are very different in available ICT tools to them, their use of ICTs, training and support that they have received and their stage of ICT adoption/integration.

This study found that considerable variation in the availability of ICT tools in England whereas there is not considerable variation in the availability tools in Northern Cyprus. However, there are basic ICT tools available to Turkish Cypriot teachers to use in their teaching such as computers, internet, electronic whiteboard (not interactive whiteboard) and Microsoft office programs. Table 1.1 shows marked differences between the availability of ICT tools in each countries school.

Table 1.1 Distribution of ICT tools in schools

ICT Tools	Availability %	
	Selected English secondary schools	Selected Cypriot Turkish secondary schools
Computers	94%	90%
Overhead projector	88%	58%
Printers	76%	76%
Scanner	56%	35%
Electronic whiteboard	78%	52%
Laptop	96%	9%
Camera	90%	0%
Video Camera	24%	0%
PSPs	34%	0%
Notebook	12%	0%
Mobile Phone	4%	0%
Voting system	16%	0%
MP3 Player	12%	0%
Microsoft office programs	92%	80%
Publisher	18%	0%
Video and sound editing software	18%	0%
Educational games	46%	0%
Subject specific software	26%	0%
Designing software	14%	0%
Simulations	26%	0%
Internet	100%	92%
Real smart	12%	0%
VLE	92%	0%
Intranet	92%	0%
E-portal	14%	0%
P drive	12%	0%

Teachers with these tools in each country are able to modify their teaching methods, giving them opportunities to present their lessons more effectively. Even there are not many ICT tools available to teachers in Northern Cyprus; teachers can still use available ICT tools to present their lesson more effectively.

Teachers were asked to indicate their beliefs about if there are enough computers/ICT tools to use in their schools. On the one hand, the more than half of English teachers (52%) were believed that there are enough computers/ICT tools in their schools while 38 percent of teachers were believed that there are not enough computers/ICT tools in their schools. Only 10 percent of teachers not sure if there is computers/ICT tools in their schools. On the other hand, the most Turkish Cypriot teachers (83.80%) were believed that there are not enough computers/ICT tools in their schools while 16.20 percent of teachers were not sure. Interestingly, not even one teacher was believed about there are enough ICT tools in their schools as they responded.

it might be said that selected secondary schools in England have more computers/ICT tools available in their schools than selected secondary schools in Northern Cyprus. . The bar charts, which is provided below in figure 1.1, gives clear idea about the differences between the two different countries teachers' response.

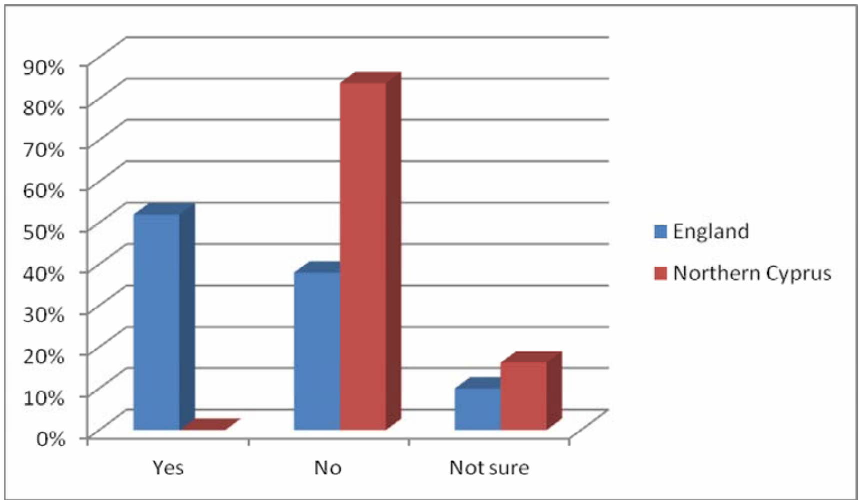

Figure 1.1 teachers beliefs about if there are enough computers in their schools (Values shown as %)

Teachers were also asked to indicate how many minutes they use ICT tools in their teaching activities in each week. Their responses were scored as follows: 0 minutes per week, less than 15 minutes per week, 15-45 minutes per week, 46-90 minutes per week and more than 90 minutes per week.

Just under half of the teachers in selected England secondary schools use ICT tools more than 90 minutes per week around 42% while there is not any teacher who does not use ICT tools in their teaching. However, around 68 percent of teachers, which means most of teachers in selected Turkish Cypriot secondary schools, do not use ICT tools in their teaching while only 5.8 percent of teachers, who are the ICT teachers, use ICT tools more than 90 minutes per week.

In the selected England schools, 26 percent of teachers use ICT tools 15 to 45 minutes per week and 22 percent of them use ICT tools 46 to 90 minutes per week while in the selected North Cyprus schools 11.6 percent of teachers use ICT tools 15 to 45 minutes per week and 4.3 percent of them use ICT tools 46 to 90 minutes per week. Around the same percent of teachers (10%) use ICT tools less than15 minutes per week in both countries.

According to these results it might be said that most English teachers in the selected secondary schools use ICT tools in their teaching whereas most Turkish Cypriot teachers in the selected secondary schools do not use ICT tools in their teaching. the reasons for lack of use of technology by Turkish Cypriot teachers could be the inadequate ICT tools and lack of trainings and supports from their schools, which is discussed as follows. For clarity, Figure 1.2 shows the two countries teachers' responses separately through bar charts.

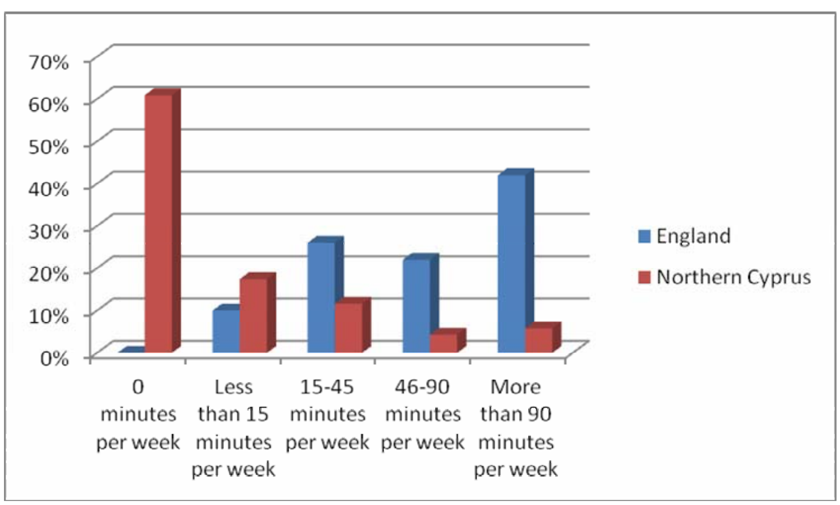

Figure 1.2 how many minutes teachers use ICT tools in their teaching activities (Values shown as %)

Teachers were also asked to declare have they ever received any ICT training. In selected England secondary schools, the most teachers around 74 percent responded that they have received ICT training and these trainings were provided by their schools as 46 percent of them responded that their schools provides them Continual Professional Development (CPD). Only 8 percent of them responded that they did not receive any ICT training at all. However, interestingly, the most teachers (61.98%) in the selected Northern Cyprus secondary schools responded that they have not received any ICT training at all and around 38.02 percent of teachers responded that they have received ICT training but it was not provided by their school. They mentioned that they have received ICT training when they were in their undergraduate program and nearly all of these teachers are ICT subject teachers. None of participated teachers in this study chose ‘my school provides us with Continual Professional Development (CPD) training’ option. It might be assumed that s selected Turkish Cypriot schools do not provide ICT training to their teachers as this could be depending on lack of finance problems .

This result shows that selected schools in England provide CPD to their teachers whereas this does not provide to Northern Cyprus teachers by their schools. The figure 1.3 illustrates teachers’ responses to that question

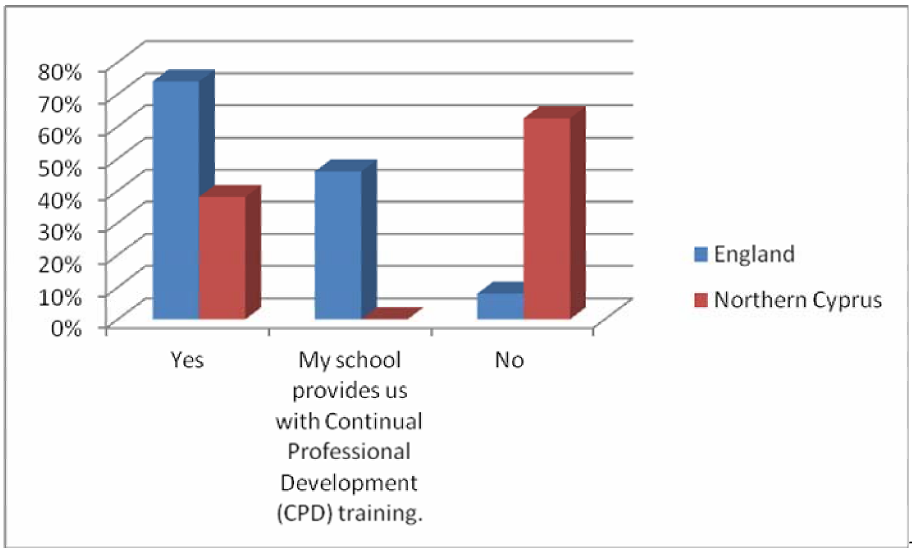

Figure 1.3 Have you ever received any ICT training? (Values shown as %)

Furthermore, there is an ICT non-teaching personnel in selected England secondary schools and teachers have support from professional ICT staff as well as they have support from their ICT skilled teaching personnel in the schools. However, according to the selected secondary schools teachers’ responses, there is not any ICT non-teaching personnel s and there is not enough support from ICT skilled teaching personnel in their school. .

Teachers were also asked to determine the types of Continuing Professional Development (CPD) training that they have had. In selected England schools, 88% percent of teachers responded that they have had ‘in-house training’ which means training held in the school and delivered by school staff using school equipment. Around 36 percent of them responded that they have had ‘external training’ which means teachers travelled to a training venue outside their school and training was delivered by another service provider using their equipment. Around 26 percent of teachers responded that they have ‘custom training’ which means an outside expert consultant came to the school to deliver training for school staff using school equipment. There are also teachers who received two or three different training as well.

Interestingly, 4 percent of Turkish Cypriot teachers responded that they have had ‘in-house training’ which means training held in the school and delivered by school staff using school equipment, 23 percent of teachers responded that they have had ‘custom training’ which means an outside expert consultant came to the school to deliver training for school staff using school equipment, and 8 percent of them responded that they have had ‘external training: I travelled to a training venue outside my school and training was delivered by another service provider using their equipment. However, there is a contradiction between Turkish Cypriot teachers’ responses to previous question, which was about the training they have received from their schools, and this question. Because none of teachers tick the ‘my school provides us with Continuing Professional Development (CPD) training’ option in the previous question and teachers were mentioned in their questionnaire that they were received trainings while they were in undergraduate program but 35 percent of Turkish Cypriot teachers responded that their schools provide training to them.

This result shows that almost all teachers were received one of training among three categories in selected England secondary schools whereas teachers in selected Northern Cyprus secondary schools did not received any professional development training from their schools. The figure 1.4 shows this difference.

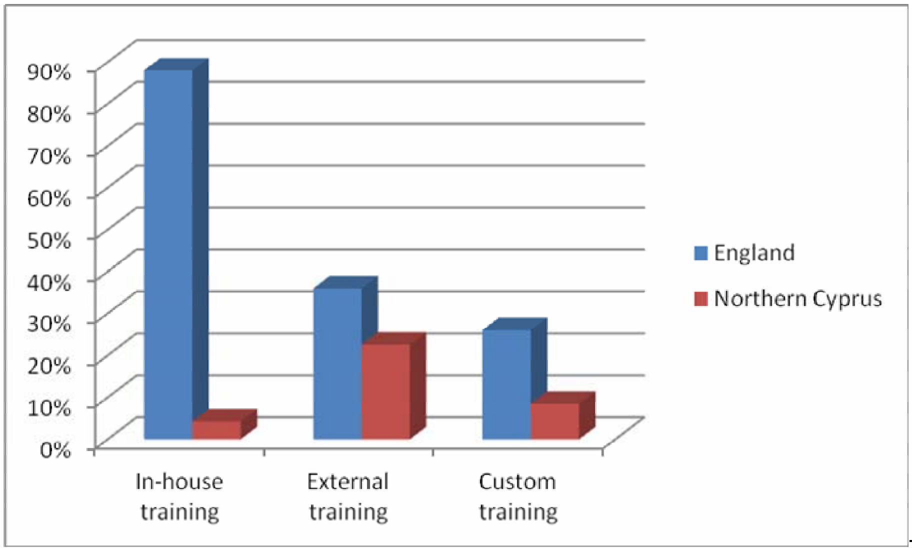

Figure 1.4 Continuing Professional Development (Values shown as %)

Teachers were finally were asked to indicate their stage of ICT adoption/integration stage level in each countries. The most teachers (42%) see themselves in stage 5 in the selected England secondary schools while the most teachers (32.39%) see themselves in stage 4 in the selected Northern Cyprus secondary school. 2 percent of English teachers and 13 percent of Turkish Cypriot teachers in the selected schools responded that they are in stage 1. 24 percent of teachers in selected England secondary school and around 10 percent of teachers in selected Northern Cyprus secondary school see themselves in stage 6. For the clarity the following figure 1.4 demonstrates the teachers' responses through the bar chart for each country. Before presenting figure 1.5, the meanings of stages were given. They are as follows:

- **Stage 1:**
  Awareness = I am aware that technology exists but have not used it for teaching. I am not confident about using computers in the classroom
- **Stage 2:**
  Learning the process = I have basic computing skills but have difficulty or lack confidence in using technology for teaching
- **Stage 3:**
  Understanding and application of the process = I am beginning to understand the process of using technology for teaching and can think of specific tasks in which it might be useful.
- **Stage 4:**
  Familiarity and confidence= I am gaining a sense of confidence in using computers for teaching and am starting to feel comfortable in using the computer in lessons for specific tasks.
- **Stage 5:**
  Adaptation to other contexts= I think about the computer as a tool to help me in teaching when planning lessons and have used a range of applications as instructional aids.
- **Stage 6:**
  Creative application to new contexts= I can apply what I know about technology in the classroom. Therefore, I am able to use it as an instructional tool and integrate it quite confidently into the curriculum including adapting examples to meet the needs of new learning situations.

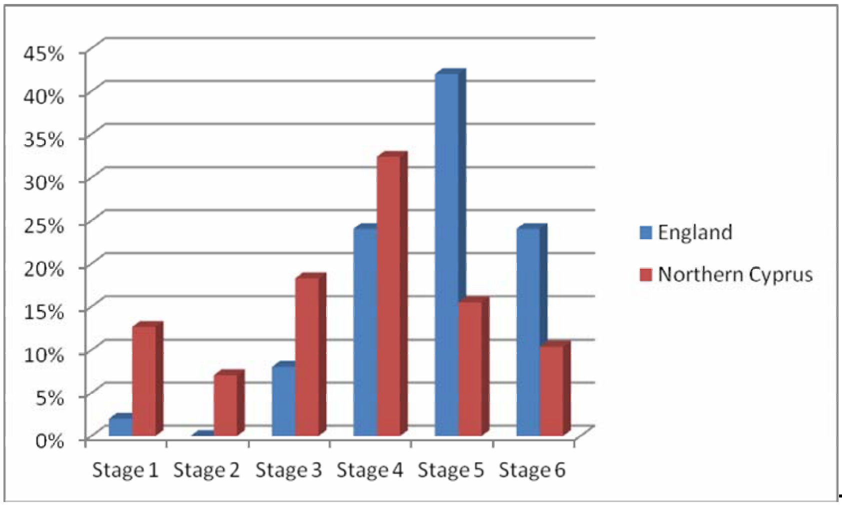

Figure 1.5 Evaluation of ICT adoption/integration in teaching (Values shown as %)

LIMITATIONS OF THE PRELIMINARY STUDY

This study is a preliminary study to present 'big/broad picture' and the researcher acknowledge the limitation of the study. As only 2 secondary schools from each country were selected for this preliminary study, it is important that further research be conducted to confirm these preliminary findings. Thus, more study need to be supplemented to this preliminary study to present a better picture of available ICT resources that are being used by teachers in their teaching, trainings and Continuing Professional Development (CPD) and support that they have received and their integration stage of ICT.

CONCLUSION

The main focus of this preliminary study was to identify the background or 'big picture' of selected England and Northern Cyprus secondary schools in terms of available ICT tools that are being used by teachers in their teaching, trainings and Continuing Professional Development (CPD) and support that they have received and their integration stage of ICT. This study reveals that the two countries are very different in available ICT tools to them, their use of ICTs, trainings, CPDs and support that they have received and their stage of ICT adoption/integration.

As a result of this preliminary study, it is found that Turkish Cypriot teachers who work for selected secondary state schools do not have enough ICT tools, trainings and supports from their schools while there are different types of ICT resources available to British teachers who work for selected secondary state schools and they normally receive support and trainings from their school. This preliminary study provided differences between two countries secondary schools which will help the researcher to use them in the actual study while comparing the two countries situation. Furthermore, according to this preliminary study the chosen schools from two countries justified and the teachers were chosen for the interview process. The actual study will be focused on the pedagogical aspects of teachers' use of ICT in their teaching. At the end of this PhD study, the best practice of ICT use in teaching will be provided.

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SUPPORTING INTERACTION AMONG PARTICIPANTS OF ONLINE LEARNING USING THE KNOWLEDGE SHARING CONCEPT

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ABSTRACT
In education business, proper interaction is a crucial factor for learning effectiveness. However, it is difficult to successfully guide the participants to achieve the appropriate interaction in an online learning environment. That is, the interaction as well as internal dialogue should be systemically performed under a valid control. In this paper, the concept of knowledge sharing is applied to achieve the appropriate interaction among participants in an online learning environment. By evaluating and integrating the differences between interaction considerations and knowledge sharing, the proposed methodology transforms the interactions into knowledge flows to easily apply the concept of knowledge sharing. Then, the corresponding activities can be acquired following the conformable analysis. According to experimental results, the learners assigned with interaction supported by knowledge sharing flows have better success in terms of learning effectiveness. That is, the concept of knowledge sharing significantly influences the interaction throughout the use of a learning platform and is a way to enhance the learning effectiveness.
Keywords: online learning, knowledge sharing, online learning interaction, learning effectiveness.

INTRODUCTION

Generally, interaction among participants is crucial for study effectiveness, since wisdom exists not only at the individual level, but is also acquired through interactions among participants (Beauchamp & Kennewell, 2010; Hernández, Pardo, & Kloos, 2007; Hwang & Yang, 2008; Koretsky et al., 2008; Reilly, 2008; So, Seah, & Toh-Heng, 2010). Accordingly, the interaction is an important concern, whether being considered in traditional study environments or digital study environments (Hakkarainen, 2009; Lau & Woods, 2009; Liu & Wang, 2010).

For digital study environments (online learning), the research of Hrastinski (2009) presents that the kind of learning is a complex process of participating and maintaining relations with others. The issue regarding interactions for online learning needs more attention. Since the activities of online learning are carried out on the go, without face-to-face discussions (Benbunan-Fich, Hiltz, & Turoff, 2003), the interaction among participants is limited in a digital environment. The interactions of the parties in an online learning environment are undoubtedly crucial for the learning objective and learning effectiveness. Therefore, it is necessary to successfully guide the participants to achieve the appropriate interaction to ensure the learning objective, thus accomplishing the learning effectiveness. That is, the interaction as well as internal dialogue should be systemically performed under a valid control.

As described in (Chou, Penga, & Changa, 2010; Jou, Chuang, & Wu, 2010; Park, 2008; Roblyer & Wiencke, 2003), there are several parties involved in an online learning system: learner, instructor, and content. The relationships among those participants are classified as Learner-Instructor, Learner-Learner, etc. (Lee, Kimb & Hackneya, 2010; Lau & Tsui, 2009; Moore, 1989). While the interactions among these parties are well-defined and kept, the learning objective can be thus arrived at. However, the possible interactions are complicated and are difficult to be distinguished since the scope is comprehensive. Hence, the learning effectiveness depends on the provision that the interaction among participants is formatted. For instance, the interaction between two learners should be publicly performed following a formal method to prevent any meaningless chatting. A

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practical solution, which models the interaction processes, is reasonably useful to overcome the issue. Clearly, it is the basis to share the advantages provided by the interaction among participants and the online learning system. To construct the solution, a design which developed the interactions process with a systemic construction is preferred. Unfortunately, to our knowledge, the previous approaches (Arbaugh & Benbunan-Fich, 2007; Gaetaa, Orciuoli, & Ritrovatoa, 2009; Sherry & Yamashita, 2004; Vandaie, 2008) concerning of the aspect of interaction and learner participation lack the presence.

In this paper, a solution for the concern is proposed in an integrated design. To organize the interaction formally, the concept of knowledge sharing (KS) seems to give a workable way according to the facilitation of transferring or disseminating knowledge from one individual or group to another. Since the KS was not proposed for interactions of online learning, three questions must be addressed:

1. What is the relationship between the roles of KS (the knowledge sources and receivers) and the online learning environment (the instructors, learners and contents)?
2. How can the tacit knowledge sharing for each participant be effectively handled?
3. How can the interaction as well as the activities of online learning be mapped into the framework of KS?

For the first question, knowledge is usually shared from a source to a receiver (Du et al., 2007; Zhuge, 2002). That is, instructors, learners and contents are the source or receiver depending on the kind of interaction process. However, in reality, the interactions of online learning are not absolutely performed in this assumption because the roles may be a source and a receiver simultaneously in some cases. For example, when a learner discusses a controversial issue with another, the knowledge is mutually shared and the role cannot be clearly bounded.

Next, the concerns for tacit knowledge are vital in a KS online learning system since the tacit knowledge is crucial and is difficult to be effectively shared. Nonaka and Takeuchi (1995a) and Polanyi (1974) stated that the unique way to learn tacit knowledge relies on costly and slow knowledge flow methods, like through apprenticeship, imitation and personal experience transfer.

In addition, the application of KS with interaction depends on the analysis of communication among the learners, instructors and contents. Thus, the procedure that transforms interactions into the form of knowledge sharing flow is no longer a choice, but a necessity. If the relevant behaviors of the participants for online learning can be precisely summarized, the corresponding KS flow derived from their interactions becomes searchable.

The main objective of this paper is to present a methodology for achieving the appropriate interaction among participants in an online learning environment. As claimed, the knowledge sharing mechanism should be a workable way for the purposes, but it is not originally designed for online learning. Our contribution in this paper is towards bridging the gap between knowledge sharing and online learning interaction. To validate the work, an experiment from a learning course of a Taiwanese private junior college is performed. In addition, a complete evaluation is discussed to show the feasibility.

The rest of this paper is organized as follows. Section 2 briefly describes related works to facilitate the understanding of the article. In Section 3, the methodology to support interaction among participants of online learning using knowledge sharing is delineated. Then, the experiment and discussion are opened to demonstrate the correctness and practicability in Section 4 and Section 5, respectively. Finally, the conclusion is given in Section 6.

RELATED WORKS

Interactions of Online Learning

The interaction, a social process, is indispensable for the achievement of teaching and learning. In such a principle, the flow of information between participants is important to the quality of learning processes (Thomassen & Ozcan, 2010). There are four types of interaction: learner-content, learner-instructor, learner-learner, and learner-interface defined in the articles (Hillman, Willis, & Gunawardena, 1994; Moore, 1989). The improvement to effectively support the interaction among these types is, therefore, a crucial issue for higher learning effectiveness.

Knowledge Sharing (KS)

Knowledge sharing (KS) is defined as the activities of transferring or disseminating knowledge from an individual, a group, an organization or a society to another, which includes both tacit and explicit knowledge broadly (Nonaka & Takeuchi, 1995a; Nonaka & Takeuchi, 1995b). Generally the mechanism is accomplished in the form of knowledge flow including at least two participants, one who offers knowledge and the other who receives it (Hendriks, 1999). However, the sharing of tacit knowledge has a complex nature since the tacit knowledge is difficult to extract from the owner (Fernie et al., 2003). Hence, the efforts for the sharing of tacit knowledge are deserved.

THE METHODOLOGY

The Framework

The KS concept is used to facilitate the appropriate interaction, which is one of the crucial factors for learning effectiveness. In other words, the learning effectiveness is not only achieved based the KS infrastructure, but also influenced by the interactions among participants. The primary relationship is shown in Figure 1.

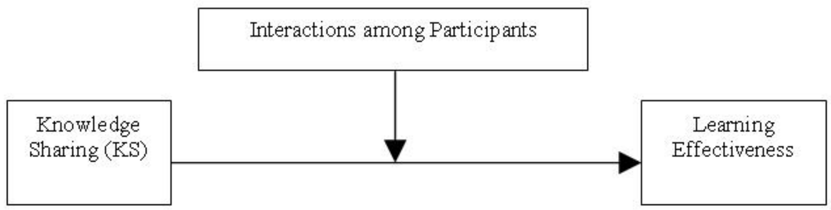

Figure 1. The Primary Relationships among KS, Interactions and Learning Effectiveness

The participants in an online learning system are learners, instructors, and contents, which can be divided into three groups, G_L, G_I and G_C. Generally speaking, each learner has to register at the system to become eligible for the teaching services provided by G_I. The G_C made by G_I is used to represent the study material, and is one of the major media to connect G_I and G_L.

Furthermore, the interactions proposed in the framework among each group are defined as the interaction between contents and learners (*Inte*$_{C-L}$), instructors and learners (*Inte*$_{I-L}$), and learners and learners (*Inte*$_{L-L}$), respectively. In Figure 2, the extension framework including the involved interactions is depicted.

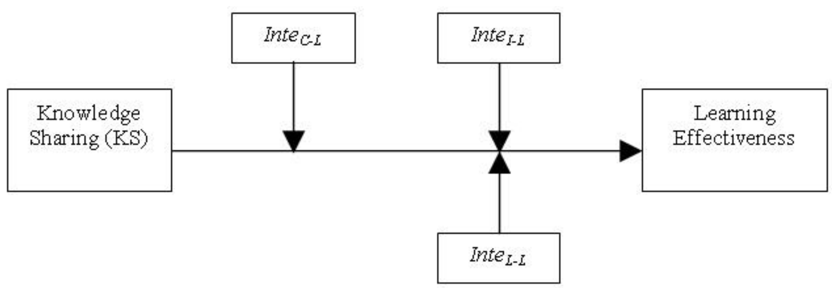

Figure 2. The Relationships among KS, Interactions and Learning Effectiveness with Extension of the Interactions

The Interactions

The interactions for each relationship involved in this paper are explored as follows:

The Interactions between contents and learners (*Inte*$_{C-L}$)

The G_L learns from the content (i.e. learning material) prepared according to the teaching objectives. If G_L can easily search for meaningful content instead of receiving packaged lectures, the knowledge flow between G_L and G_C becomes two-way communication, thus enhancing the effectiveness. Therefore, this consideration is necessary for the *Inte*$_{C-L}$. On the contrary, the interaction from G_L to G_C is not involved in this research since the G_I cannot influence the details of G_C unless the G_I provides the help.

The Interactions between instructors and learners (*Inte*$_{I-L}$)

The interaction between G_I and G_L is established in two-way flows of knowledge sharing. First is the knowledge flows from G_L to G_I. Due to the importance of G_L's comments, a way used to achieve the channel for G_L's comment feedback during the teaching period is essential. This work should be carefully designed since the degree of openness and the average waiting time for useful response determine its success. Next, the knowledge flow from G_I to G_L is a part of teaching instruction. It is a procedure to provide G_L student counseling in terms of lecture issues. The individual problems can always be directly solved in the operation. Hence, some useful mechanisms for the knowledge flow from G_I to G_L are also important.

The Interactions between learners and learners ($Inte_{L\text{-}L}$)
As claimed in various approaches (Chang, Wang, & Chen, 2009; Chao, Hwu, & Lee, 2009; Liang, 2009; Liaw, Chen, & Huang, 2008; Beauchamp & Kennewell, 2010; Lee et al., 2010), significant wisdom does not only exist in an individual, but, rather, is acquired through the interactive relationship from learners with each other. When two or more learners exchange subject matter, they are said to share their knowledge. The more vital the $Inte_{L\text{-}L}$ is, the better the learning effectiveness would be gained. Therefore, the success for $Inte_{L\text{-}L}$ not only relies on the fluency of communication among learners, but is also established on the learners' enthusiasm. As a result, the enhancement of emulation among learners is the way to better learning effectiveness while considering this subject.

Overall
To realize the discussion, the evaluated requirements for each interaction are summarized in Table 1. In addition, the corresponding parties of each KS flow are also presented to clarify the relationships.

Table 1: *The Requirements for Each Interaction*

Requirement	Interaction	Flow Source of KS	Flow Receiver of KS
two-way communication	$Inte_{C\text{-}L}$	G_C	G_L
comment feedback channel	$Inte_{I\text{-}L}$	G_L	G_I
student counseling	$Inte_{I\text{-}L}$	G_I	G_L
subject matter exchange	$Inte_{L\text{-}L}$	G_L	G_L
fluency of communication	$Inte_{L\text{-}L}$	G_L	G_L

The Teaching Method
The teaching method includes three major aspects: content phase, teaching procedure and evaluation. According to the requirements, the methods and their corresponding activities are respectively discussed as follows.

Content Phase
Since the two-way communication between $Inte_{C\text{-}L}$ is the objective, the content is designed to be selected. That is, G_L is allowed to select the content which they require. In addition, the content should be totally kept and shared for the participants, since that is an appearance of knowledge. Therefore, for this phase, not only the selective content is conducted, but also the deployment of keeping history content and discussion is required.

The Activities
1. Content Digitization: This activity is basically needed to achieve the online learning. The whole entirety of the teaching material are firstly made or transformed into the digital form. Then, the functionalities in terms of adding, deleting and updating are offered to facilitate instructors' maintenances.
2. Searching: In order to achieve the functionality of selective content, the index is appended while content is added or updated. The indices are generated according to the semantic and meaningful portion of content, such as subject title, chapter name, keyword, etc., so that the content can be searched using an easy, rapid operation.

Teaching Procedure
The considerations for the teaching procedure significantly affect the learning effectiveness. The aim for this phase is to strengthen the interactions of $Inte_{I\text{-}L}$ and $Inte_{L\text{-}L}$, which is difficult in an online learning environment. As such, not only the presentations of G_I have to be received by the G_L, but also the issue regarding the discussion of G_L should be addressed. In addition, the method involves the keeping of whole discussion records, which is a well-established knowledge-base for further sharing.

The Activities
1. Initiative Raising Issue: The course related issues are initiatively shared and raised for G_L and G_I by each participant. In addition, the sharing of experiences as well as and feedback responses is achieved in this activity.
2. Problem Solution: During the teaching procedure, the course problems can be issued on a public bulletin or discussion board. Then, instructors give the relevant hints which lead to thinking and growing. Furthermore, the G_L is able to solve the announced problems, as well. It is helpful for the satisfactions of G_L, derived from the sentence: "to teach is to learn".
3. Painting: In addition to textual interaction, the drawing and painting functionality regarding thought and interesting events are provided. Moreover, it can be applied as a simple e-whiteboard for G_I. Thus, the interaction between instructors and learners is fulfilled by this function.

4. Voting: According to public balloting, the favorite trend of all learners can be anonymously and statistically understood. The special manner results in invisible interactions, since it facilitates the integration of all participants' consensus.

Evaluation
The evaluation involves two major aspects: the learning effectiveness and feedback responses. The examination is a direct method to control learning effectiveness. Moreover, once the feedback responses are continually allowed, the student counseling throughout the learning duration can be finished.

The Activities
1. Examination: This activity is performed at the end of a semester, and can be designed in various types depending on instructor decisions and real conditions.
2. Feedback and Investigation: Those works are arranged without a fixed schedule. Then, the collected results are kept and shared online to assist the advancement of teaching operations.

Experiment
To validate the contribution of the paper, an experiment which measures the learning effectiveness based on the proposed framework is introduced. Its details include several major parts and are described as follows:

Experimental Participants
128 students between sixteen and nineteen years of age are recruited from a Taiwanese private junior college. These students are randomly divided into three teams (Team A, B and C), which is useful for eliminating the differences of learner motivation and background. The students in Team A make use of the proposed system for assisted learning. Then, Team B is allocated to using a common learning platform with an existing tool, the blog system, for example. Team C employs the fundamental learning system without any external help.

Experimental Design
It is necessary to perform a pretest/posttest nonequivalent control-group experimental design structure (Gravetter & Forzano, 2005), which takes place before and after measuring each team, as shown in Table 2. The pretest and posttest are required to assess the learner's fundamental concept of computers as well as their familiarization with the current teaching subject, respectively.

To minimize the error variances within groups and function-elimination of systematic bias, the experiment analysis of covariance (ANCOVA) (Fan, 1992) are taken. It is one of the statistical techniques which are widely employed for researches, since it not only supports the statistical control, but also reduces the error variance.

Table 2: *Experimental Design*

Team	Pretest	Independent Variable	Posttest
A	O	X_1	O
B	O	X_2	O
C	O	X_3	O

Note. X: Experimental Treatments, O: Pretest or Posttest

The Intervention of Learning Program
For precise results, the learning programs designed in the experiment eliminate the possible condition regarding learner, instructor, and content, besides the learning tool. In Table 3, the learning schedule is given to clarify the details of the learning process for this experiment. Since Team C is incapable of feedback response, only Team A and Team B can execute comment feedback partially, and the complete feedback can be received in the final team reporting. The occasion of feedback response is set throughout weeks 2 to 7.

Table 3: *The Learning Process Schedule*

Week	Process	Team A	Team B	Team C
Week 1	Instruction Guide	○	○	X
Week 1	Pretest	○	○	○
Week 2 ~ 7	Learning Feedback Response	○	○	X
Week 6 ~ 7	The Final Team Reporting	○	○	X
Week 8	Posttest	○	○	○

Note. O: Treatment, X: Control

DATA COLLECTION

In this experimental course, the international certification examination of the Microsoft Office application is one of the crucial assessments for learning effectiveness. The official examination system developed by the Taiwan Computer Association is reliable and fair. Thus, the achievement of passing though this examination implies that the learning effectiveness is a success because the major teaching objective is in this aspect.

The examination is separated into the standard level and professional level. The professional level consists of the questions of the standard level with multiple items, and is more suitable for whoever has passed the standard level. In the past, after learning the relevant course for three months, thirty percent of the students in a class could pass the standard level test; only a few students were able to pass the professional level.

DATA ANALYSIS

As listed in Table 4, the success of the examination of Team A is obviously better than that of Team B and Team C at the end of learning. There are six students in Team A passed the professional-level examination, and only three students from Team A failed the standard-level examination. Clearly, the team aided by the proposed system demonstrates better learning effectiveness than other teams. In other words, the activities derived from appropriate interactions among participants are provably helpful for better effectiveness.

The level of significance is set at α=0.05. The covariate is the pretest scores, and the dependent variable is the posttest scores. As summarized in Table 5, the result confirms the condition for operating ANCOVA. The experimental process eliminating the effects of the protest scores reaches statistical significance (F=21.85, p<=0.05), listed in Table 5, after applying ANCOVA. According to posterior comparisons, the learning achievement and effectiveness of Team A are significantly higher than those of Team C.

Table 4: *Examination Result*

Team	Sample Number (Persons)	Success Amount		Average Score
		Standard Level (Persons)	Professional Level (Persons)	
A	40	37	6	78
B	46	14	0	43
C	42	15	2	59

Table 5: *The ANCOVA for Overall Achievements (Dependent Variable: Posttest; Covariate: Pretest)*

Variance	*SS*	Freedom Degree	*MS*	*F*	Sig.	Estimated Effect Size	Observed Power
Covariate (Protest)	705.09	1.00	705.09	7.23	0.01	0.06	7.23
Between Teams (Instruction)	4263.05	2.00	2131.52	21.85	0.00 ***	0.26	43.71
Within Team(Error)	12095.10	124.00	97.54				
Overall	395073.36	128.00					

Note. ***p<0.001

Clearly, the learners in Team A have better success in terms of study effectiveness. The major inference is the arrangement which provides the opportunity of knowledge sharing and interactive learning. Compared with Team C, the learners in Team A have many more knowledge sharing operations, regardless of the spatial and temporal restriction. Although Team B has some general online learning platforms for learning, the study effectiveness is slightly poorer than the accomplishments of Team A. It is clear that the influence of the knowledge sharing concept and interaction is crucial during the use of a learning program.

DISCUSSION

Researches in online learning interactions are constantly discussed (Bekele, 2010; Capponi et al., 2010; Liu & Wang, 2010). Most of the relevant approaches reveal the positive influence of information technologies, but the consideration regarding the participants is lacking. The participant is undoubtedly necessary and is the kernel in the system. That is, the behavior, experience, requirement as well as the possible reaction of participants are important while applying online learning systems. Consequently, instead of the technology aspect, the paper poses the idea derived from participants and establishes the framework from participants, interactions, methods and activities. The KS concept is introduced to support the interaction among participants in an online learning environment, it is essential to discuss the achievement of KS and interactions. The relationship among knowledge sources and knowledge receivers is shown in Figure 3. It shows that a participant can be a source and a receiver simultaneously. The proposed interactions of G_L, G_I and G_C comply with the concept of the simultaneous roles depending on the activity which is encountered.

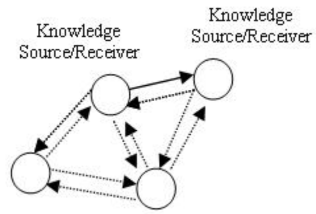

Figure 3. The Knowledge Sharing Concept

There are several relevant activities in the proposed system, and are discussed in terms of KS aspect as follows:

Searching:
For G_L, this is the way to effectively obtain the required content instead of single receiving. The consideration is helpful to achieve the sharing of useful knowledge.

Initiative Raising Issue:
The issue raising process is treated as a knowledge sharing request from others. Specifically, the requests are broadcasted to all participants and thus the knowledge in the domain can be vastly collected. It, therefore, increases the depth and width of the discussion.

Problem Solution:
The conduction of G_I is a kind of knowledge flow to G_L. That is, the clues used to solve the issued problem are streamed from G_I to G_L in KS form.

Painting:
To support the interactive multimedia, this activity is applied to facilitate the sharing process of thought and knowledge in a direct way. Its receiver can be the G_I or other G_L, so that the interaction is unlimited.

Voting:
Since the voters are anonymous, the knowledge can be shared without possible misgivings.

Examination:
The G_I takes the examination when a learning stage is finished. The flow of learning effectiveness of a complete perspective can be received. Although the interaction is passive for G_I, it is a fair way to hold the circumstances of learning effectiveness under the control systemically.

Feedback and Investigation:
Compared to the activity of "Examination", this activity is processed casually. Aside from the event, the KS flow is totally identical to the flow in the activity of "Examination". In Figure 4, the overview depicting the mapping of proposed activities and KS concept is presented.

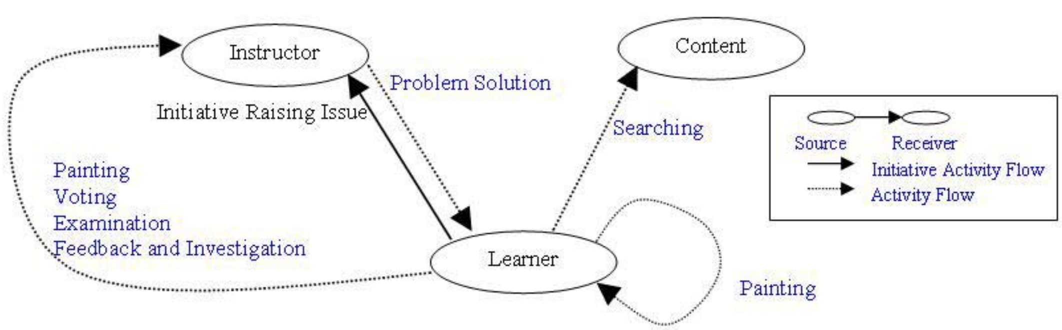

Figure 4. The Mapping of Proposed Activities and KS Concept

CONCLUSION

Due to the increased development of computer and internet technology, online learning is not only viable but also a tendency in educational business. The interaction among participants is surely one of the crucial factors for learning effectiveness. To achieve appropriate interaction among participants, we have built an online learning framework through the use of the knowledge sharing concept, which is a way to organize interaction formally. The major contribution is to evaluate the differences between interaction considerations and knowledge sharing, thus systemically binding these two mechanisms. The proposed methodology transforms the interactions of whole participants into knowledge flows, so that the knowledge sharing concept can be applied easily. The experiment, which has eliminated the possible factors of correctness influence, is involved for evaluation. According to the result, it is concluded that the appropriate interaction among participants is supported using knowledge sharing, and thus the learning effectiveness is enhanced under the design.

Furthermore, some of the interaction flows are not described in this study because the kinds of relationships are complicated and require more affects. For example, neither the interaction between two or more instructors nor the interaction flow from learners to contents is considered. In order to establish a comprehensive infrastructure of interactions, those provisions have to be seamlessly integrated into the proposed system. That is also a crucial issue of online learning and is the direction of our future work.

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THE EFFECT OF COMBINING ANOLOGY-BASED SIMULATION AND LABORATORY ACTIVITIES ON TURKISH ELEMENTARY SCHOOL STUDENTS' UNDERSTANDING OF SIMPLE ELECTRIC CIRCUITS

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ABSTRACT
The purpose of this study was to investigate whether the combination of both analogy-based simulation and laboratory activities as a teaching tool was more effective than utilizing them separately in teaching the concepts of simple electricity. The quasi-experimental design that involved 66 seventh grade students from urban Turkish elementary school was used. The groups were randomly assigned to the control group I in which the real laboratory activities were used, to the control group II in which analogy-based simulation activities were used and to the experimental group in which both analogy-based simulation and laboratory activities were used together. Electricity performance test (EPT) prepared by the researchers was administered to assess the students' understanding of electric circuits before and after the teaching intervention. The results indicated that the combination of both analogy-based simulation and laboratory activities caused statistically greater learning acquisition than the analogy-based simulation and laboratory activities did alone. However, on the contrary to our expectations there was no statistical difference between the control I and control II groups. The results highlighted that environments of laboratory and computers are complementing each other, not to prefer one to another in teaching the concepts of simple electricity.
Keywords: Science and technology education, Concepts of simple electricity, Laboratory environment, Analogy-based simulation environment, Quasi-experimental design.

INTRODUCTION

The physics science topic "electrical circuits" is one of the core elements of the elementary science and technology curriculum in Turkey. Teaching and learning of this topic is based on use of formal representation and hands-on activities fascinating the imagination of young children in elementary schools. However, our experience in teaching of electricity with prospective science teachers have shown that even after a systematic and fairly advanced study of the topic in a college, in which the students become quite efficient in carrying out circuit analysis by using Kirchhoff law, they are still incapable of qualitatively analyzing simple circuit. For example, they do not have sufficient qualitative identification about what the potential difference between two points of resistance and the electric current mean in basic electrical circuit. According to the research containing similar finding afore mentioned, many difficulties and misconceptions in the topic of electric circuit are still found after the study, at all ages and levels (Arons, 1982; Borges & Gilbert, 1999; Cohen, Eylon & Ganiel 1983; Iona, 1979; Fredette & Clement, 1981; Fredette & Lochhead, 1980; Osborne, 1983). Most of the common difficulties are due to an incomplete understanding of the abstract concepts such as electric current and electric potential (Carlton, 1999; Lee & Law, 2001; Liegeois, Chasseigne & Papin, 2003). Electricity even itself is a difficult concept for students to come to terms with. The invisible nature of what is happening makes it an abstract topic (Carlton, 1999). What is required is that the student develops a mental model which can visualize the electrical circuits concepts based on other system which are easily visualized to enhance the learning of these abstract topic. Logically, we learn through either deductive and inductive or analogical reasoning; that is to say, moving from the whole to the part and from the part to the whole or from the part to the part. It can be said that there is no further way to learn. Therefore, visualization by analogy constitutes an important part of the learning process when instructors try help students to understand what is happening inside an electrical circuit and to explain its concepts. Analogy is a powerful cognitive mechanism that is used to learn new abstractions in electrical topics by students (Chiu & Lin, 2002; Genter & Genter, 1983; Gutwill, Frederiksen & Ranney, 1992) and it is often used to in the form of text, pictures, videos and verbal examples in traditional classrooms. But to further enhance students' visual perception of a phenomenon, some of the unobservable relationships that comprise the phenomenon may be depicted via computer simulations (Trey & Khan, 2008). Computer simulations have special value as they offer a high potential for interactive learning in all domains of science education (Trundle & Bell, 2010). A significant amount of previous research has demonstrated the effectiveness of computer simulations in student learning. A good number of these studies have focused on the success of computer simulations in supporting students' understanding, inquiry and reasoning skills (Akpan & Andre, 2000; Chang, Chen & Finkelstein et al., 2005; Geban, Askar & Özkan, 1992; Huppert & Lazarowitz, 2002; Lin & Sung, 2008; Magin & Reizes, 1990; Monaghan & Clement, 1999; Yaman, Nerdel & Bayrhuber, 2008). However, many researchers have indicated that the positive effects of simulations on students' learning performance are not self-evident (de Jong & van Joolingen, 1998). Marshall and Young (2006) have shown that the use of computer simulations is less effective than traditional instruction and hands-on laboratory approaches.

The results of two recent studies by Zacharia (2007), Jaakkola and Nurmi (2008) have indicated that the benefit of using simulation along with hands-on laboratory activities is that it promotes students' understanding of electricity. While one of these studies (Zacharia, 2007) had one control group assigned to the real laboratory environment, the other one (Jaakkola & Nurmi, 2008) had two control groups assigned to the real and virtual laboratory environments. Students in the experimental group of both studies were responsible for completing the assignments using simulation and laboratory works about the electric circuit. With the simulation tool of the study by Jaakkola and Nurmi (2008), elementary school students were able to set up various circuits easily by dragging wires, bulbs and resistors into desired points in the circuits with simple mouse moves; the battery voltage can be changed this way as well. They could also conduct different electric measurements with a multimeter simply by dragging its probes onto the required testing points.

For further analysis, in our work, we investigated whether it would be more beneficial to combine analogy-based simulation and laboratory activities (in experimental group) than to use them separately (in two control groups) in learning simple electricity. For analogy-based simulation activities, the analogy of fluid system by Hewitt (1987) was developed to render interactively in a virtual environment. In this context, the main research questions examined in this study were "Would it be better to combine analogy-based simulation and laboratory activities than to use them separately?" and "How do these three environments affect students' learning electricity?". For this purpose, the following sub-problems were determined:

- Is there a significant difference among the pre-test scores of the students in the experimental group (using analogy-based simulation and laboratory activities together), the control group I (using real laboratory activities) and the control group II (using analogy-based simulation activities)?
- Is there a significant difference between the pre-test and post-test scores of the students in control group I?
- Is there a significant difference between the pre-test and post-test scores of the students in control group II?
- Is there a significant difference between the pre-test and post-test scores of the students in experimental group?
- Is there a significant difference among the post-test scores corrected according to the pre-test scores of the experimental group, control group I and control group II?

METHOD

Sampling and Experimental Design

The participants given in Table 1 were 66 seventh grade students at about 13 years old from an urban Turkish elementary school. The participants in three groups were selected from three public schools. For the quasi-experimental design, these groups were assigned randomly, namely, the control group I (using real laboratory activities), the control group II (using analogy-based simulation activities) and the experimental group (using analogy-based simulation and laboratory activities together). The students had not received any formal education on electricity before the study was carried out.

Table 1. The gender of the students in three groups

Groups	N	P
Experimental group	27	
Male	13	48
Female	14	52
Control group I	21	
Male	12	43
Female	9	57
Control group II	18	
Male	10	55
Female	8	45

N: Number of the students who participated in the study
P: Percentage of students who participated in the study

"Pre-test and Post-test Design with Matched Control Group" which was one of the quasi-experimental designs was used in the study. Of the groups in the study, the experimental group was taught using the combination of analogy-based simulation and laboratory method, the control group I was taught using laboratory method and control group II was taught using analogy-based simulation method (Table 2).

Table 2. Experimental design of study

Groups	Pre Test	Method	Post Test
Experimental group	EPT	Combining analogy-based simulation and laboratory activities	EPT
Control group I	EPT	Laboratory activities	EPT
Control group II	EPT	Analogy-based simulation activities	EPT

EPT: Electric Performance Test

In the study, academic achievement test (EPT) which was prepared by the researchers was implemented to the experimental and control groups as the pre-test. The same test was implemented to the experimental and control groups once more at the end of the study.

Procedure

The implementation of the study lasted for three weeks and 12 periods on the basis of 4 hours per week in 2009-2010 educational year. Before the implementation, the students were given pre-tests. To move to the next stage of study, the results of the pre-tests were evaluated. The pre-test scores indicated the homogeneity within three groups. The students in the control group I, control group II and the experimental group were placed to their learning environments and given information about the course and learning environments. Throughout the course, instructions were given in specially designed worksheets for three learning environment. 24 worksheets were prepared according to of Turkish Science and Technology Curriculum (TSTC) by the researchers. The 13 of the worksheets which were organized according to the learning method of inquiry were including analogy-based activities and 11 of them were including laboratory activities. Therefore, the instructions were made to preserve the same teaching method and the curriculum material. The students in each group worked in a small-group during the course to supply effective learning (Chang & Lederman, 1994; Huber, 2003). In order to measure and compare the effectiveness of the different learning environments, subject knowledge post-test was administered to students a day after the course. Although students worked in a small group during the course, they completed all of the test individually.

Curriculum Materials

The course for the experimental and control groups was carried out depending upon the 7th year Science and Technology teaching program which was developed by Turkish Republic Ministry of National Education. In the program, the learning field is "Physical Phenomena", the name of the unit is "Electricity in Our Life" and the suggested period is 12 hours. The program aims at enabling students by constructing basic circuits by means of battery, bulb, key, ampere meter, voltmeter and connection wires to

- ✓ make the features of four basic concepts of electricity unit which are "Electricity Circuit Intensity (I)", "Potential difference or tension between the points of the battery (V)", "Resistance (R)", "Potential difference or tension between the points of resistance (V)" meaningful at the microscopic and macroscopic level,
- ✓ express these features using numbers and units after measuring,
- ✓ discover the relationship (ohm law) among these qualities,
- ✓ and learn what kind of changes occur when the bulbs (resistance) are connected in series and how these connection types change in our daily life according to the purpose.

This unit includes learning activities which encourage the students to solve a problem in an electricity circuit in accordance with the required conditions besides their making experiments. Moreover, it is aimed at students' acquiring scientific process skills and having certain attitudes and values in addition to their acquiring knowledge about the electricity circuit throughout the unit (MEB, 2005).

Learning Environment

Laboratory Environment for Control Group I: Students assigned to the *Laboratory Environment* tried to learn the basic concepts of circuit and the relationship among them in a traditional classroom with laboratory equipment kits that included real batteries, bulbs, wires, switches, ampere meter and voltmeter (see Figure 1).

Figure 1. Sample of laboratory environment for control group I in a classroom of Turkish elementary school.

Analogy-based simulation Environment for Control Group II: Students assigned to the *Analogy-simulation Environment* tried to learn the basic concepts of circuit and the relationship among them in a computerized classroom with an online electricity analogy-based simulation, the 'Electricity Analogy-based Simulation Tool (EAST)' (see Figure 2 and 3). The activities in EAST were developed by originating the analogy of fluid system of Hewitt (1987) in virtual environment.

Students could manage to accomplish the following processes in a simple electricity circuit which is composed of battery, bulb, connection cable, key, ampere meter and voltmeter while using EAST:

- They can observe the water and electricity circuit respectively turning the valve in the water circuit and the key in the electricity circuit on. They can accelerate and slowdown these circuits using the mouse. They can
- measure the intensity of the electricity circuit. Students try to discover the "electricity circuit intensity" during these quantitative and qualitative observations.
- They can observe the changes in the circuits increasing the number of batteries in the electricity circuit and increasing the power of pump in the water circuit. This observation is to help them to discover the "the potential difference between the edges of the battery" concept.
- They can quantitatively observe the change water causes when the power of the pump in the water circuit changes and the change of brightness of the bulb (resistance) when the number of batteries changes. Thus, students can discover what the intense means by measuring the change in the bulb using voltmeter.
- They try to discover the role and the meaning of "resistance" in an electricity circuit changing the resistance of the bulb in the electricity circuit and the pipe in the water circuit.
- The students that make the basic concepts meaningful construct more complex circuits connecting more bulbs or the battery parallel or in series. They try to discover according to which law these circuits work.

Figure 2. Sample of analogy-based simulation environment for control group II in a computerized classroom of Turkish elementary school.

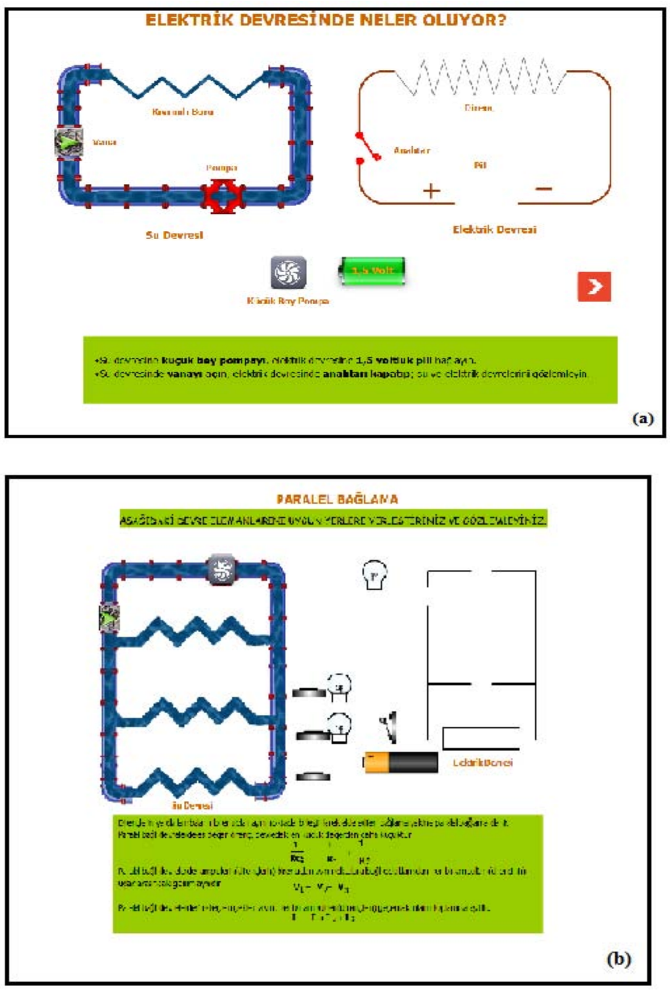

Figure 3. A sample of Electricity Analogy-based Simulation Tool (EAST): The analogy-based simulation for the basic electricity concept in the simple electric circuit (a), in the parallel circuit (b).

Combination Environment for Experimental Group: Students in computerized classroom used both the EAST and laboratory equipment kits to learn the basic concepts of circuit and the relationship among them. Students were first asked to complete the assignment using the analogy-based simulation; and then they were asked to repeat the assignment with the laboratory equipment kits.

Data Collection

Electricity Performance Test (EPT) consisted of 24 multiple choice questions was prepared according to the objectives of Science and Technology Curriculum for the 7th grade students in Turkey by researchers. The test was applied to 225 students in 7th grade to provide the validity and reliability of this test and it was found that the reliability of the EBT based on Cronbach alpha was 0.83. Each correct answer was scored as one point; false or empty answers were scored as zero point; and the total score was calculated and this score was used in evaluation.

Data Analysis

The data were evaluated in SPSS 11.5 package program. It was accepted that there was 0.5 degree of significance. The mean and standard deviation scores, which students got from pre-tests and post-tests in experimental and control groups, were presented descriptively.

One-way ANOVA was used to determine whether there was significant difference among the pre-tests of the groups; and one-factor ANCOVA was used to determine whether there was significant difference among the post-tests of the groups. In order to determine the differentiation way of the post-tests, Bonferroni, one of the multiple comparison test, was used.

T-test (Paired Samples t-test) was used to determine if there was a meaningful difference between the applied method and academic achievements of the groups.

FINDINGS

The Findings Related to the Pre-test Scores of Experimental, Control Group I and Group II Students

The mean and standard deviation values related to the “EPT” pre-test scores of the experimental and control group students were presented in Table 3.

Table 3. The mean and standard deviation values related to the academic pre-test scores of the students in the experimental and control groups.

Group	N	Mean	Std. deviation
Experimental Group	27	6.52	2.17
Control Group I	21	7.24	2.8
Control Group II	18	6.06	2.81

When Table 3 was examined, it could be seen that the students in both experimental and control groups exhibited a homogeneous structure in terms of their pre-test scores.

Table 4. One-way ANOVA (Analysis of Variance) results of the students in the experimental and control groups based on the EPT pre-test scores

The Source of the Variance	Sum of Squares	df	Mean Squares	F	p	.
Between Groups	14.03	2	7.01			
Within Groups	415.49	63	6.59	1.06	.35	.03
Total	429.53	65				

When the Table 4 was examined, it could be seen that there was significant difference ($F_{2,63}=1.06$, $p>.05$, ˜ .) between the “EPT” pre-test scores of the students in experimental and control groups. Based on this, it could be claimed that the pre-test scores of the students in experimental and control groups were equal.

The Findings Related to the Pre-test and Post-test scores of the Control Group I Students

The scores of the t-test which was conducted for the significance between the pre-test and post-test scores of the control group I students who had learned the Primary School 7th grade “Electricity in Our Life” unit through laboratory method were presented in Table 5.

Table 5. The t-test Scores of the Students who were taught through Laboratory Method Based on EPT.

Measurement	N	$\bar{X}$	S	df	t	p	
Pre-test	21	7.24	2.8	20	6.69	.00	.69
Post-test	21	12.95	3.51				

It was found that there had been a significant increase in the academic achievements of the students after having the unit through laboratory method $t(20)=6.69$, $p<.05$, . While the mean of the achievement test scores was 7.24 before the implementation, it increased to 12.95 after having the course through laboratory method. According to this finding, it could be claimed that laboratory method had an important role in increasing the academic achievements of the students.

The Findings Related to the Pre-test and Post-test scores of the Control Group II Students
The scores of the t-test which was conducted for the significance between the pre-test and post-test scores of the control group II students who had learned the Primary School 7th grade "Electricity in Our Life" unit through analogy-based simulation method were presented in Table 6.

Table 6. The t-test Scores of the Students who were taught through Analogy-Based Simulation Method Based on EPT.

Measurement	N	$\bar{X}$	S	df	t	p	
Pre-test	18	6.06	2.81	17	8.97	.00	.82
Post-test	18	11.94	4.91				

It was found that there had been a significant increase in the academic achievements of the students after having the unit through analogy-based simulation method $t(17)=8.97$ $p<.05$, . While the mean of the achievement test scores was 6.06 before the implementation, it increased to 11.94 after having the course through analogy-based simulation method. According to this finding, it could be claimed that analogy-based simulation method had an important role in increasing the academic achievements of the students.

The Findings Related to the Pre-test and Post-test Scores of the Experimental Group Students
The scores of the t-test which was conducted for the significance between the pre-test and post-test scores of the experimental group students who had learned the Primary School 7th grade "Electricity in Our Life" unit through the combination of laboratory method and analogy-based simulation method were presented in Table 7.

Table 7. The t-test Scores of the Students who were taught through the Combination of Laboratory Method and Analogy-Based Simulation Method Based on EPT.

Measurement	N	$\bar{X}$	S	df	t	p	.
Pre-test	27	6.52	2.17	26	20.34	.00	.94
Post-test	27	15.3	2.92				

As shown in Table 7, it was found that there had been a significant increase in the academic achievements of the students after having the unit through the combination of laboratory method and analogy-based simulation method $t(26)=20.34$, $p<.05$, While the mean of the achievement test scores was 6.52 before the implementation, it increased to 15.3 after having the course through the combination of laboratory method and analogy-based simulation method. According to this finding, it could be claimed that the combination of laboratory method and analogy-based simulation method had an important role in increasing the academic achievements of the students.

The Corrected Post-test Scores of the Experimental, Control I and Control II Group Students According to Pre-test Scores Based on EPT
EPT corrected post-test scores of the groups according to the pre-test scores were presented in Table 8. According to this, EPT post-test scores of the experimental group was calculated as 16.22; of the control group I was as 13.90**;** and of control group II was 12.94. Depending on these scores, it could be considered that the control group II had the lowest mean score of the post-tests. However, when the pre-test scores of the groups were controlled, it was observed that there had been some changes in the EPT post-test scores of the control group I and control group II. The corrected EPT post-test mean scores were 16.28 for the experimental group; 13.39 for the control group I; and 13.44 for the control group II.

Table 8. The Descriptive Statistics of the EPT Scores According to Groups

Group	N	Mean	Corrected Mean
Experimental Group	27	15.3	15.38
Control Group I	21	12.95	12.41
Control Group II	18	11.94	12.43

If the groups were ranked from top to down according to their academic achievements according their EPT mean scores, it could be stated that the group with the highest mean score was experimental group and control group I and control group II followed this group respectively. The results of ANCOVA which was conducted to see whether there were a significant difference observed among the corrected EPT mean scores of the groups were presented in Table 9.

Table 9. The ANCOVA Results of the Post-test Scores that were Corrected Based on EPT Pre-test Scores According to the Groups

The Source of the Variance	Sums of Squares	df	Mean Squares	F	p
Pre-test	317.39	1	317.39	35	.00
Groups	139.72	2	69.86	7.7	.00
Error	562.13	62	9.06		
Total	132.88	66			

According to the ANCOVA results, it was found that there was a significant difference $F(2,62)=35$, $p<.05$ among the EPT corrected post-test scores of the groups in which different teaching methods were applied. In other words, the different teaching methods that were applied in groups were related to the post-test scores of the groups.

Table 10. Summary data from post – hoc test of learning environment

Learning environment (I)	Learning environment (J)	Mean Difference (I-J)	Std. Error	Significance	95% Confidence interval for difference	
					Lower Bound	Upper Bound
Control group II	Control group I	.02	.98	1	-2.39	2.44
	Experimental group	-2.94*	.91	.00	-5.2	-.68
Control group I	Control group II	-.26	.98	1	-2.44	2.39
	Experimental group	-2.97*	.88	.00	-5.14	-.8
Experimental group	Control group II	2.94*	.91	.00	.68	5.2
	Control group I	2.97*	.88	.00	.8	5.14

*$p< .05$, *Control Group I- Experimental Group, Control Group II-Experimental Group*

Control Group I : The group in which the experiment method was applied
Control Group II : The group in which the analogy-based simulation method was applied
Experimental Group : The group in which the analogy-based simulation and experiment method was applied

According to the results of Bonferroni test (Table 10) which was conducted among the corrected EPT post-test scores of the groups, significant difference was found between the mean scores of the control group I in which the experiment method was applied and the experimental group in which analogy-based simulation method and laboratory method were applied together; and between the mean scores of control group II in which the analogy-based simulation method was applied and the experimental group in which analogy-based simulation method and laboratory method were applied together. This difference was in favor of the experimental group. No significant difference was found between the EPT post-test mean scores of the control group II in which the analogy-based simulation was applied and control group I in which the experiment method was applied. It could be stated that the combination of the analogy-based simulation and laboratory methods was more effective than the other methods.

CONCLUSION AND DISCUSSION

The purpose of this study was to test whether the combination method composed of analogy-based simulation and laboratory method was more effective than using these methods separately while teaching the basic concepts of electricity circuits or not. The results indicated important developments after evaluating pre-tests and post-test in all three learning environments. It was observed that the students who were taught in combined learning environment were more successful when the post-test scores for the three learning environments were compared. In order to carry out the study, 13 analogy-based simulations and 11 experiments which were appropriate to the electricity circuit topics in Turkish Science and Technology course program were designed and developed. There was no significant difference between the pre-test scores of the experimental and control groups in which the topics were told using different teaching materials. When the post-test mean scores in the combined learning environment were compared with the ones in laboratory and analogy-based simulation environments, it was found to be significantly higher. This finding is parallel with many studies (Jaakkola & Nurmi, 2008; Ronen & Eliahu, 2000; Zacharia, 2007) in literature. Jaakkola and Nurmi found that the combined simulation and laboratory activities were more effective in understanding the electricity circuits and increasing the success than when the simulation and laboratory activities were used separately; besides, they could not found statistically significant difference between the simulation and laboratory groups. This study we completed was started inspiring from Jaakkola and Nurmi's study and it was hypothesized that simulation group would be more successful than the laboratory group as the simulation tool was developed one step more with the analogy support. However, the results were not as we expected. To the contrary to our expectations, there was no statistically significant difference between the scores of the students who were taught in analogy-based simulation and laboratory environments. Although this finding was not in accordance with the results of the study carried out by Finkelstein et al., (2005), the results of some studies (Jaakkola & Nurmi, 2008; Ronen & Eliahu, 2000; Zacharia, 2007) indicated that computer and laboratory environments complemented with each other and either of them could not be preferred to the other in teaching electricity topics.

An individual has three types of learning: the first one is *induction* which is defined as the learning from part to whole. The second one is *deduction* which is defined as the learning from whole to part. The third one is analogy which is defined as the learning from part to part. The role of analogy and simulations supported with the analogy in making the microscopic phenomena related to the electricity concrete and providing conceptual development is quite important (Heywood, 2002). However, although analogy-based simulations provide with the students clear and informative learning environment, it is also important for students to have real experiences with electricity related laboratory materials in laboratories. Many studies have indicated that the activities carried out in real laboratory environments are effective in increasing students' conceptual developments and correcting their current misconceptions besides developing students' skills and attitudes (Glasson, 1989; Hofstein & Lunetta, 1982).

As a result, the findings of this study expressed that the teaching in which the analogy-based simulations were used with laboratory activities together provided with the students in better understanding the electricity topics (Jaakkola & Nurmi, 2008; Ronen & Eliahu, 2000; Zacharia, 2007). In addition to this, it was also observed during the teaching implementations that the students using analogy-based simulations were more motivated for the course, their attention was not distracted and even the student with low level of success were quite eager to participate into the course. When the fact how the motivation is important is taken into account, which one is more effective in increasing students' motivation – the simulation method or the laboratory method – should be suggested as for the further research.

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THE EFFECTIVENESS OF COOPERATIVE LEARNING ON THE READING COMPREHENSION SKILLS IN TURKISH AS A FOREIGN LANGUAGE

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ABSTRACT
Cooperative learning is a process through which students with various abilities, gender, nationalities and different level of social skills carry out their learning process by working in small groups and helping each other. Cooperative learning is a pedagogical use of small groups which enable students to maximize both their own and others' learning.

This study was carried out in order to identify the efficiency and the effects of cooperative learning techniques on the reading skills of the students who learn Turkish as a second language. A total of 40 students (20 subjects in experimental group, 20 subjects in control group), who learn Turkish as a second language at Istanbul University Language Center, participated in this study which was done in accordance with the 'pre-test post-test control group' model as one of the experimental research designs. In the experimental group, cooperative learning techniques were used for reading comprehension activities, while traditional teaching model was followed in the control group. The data were gathered through the 'Reading Comprehension Skills Achievement Test' developed by the researchers, and a number of suggestions were made to develop reading skills in teaching Turkish as a foreign language.
Keywords: cooperative learning, reading comprehension skills, teaching Turkish as a foreign language.

1. INTRODUCTION

Thanks to communication and information technologies, the disappearance of the borders with the spread of globalization, and the world's getting smaller make it necessary to learn a foreign language. In accordance with these advancements, the interest in Turkish language also increases.

Upon a boom in the interest in Turkish language, those working in the field mostly focus on how to teach Turkish more effectively or how students can learn this language on their own. In other words, the innovations in the field of education have started to be applied in teaching Turkish as a second language.

As it has already been known, teaching a language is a multidimensional task which requires different techniques and methods compared with teaching other subjects. In order to study a language either as a first or second language, one makes an effort to develop and integrate four basic skills which are listening, speaking, reading and writing. However, it is difficult to improve all these skills all at once in terms of teaching a foreign language since proficiency in learning a foreign language differs from an individual to another, whereas a native language can be learnt by all the members of a society to some extent. Therefore, it is necessary to make use of various methods and techniques which will minimize the differences within a classroom and help learners to participate in lessons equally. Cooperative learning which is the focus of this study is one of these methods which help learners to participate in lessons equally and effectively.

1.1. Cooperative Learning

As a learner-centered method, cooperative learning is a teaching method by which learners study by helping one another in small groups in their learning process in order to achieve a common objective (Açıkgöz, 2003). Cooperative learning as a concept consists of several instructional methods in which learners study a language in small groups of 4-6, and group performance is rewarded in several different ways (Slavin, 1988).

Cooperative learning is an in-class learning approach which is used to help learners develop a positive image both for themselves and their peers, and to improve problem solving and critical thinking skills in order to encourage learners in terms of social skills based on cooperation (Gömleksiz, 1993). Cooperative learning is a learning method in which learners help each other in terms of their learning process by making up small homogenous groups to achieve a common goal; and in which group performance is rewarded in several different ways.

There are differences between learners' studying in groups and cooperative learning method. In group-work, learners can sit around a table while studying, but they cannot communicate with each other independently while studying together. Therefore, small study groups cannot affect each other positively. That's why, their communication can be considered to be individual learning. Then, in cooperative learning, learners' efforts are rewarded as a group. To illustrate, if learner groups are to do an assignment, if only one student does that whole task, and studies without the help of the others, this cannot be considered as a group work based on cooperative learning method. In cooperative learning groups, sense of responsibility means that group members should know that materials prepared by all group members are for the sake of the success of the group. The learners in these groups do not need to learn how to cooperate since teachers manages the organization and the structure of the groups (Johnson and Johnson, 2002).

In order for a group work to be a cooperative one, learners should be aware of the fact that they need to study so as to maximize the learning of both their own and their friends. In these groups, learners make an effort to maximize their own and other group members' learning since the performance of cooperative learning groups is possible only when each individual struggles for the benefit of all group members.

For a group work to be considered a cooperative learning process, following components and conditions should be taken into consideration:

1. Group reward: In order for members of a group to succeed, it is necessary for the group itself to become successful.
2. Positive interdependence: It creates a situation in which individuals make a common effort for the reward and their common goal which can in fact be possible via positive dependence, positive product dependence, and positive process dependence.
3. Individual accountability: It means that group success depends on the learning of each and every individual. Every learner has the responsibility to learn the subject and do whatever must be done.
4. Face-to-face promotive interaction: It means that group members motivate one another.
5. Social skills: It is about teaching learners how to build relations among individuals and encouraging them to use this.
6. Group processing: It is about identifying which behavior of the members benefit to the success of the group, and also which behaviors should continue and which ones should be modified.
7. The opportunity for equal success: It is about benefitting to the success of the group by developing their own behaviors and this can be achieved through a specific grading method (Açıkgöz, 1992).

In cooperative learning method, the realization of individual objectives is dependent on the overall success of the group. Therefore, the ones who want to be successful are forced to help other group members. Wilkinson (1994) states that cooperative learning enables fast learners to help respectively slow learners in terms of improving their skills. In other words, every learner struggles to develop both themselves and other group members because they are aware of the fact that the success of the group depends on the performance of each individual.

According to cooperative learning, group is a whole entity and all the members are responsible for the success or the failure of the group. As Senemoğlu (1998) quotes from Webb, Deering, and Melath, a group goal encourages learners to make an explanation in order to help their learning; to teach them learning strategies; and to communicate actively based on a theme, whereas it motivates low-level learners to ask for help. In cooperative learning groups, even though the success of the group is the focus, it should be noted that it is also based on individual performance of the learners.

1.2. Cooperative Learning Techniques

Within the framework of its basic principles, several cooperative learning techniques have been developed. Of all these, the most widely exploited techniques are presented below (Açıkgöz, 2007):

1. Learning Together
2. Academic Conflicts
3. Learners Teams
   a. Learners Teams- Achievement Divisions
   b. Team-Game-Tournament

c. Team Pair Solo
d. Cooperative Reading and Writing
4. Group Research
5. Co-op
6. Jigsaw I
7. Discovery
8. Jigsaw II
9. Ask Together - Learn Together

The learning techniques to be used in classroom environment need to be chosen considering lesson objectives, subject, learners' achievement levels, their skills and available amenities. If teachers and learners are not experienced in using cooperative learning techniques, they had better choose more well-structured techniques (Slavin, 1980; Yıldız, 1999).

In this study, of all those cooperative learning techniques, "Ask Together - Learn Together" is used because this technique consists of instructional tasks which help the development and evaluation of comprehension skills.

1.2.1. Technique of Ask Together - Learn Together
This technique has been developed by Açıkgöz (1990). According to Açıkgöz (1992), it is based on the principle of sheer cooperation among learners and it does not give the opportunity to do nothing. This technique gives utmost importance to positive interdependence within group, individual accountability, group processing, reward, and face-to-face promotive interaction.

In Ask Together - Learn Together Technique, the following materials could be exploited:

Reading Texts: Some excerpts or sections taken from books, stories or notes prepared by the teacher can be used as reading materials.
Question-Response Cards: These are the cards on which the questions and responses of the group and individuals might be written and its size might vary depending on the activity.
Theme Sheets: This is a paper on which important points to be considered during reading are listed.
Group Presentation Evaluation Forms: It is developed by the teacher to evaluate group presentations in terms of content and organization.
Examination: It consists of multiple choice or short-response questions which are about the subject. It must not exceed 10-15 minutes.

The following are the suggested steps to be followed while carried out the Technique of Ask Together - Learn Together:

1. Organizing groups: Groups ideally should consist of 3-4 learners. It is important to organize groups heterogeneously based on their skills, level of achievement, gender, and their socio-economic status. Finding a name for each group has a positive effect on motivating learners and attracting their attention into the lesson.
2. Reading: Each learner reads the related text or section individually and silently. The teacher might inform the learners about the important points to be considered during reading or the themes.
3. Preparation of Learner Questions: It is the step at which learners are expected to prepare questions about the reading or the themes. They write the questions on a card. The teacher grades each questions based on their level and accuracy, which is necessary to monitor the performance of each learner.
4. Preparation of Group Questions: Having prepared individual questions, members come together to prepare the group question. Learners are expected to explain the positive and negative aspects of each question to one another rather than tagging them as bad or good. In order to make sure learners' participation, learners are given roles in turns such as recorder, postman, reporter, debate leader, and invigilators or monitors.
5. Sending Group Questions: The question prepared by the group is written on a card and sent to another group chosen randomly by a student with the role of a postman.
6. Responding to Group Questions: This is another step requiring the cooperation of group members. The fact that each group has only one question card is necessary due to positive interdependence.
7. Presenting Responses to the Class: By means of spokespeople that they have chosen, the groups present their response to the question they have to the whole class. In order to guarantee the learning of everyone in the group, the spokespeople can also be chosen by the teacher rather than the group members.
8. Evaluating Group Presentations: The performance of the spokesperson is evaluated by the teacher or other students. The teacher might give a form for this; and after the evaluation process, a point is given to the spokesperson and the group.

9. Whole-class *Discussion*: After the groups have completed their presentation, the teacher can start a discussion by summarizing the subject. During this discussion, it is aimed to clarify the points that could not be focused on and not understood completely.

10. Testing: After the session is completed, all students take an exam individually. The points gathered from the exam and their presentations are summed up and a group point is measured. By comparing group points to previously defined criteria and a scale, groups are given rewards which are also decided in advance such as “very good”, ”good”, ”not bad”.

2. METHOD

2.1. Design of the Study

In the present study, experimental research model consisting of pre-test, post-test with a control group was applied. Experimental group was taught through Ask Together - Learn Together, whereas control group was taught through traditional teaching methods which involve lecturing and question-response.

The experimental research model is shown on Table-1:

Table 1: Experimental Research Model

<table>
<tr><td>Groups</td><td>Pre-test</td><td>Experiments</td><td>Post-test</td></tr>
<tr><td>Experimental Group</td><td rowspan="2">Reading Comprehension Achievement Test</td><td>Cooperative Learning</td><td rowspan="2">Reading Comprehension Achievement Test</td></tr>
<tr><td>Control Group</td><td>Traditional Teaching</td></tr>
</table>

2.2. Participants

The study was carried out at Istanbul University Language Center and subjects were chosen from the learners who study Turkish as a foreign language in Turkey. For this study, a total of 40 students who learn Turkish at B1 level according to Common European Framework, and 20 of the subjects were in experimental group, while 20 students were in the control group.

2.3. Data Collection Instruments and Analysis of the Results

The data of the study were gathered through “Reading Comprehension Achievement Test” which had been developed by the researchers. Firstly, during an 8-week period until the experimental tasks were finished the objectives and skills which had been aimed to be taught were identified and a comprehension test was developed in order to test the level of achievement. The KR coefficient of the test was calculated as .7984. In this test composed of 24 multiple choice questions, there are 6 texts 2 of which are informative; and there are also 3 stories and a poem among these texts.

The data of the study were analyzed through software package SPSS 11.00 (Statistical Package for the Social Sciences). In order to understand the efficiency of cooperative learning method, pre- and post-test results were compared and t-test scores were analyzed to see whether the differences were significant or not.

3. Findings and Discussion

In order to analyze the effects of cooperative learning method and traditional teaching methods on reading comprehension skills and achievements of the students learning Turkish as a foreign language, first Reading Comprehension Achievement Test were carried out both in experimental and control groups and then the differences were compared.

Tablo 2: A Comparison of Reading Comprehension Achievement Pre-test Scores of Experimental and Control Groups

<table>
<tr><td>Group</td><td>N</td><td>$\bar{x}$</td><td>Ss</td><td>Sd</td><td>t</td><td>P</td></tr>
<tr><td>Experiment</td><td>20</td><td>14,15</td><td>4,46</td><td rowspan="2">34</td><td rowspan="2">0.59</td><td rowspan="2">0.55</td></tr>
<tr><td>Control</td><td>20</td><td>13,97</td><td>4,44</td></tr>
</table>

p>.05 (insignificant)

When the mean scores of experimental and control groups (the mean score for the experimental group is 14.15; the mean score for the control group is 13.97), are compared, it can be seen that these scores are very close to each other, and the facts that there is no significant difference between the mean scores of these groups shows that groups were at a similar level of achievement at the beginning.

In order to analyze the effects of cooperative learning method on reading comprehension skills and achievements of the students learning Turkish as a foreign language, according to the Reading Comprehension Achievement Post-Test results of cooperative learning and traditional teaching method groups, their means scores, standard deviation scores were calculated and t-test was conducted.

Tablo 3: A Comparison of Reading Comprehension Achievement Post-test Scores of Experimental and Control Groups

Group	N	$\bar{x}$	Ss	Sd	t	p
Experiment	20	20,46	4,28	34	2.41	0.02
Control	20	15,27	3,88			

p>.05 (insignificant)

Table 3 shows the difference between reading comprehension achievement post-test scores of experimental and control groups. The mean score of the experimental group is 20, 46, whereas the mean score of the control group is higher than 15, 27. As a results of the statistical 2-tailed t-test results, p value is lower than .05 and the t score is 2, 41. The results show that there is a significant difference between the mean scores of the experimental and control groups and it was observed that cooperative learning method applied in experimental group has a higher effect on reading comprehension skills when compared with the effects of traditional teaching methods.

Tablo 4: A Comparison of Pre and Post-test results of Reading Comprehension Achievement Test Scores of Cooperative Learning Group

Experiment Group	N	$\bar{x}$	Ss	Sd	t	p
Pre-test	20	14,15	4,46	18	4.42	0.01
Post-test	20	20,46	3,28			

p>.05 (insignificant)

Table 4 shows that the mean scores of post-test results (20, 46) of cooperative learning group is higher than their pre-test scores (14, 15). In order to analyze the significance of the difference statistically, t-test was carried out and it shows that there is a significant difference between the mean scores of pre-test results of the cooperative learning group when it is compared with their reading comprehension achievement post-test scores. (sd=18, t-test=4,42, p<.05).

Tablo 5: A Comparison of Pre and Post-test Results of Reading Comprehension Achievement Test Scores of Traditional Teaching Group

Control Group	N	$\bar{x}$	Ss	Sd	t	p
Pre-test	20	13,97	4,44	17	1.18	0.16
Post-test	20	15,27	3,88			

Table 5 shows that the mean scores of post-test results (15, 27) of traditional teaching group is higher than their pre-test scores (13, 97). In order to analyze the significance of the difference statistically, t-test was carried out and it shows that there is no significant difference.

6. CONCLUSION AND DISCUSSION

Considering the results of the present study, it is obvious that cooperative learning is more effective in improving reading comprehension skills of learners who study Turkish as a foreign language when compared with traditional teaching methods. This finding of the present study support the findings of various other studies carried out through reading comprehension and cooperative learning both nationally and internationally (Adams, 1995; Ghaith, 2003; Güngör and Açıkgöz, 2005; Stevens, 2003). Moreover, the students expressed that they had fun during experimental studies; they did not get bored since they were active during almost the whole lesson, and finally they got to know their classmates more thanks to these activities.

Since reading is a multidimensional process covering various aspects such as communication, perception and cognitive, affective and kinesthetic process (Sever, 1995), carrying out reading comprehension activities through cooperative learning strategies has helped the process to be experienced more actively.

As a consequence, following suggestions can be made:

1. In this study, as one of the cooperative learning techniques, Ask Together - Learn Together technique was used. In parallel to lesson objectives, further research could be done to analyze the effect of other cooperative learning techniques on teaching Turkish as a foreign language.

2. Cooperative learning techniques could be benefited not only in terms of reading comprehension skills but also in respect to developing other language skills such as grammar, writing, and speaking.

3. Since studies covering a short period of time is restrictive and misleading, further studies covering a longer period of time could be carried out in respect to the effectiveness of cooperative learning model.

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THE FACTORS THAT MOTIVATE AND HINDER THE STUDENTS WITH HEARING IMPAIRMENT TO USE MOBILE TECHNOLOGY*

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ABSTRACT
This research which aims to find out the factors that motivate students with hearing impairment to use PDA (Personal Digital Assistant), a product of mobile technology, in instructional activities, interactions with their peers and instructors, and in their daily lives, and the factors that hinder these individuals from using PDA was designed as an action research. The research was conducted with 12 students with hearing impairment taking "BIL151Fundamentals of Information Technology-I" course in School for the Handicapped, Department of Applied Fine Arts at Anadolu University. The participants used the HP IPAO hw6915 modeled PDAs for education and social interaction purposes in the activities carried out in the scope of the research for 16 weeks. For data collection, reflections gathered with questionnaire and critic event method were employed. The quantitative data were analyzed with descriptive statistics while the qualitative data obtained from one sample t-test were analyzed with content analysis done in an inductive approach. The research was supported by TUBITAK, The Scientific and Technological Research Council of Turkey (Project Number: 107K022). This article presents the findings of the project that show the situations that motivate and hinder students with hearing impairment to use PDA.
Keywords: Mobile technologies, students with hearing impairment, motivators, barriers

INTRODUCTION
Children with prenatal or pre-language hearing loss face great difficulties in acquiring the speaking dimension of their mother tongue. The problems in their hearing and the differences in their speech cause the children with hearing impairment not to understand talks thoroughly, reduce intelligibility of their speech, or make them totally unintelligible (Brannon, 1986; Northern and Downs 199; Osberger and Macgarr, 1982; Tüfekçioğlu, 1989).

The inadequacy of the speech intelligibility in children with hearing impairment may make their communication through speech harder, and it may even cause them not to communicate at all (Kretschmer and Kretschmer, 1978; Sanders, 1971). These communication breaks of the child with hearing impairment may result in facing problems in social and emotional problems as well as problems in their future lives, education, and work (Sanders, 1971; Tüfekçioğlu, 1992).

Besides face to face communication we experience through talking in our daily lives, we can feel the need to reach previous or distance information, and communicate with the people far away from us. We can use tools such as telephone, fax and e-mail to meet our distance communication need. The widespread use of cell phones and their texting facility began to be an alternative way of communication for individuals with hearing impairment. However, the importance of reading and writing, another dimension of oral communication is undeniable for the individuals with hearing impairment to use distance communication tools. In this sense, mobile technology environments that offer opportunities of teaching and learning free from time and place serve as a very effective option for the education of children with hearing impairment.

However, concerning the effective use of above mentioned distant communication tools, the importance of reading and writing, which are the other dimensions of oral communication, is undeniable for the individuals with hearing impairment. As a result of the civilization of the humankind, the written discourse becomes more popular means of communication. Today, the increase in the publication of books, journals/magazines and similar written media as well as wide spread use of Internet ease the availability of information which in turn contribute to the rapid development of the civilizations. By means of written media and computer environments, the written discourse not only provide communication but also ease to access the information and convey this information to our next generations. Beyond all question, students with hearing impairment continuously need some innovative approaches and methods which might have an effect on their cognitive and socio-emotional

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developments as well as their academic achievements. In this respect, the mobile technologies, which provide learning and teaching opportunities without any time and place limitations, come to scene as a significant educational tool/option in the education of the students with hearing impairment.

The rapid developments in the information and communication technologies accompanied various vital opportunities for the constituents the information society. Considering the daily life dynamics of the modern societies, it can be claimed that accessing to the sources of information without any time and place limitations and communicating with others become an essential need of individuals. The common ground of such a consideration, which was handled within the technological frame of accessing information and establishing communication, is the Internet technologies. The Internet provides very fruitful opportunities for learners and teachers in the information societies where the concepts such as lifelong learning and time and place independent learning are on the rise.

The mobile technology concept is generally used to refer to mobile information-communication tools and standards such as cell phones and PDAs (Personal Digital Assistant) (Çuhadar and Odabaşı, 2004). Since the mobile devices are portable, ubiquitous and easily accessible, many people use them for different purposes, especially for enhancing the learning with mobile devices (Özdamar Keskin and Metcalf, 2011). The small size properties of the mobile technologies enable the individuals to carry those tools while they are maintaining their daily life activities. Similarly, a new concept called "m-learning", namely, mobile e-learning appeared in literature with instructional use of these tools which are easy to carry in daily life activities, and suitable for wireless communication. There are various definitions of the m-learning in the literature. For instance, while Quinn (2000) defined it as an e-learning activity that can be facilitated through portable computers, Fagerberg, Rekkaedal and Russell (2002) defined it as the use of mobile technologies in the world of education. Similarly, Georgiev, Georgieva and Smrikarov (2004) defined m-learning as the new form of existing e-learning and distant learning applications. The common point of these definitions is originated from the fact that the content of learning is transmitted to the learners through wireless networks by means of mobile instruments (Al-fahad, 2009; Odabaşı et.al. 2009).

Learners can interact with their peers either on the course related or on extracurricular subjects without any time and place limitations in student center m-learning applications where PDAs are used. One of the important contributions of PDAs, which are used for the purpose of education, is that, they could prolong the teacher-student or student-student discussions that occur during the class hours to the post lesson sessions through using various Internet tools such as blogs, discussion forums or chat rooms. The PDAs could be used at any time by the teachers for feedback purposes, since they provide communication without any time and place limitations and include various communication means such as e-mail, voice call, and SMS (short message), etc. Similarly, PDAs also enable students to ask questions to their teachers or friends and get answers to their questions whenever and wherever they want.

Furthermore, since PDAs have Internet access in and out off the school contexts, they could also enable the use of Web-based applications in the courses. The interactive Web pages, which are also called blogs, can be used to provide social interaction among the students and to provide learners a richer interaction environment with other stakeholders. Recent educational studies and theories that focus on blogs highlight the importance of social interaction in the field of teaching and learning (Ferdig and Trammell, 2004).

Although PDAs are assumed as tools that can fill an important gap in education and social interaction areas of both hearing and hearing impaired students, this function of technology can only be fulfilled when individuals with hearing impairment accept and use mobile technologies. It is supposed that recognition of the possible factors that can motivate or hinder individuals with hearing impairment to use mobile technologies for instructional and social interaction purposes, or organizing the learning environments so as to solve the possible problems, might lead acceptance of the technology and motivation for their use by the hearing impaired individuals.

PURPOSE OF THE STUDY

The purpose of the present study is to define the possible factors that can motivate or hinder individuals with hearing impairment to use mobile technologies for instructional and social interaction purposes. The present study employed PDAs as the mobile technology. It is hoped that the findings of the present study might contribute to the further studies in the field and guide the researchers who might design mobile technology based learning environments for the individuals with hearing impairment. Along with this purpose, the present study posed following research questions;

1. What are the motivational factors that might lead to use mobile technologies by the hearing impairment students in their instructional activities, interactions with their peers and instructors, and in their daily lives?
2. What are the hindering factors that might prevent the use of mobile technologies by the hearing impairment students in their instructional activities, interactions with their peers and instructors, and in their daily lives?

LIMITATIONS OF THE STUDY

- In terms of the content, the present study is limited to the course materials and face to face and online activities that were structured along with these course materials throughout 16 weeks.
- In terms of the mobile technology, the present study is limited to the hardware and software characteristics of a PDA which is commercially known as HP iPAQ hw6915.
- In terms of the online activities that were offered to the students, the present study is limited to a blog environment which was supported by WordPress software.

METHODOLOGY

Research Design

The study was designed as an action research which is one of the qualitative research methods. Action research is a pre-planned and well-organized research process, which intends to improve or understand the current actions or teaching procedures that exist in real classroom environment and inform other parties about the current phenomenon (Johnson, 2002). The nature of such kind of research designs necessitates figuring out a problem that exist during the practice process and providing solution to that problem through gathering and analyzing the data systematically (Yıldırım and Şimşek, 2005).

Participants

The students with hearing impairment at tertiary level form the scope of the study. Criterion sampling technique, which is one of the purposeful sampling methods, is used when determining the participants of the present study. The purposeful sampling enables researchers to scrutinize the cases which were supposed to have wealthy information. In this respect, in most of the cases, purposeful sampling techniques are functional to figure out and explicate the events and phenomenon in detail. The criterion sampling, on the other hand, is the way of examining the cases which meet a series of predetermined criteria (Patton, 2002). The criterion used in determining the participants was choosing the students with hearing impairment at tertiary level who hold preliminary information and skills for computer use. Thus, the participants of the study were 12 students with hearing impairment taking "BIL151 Fundamentals of Information Technology-I" course in the Research Institute for the Handicapped Students at the Department of Applied Fine Arts at Anadolu University. The students' participation to the study was on volunteer basis. Additionally, all of the participants signed a written confirmation (consent form) about their volunteer participation to the project prior to the beginning of the research.

Data Collection Instruments

The action research process requires collecting research data systematically in order to identify and solve potential problems that might occur in the teaching environments. It is expected that the collected data should describe the setting (context) sufficiently and in detail. Thus, the data of the study was collected through a questionnaire (survey) and reflections which were performed as critical event analysis technique. The data gathering instruments of the study were explained in detail in the following sections of the paper.

PDA Use Questionnaire

The "PDA Use Questionnaire" is developed and used in the present study in order to identify the possible factors that can motivate or hinder participants to use PDAs. Basically, the questionnaire consists of two separate sections. The questions in the first section inquire the demographic information about the participants, whereas, the second section includes items related to the possible factors that can motivate or hinder participants' use of PDAs for their instructional and social interaction purposes. The second section of the questionnaire includes total 48 items and participants responded each of the items through selecting one of the stated options which are "agree", "neutral" and "disagree".

Regarding the fact that different PDAs have different hardware and software features, 37 of the items in the second section were formed on the basis of the technical features of HP IPAQ 6915 which was the model of PDA used by the participants throughout the research process. Thus, participants stated their opinions through selecting one of the options ranged from “agree”, “neutral” to “disagree” in order to identify the factors that can motivate or hinder participants’ use of PDAs for their instructional purposes.

The (Practice of) Critical Event Approach

In the last week of the study, participants were asked to write reflection reports and describe the favorable and unfavorable moments that they have experienced while they work with PDAs. The questions were delivered to the participants as two separate forms where they could write their opinions. At the beginning of the practice (study), each of the participants was delivered the first form in which they were asked to write their opinions related to their favorable moments while using the PDAs. The participants were given a plenty of time to write their opinions on the forms. During this process, when the participants gave their forms to the instructor, he examined the forms and guided the participants to write their feelings in detail. However, the instructor paid attention while guiding them so as to not have any effect on the opinions of the participants. Subsequent to students’ returning the first forms, they were given the second form in which they were asked to write their opinions related to their unfavorable moments while using the PDAs, and the similar procedures were followed in this phase as well.

The Data Analysis

The descriptive statistical analysis methods were used in the analysis of the quantitative data that obtained by means of questionnaire and percentages, frequencies, means and standard deviation values were identified. Since every parametric tests require the normal distribution of the data (Pallant, 2001), prior to making any parametric test, all of the data were examined by using SPSS 15.0 software regarding the normality of the distribution of the data, thus, Q-Q, P-P diagrams and histograms were analyzed, skewness and kurtosis values were examined, and Shapiro-Wilk and Kolmogorov-Smirnov (k-s) tests were used in this process. Additionally, one sample t-test was used in order to examine the difference between the mean score that obtained from qestionnaire and the hypothetical mean score.

The expert opinion was also taken in order to establish the reliability of the quantitative data that obtained by means of questionnaires. In terms of the reliability issues, Cronbach alpha internal consistency coefficient was used and 0.70 internal consistency coefficient value was regarded as the baseline (Huck, 2000; Pallant, 2001). As the result of the reliability estimations, the reliability of the first section was calculated as (cronbach alpha) α= .86, whereas, it was calculated as α= .84 or the second section of the questionnaire.

Inductive content analysis was performed with the qualitative data, which obtained by means of the written responses of the participants on the first form that inquires their opinions related to their favorable feelings while using the PDA, and on the second form that inquires their opinions related to their unfavorable feelings while using the PDA. The main aim of the content analysis is to figure out the findings of the study out of the frequent, dominant and/or meaningful themes that emerged from the raw data (Thomas, 2003). Inductive content analysis requires in-depth analysis of the data, which helps to figure out the themes and dimensions that were not predicted beforehand (Patton, 2002; Strauss and Corbin, 1990).

The reliability and validity calculations of the obtained themes were performed by the field experts and the reliability of the data that obtained by critical event analysis of the first form was computed as .94, whereas, it was computed as .95 for the data that obtained from the themes in the second form. In order to establish the trustworthiness, transferability, credibility and confirmability (Guba, 1981: cited in Shenton, 2004) of the qualitative data, following actions were performed; selecting purposeful sampling, recording and reporting every details througout the research process, objectivity in the identification and interpretation of the data, colecting suficient data, using real data sources, prolonged interaction, perspective based data colection, data triangulation, getting expert opinion and descriptive narration.

FINDINGS

The findings related to motivating and hindering factors that affect the use of PDAs by hearing impaired individuals were presented in the following section along with the research questions. The findings of the quantitative data, which were obtained by means of participants’ responses to 48 items in the first part of the questionnaire, concerning the opinions of the participants related to the motivating and hindering factors that affect the use of PDAs by hearing impaired individuals, can be summarized as follows;

As the first step, the participants’ total scores that they have attained from the first part of the “The Use of PDA questionnaire” were computed. In order to test whether the data match the requirement of normal distribution, which is the prerequisite of the parametric tests (Pallant, 2001), the total scores of the participants were examined by means of Shapiro-Wilk and Kolmogorov-Smirnov (k-s) tests through using SPSS 15.0 software.

The test statistics for K-S test was computed as D=.129, and in the .05 significance level, the findings were regarded as significant p>0.05. The Shapiro-Wilks statistics of the data was computed as W=.94 and in the .05 significance level, the findings were regarded as significant p>0.05. Additionally, the Q-Q and P-P diagrams were examined. It was observed that the computed skewness value of the distribution (.021) and kurtosis value (-1, 20) were within the normal distribution criteria. Thus, the distribution of the data was regarded as normal distribution.

The mean score of the first part of the "Use of PDA" questionnaire was computed as 118,25. There are 48 items in this part of the questionnaire. Thus, the minimum mean score that can be obtained from the questionnaire is 48 whereas the maximum score is 144. The hypothetical mean score that can be obtained from the questionnaire is 96. According to the results of one-sample t-test, which was performed to examine the difference between the mean score and hypothetical mean score, the mean score of the items in the questionnaire was found statistically significant at .05 significance level (t=5.66; p<.05), thus, having higher mean score (118, 25) than the hypothetical mean score (96), revealed that the motivation levels of the participants in using PDAs in their instructional activities is also high. When the mean scores of each participant were examined further, it was found that none of the participants get lower mean score than the hypothetical mean score. Thus, it can be claimed that all of the participants have higher motivation in using PDAs in their instructional activities.

The mean scores and standard deviations of each item in the questionnaire were illustrated in Table 1 in descending order.

Table 1: The Motivating factors in the use of PDAs in instructional activities of participants

No	Aspects	Item	N	Mean	SD
24	1	I was able to follow the course even when I could not attend the course	12	2,92	0,29
25	1	I was able to access to the information that I sought whenever and where ever I want.	12	2,92	0,29
27	1	I have learned the issues that I do not know from my friends	12	2,92	0,29
35	1	I got information from my friends about the issues that I have missed	12	2,92	0,29
9	3	I was able to get in touch with my friends through SMS	12	2,83	0,58
17	3	I was able to get immediate responses to my messages	12	2,83	0,58
20	3	My friends able to provide me immediate help to solve my problems related to the course subjects.	12	2,83	0,39
43	3	I was able to ask questions and get answers from my friends whenever I want.	12	2,83	0,39
46	1	I was always able to carry my course materials (Word document, power point presentations, etc) with me.	12	2,83	0,58
2	3	The discussions helped me to learn better	12	2,75	0,45
11	3	I was able to express my opinions better when I wrote them in the discussions	12	2,75	0,45
13	1	The information that was provided through PDAs reinforced what I have learned during the course	12	2,75	0,45
28	4	The instructor encouraged me to use PDAs in the course.	12	2,75	0,45
33	4	The instructor helped me immediately to solve my course related problems.	12	2,75	0,45
41	3	I was able to express myself better in the written discourse (SMS, Blog, e-mail) than that of classroom discussions.	12	2,75	0,62
3	2	The use of PDAs enhanced my vocabulary knowledge in my social life.	12	2,67	0,49
10	2	I felt prestigious when I was given the PDA	12	2,67	0,65
16	3	I was able to ask questions and get answers from my friends whenever I want.	12	2,67	0,65
22	3	I was able to organize social activities with my friends	12	2,67	0,49
30	3	PDAs improved my sincerity with my friends.	12	2,67	0,78
39	4	I was able to get immediate feedback to my homework that I have sent.	12	2,67	0,49
1	1	I was able to ask questions and get answers from my instructor	12	2,58	0,79

No	Aspects	Item	N	Mean	SD
		whenever I want.			
14	2	My friends' use of PDAs encouraged me to use PDA in the course.	12	2,58	0,52
29	2	PDAs increased my interaction with my milieu.	12	2,58	0,52
36	4	I was able to reach to my instructor through e-mail.	12	2,58	0,79
38	4	I was able to reach to my instructor through SMS.	12	2,58	0,79
48	4	I could not reach to my instructor when I need.	12	2,58	0,79
42	1	The use of PDAs enhanced my vocabulary knowledge in the technological issues.	12	2,50	0,67
23	3	I could not reach to my friends when I need them	12	2,42	0,67
31	2	PDAs enabled me to establish a continual communication with my family	12	2,42	0,90
32	2	I was able to record the interesting events around me by PDA.	12	2,42	0,79
44	4	I was able to get information from my instructor about the issues when I have missed the course	12	2,42	0,79
8	2	I was able to get in touch with my friends through e-mail	12	2,33	0,99
34	2	I was able to know my friends well.	12	2,33	0,89
15	2	It was difficult to carry out my PDA with me regularly.	12	2,25	0,97
18	3	I thought that I might bother my friends with my messages.	12	2,25	0,75
7	1	I had difficulties in reading the lecture notes	12	2,17	0,94
19	4	I thought that communicating with my instructor might cost me some extra expenses.	12	2,17	0,84
6	4	I did not participate to discussions since my instructor did not participate in the discussions sufficiently.	12	2,08	0,79
26	4	I thought that I might bother my instructor with my messages.	12	2,08	0,79
37	3	I did not participate to discussions since my friends did not participate in the discussions sufficiently.	12	2,08	0,79
40	3	I thought that communicating with my friends might cost me some extra expenses.	12	2,08	0,79
47	1	I had difficulties in accomplishing the tasks in the activities.	12	2,00	0,95
12	2	I made new friends by using PDA.	12	1,75	0,75
45	1	Supporting the course with PDAs cost me extra expenses.	12	1,75	0,87
5	1	I felt that I must use PDA continuously for my course.	12	1,67	0,89
21	2	The others' curiosity while I was using PDA disturbed me.	12	1,67	0,89
4	1	I had difficulties in sending my homework.	12	1,58	0,90

The 48 items in the first section of the questionnaire were examined concerning the four subsequent aspects of the research questions and they were listed as "aspects" in the table. Hence, 1 indicates the instructional activities, 2 indicates the daily life, 3 indicates peer interaction and 4 indicates the interaction with the instructor. When the Table 1 is examined concerning the highest scores, it was found that the most motivating factor for the participants' use of PDA is their use in instructional activities. It is followed by using the PDAs for interacting between the students. It can be seen in Table that five out of the first ten items were related the use of PDAs in the instructional activities and the other five of them were related the use of PDAs in the interaction with their friends. However, the items which are related to the instructional activities were placed upper parts of the questionnaire since those items get higher mean scores. While the use of PDAs for the purpose of interaction with the instructors was placed on the third rank, their use in the daily life was the least motivating factor for the participants.

When the findings of the quantitative data were reviewed in general, it was found that the most motivating factor which lead the participants to use PDAs (in their instructional activities) were; being able to follow the course even when they could not attend the course, being able to access to the information they sought whenever and wherever they want, being able to get information from their friends about the issues that they have missed or unknown, being able to get immediate responses to their messages, being able to get help from their friends on solving the course related problems and being able to carry out the lecture notes continually. Additionally, learning better through participating in online discussion forums by using PDAs being able to express their opinions better when they wrote them in the discussions, and being able to access to the information on the Web through using PDA reinforce what they have learned during the course.

On the other hand, when the hindering factors that did not lead the participants to use PDAs in their instructional activities were examined, it was found that only five of the items have mean scores below 2.00; thus, it was supposed that those five items might be the factors which prevent participants' use of PDAs in their instructional activities.

Not making new friends through PDAs, having extra burden because of the PDA aided course, feeling obliged to use PDA for lessons all the time, feeling uncomfortable since other people get interested in them while using PDA, and the difficulties they experience in sending messages are the factors that hinder the participants from using PDAs. When the table was statistically examined concerning the four aspects, it was found that participants' using PDAs in interaction with each other was in the first rank with 2.65 mean score and the participants' using PDAs interaction with their instructor was found in the second rank with 2,52 mean score. Thus, it was found that the most important motivating factor was identified as "interaction" in participants' use of PDAs. Participants' using PDAs in the instructional activities becomes third important factor with 2,41 mean score, and using PDAs in daily life was found as the fourth important motivating factor in using PDAs by hearing impaired individuals.

The factors which motivate the participants to use PDAs in the interaction with their friends were listed in table below.

Tablo 2: The Motivating factors in the use of PDAs in interaction with their peers

Motivating Factors
Gaining instructional advantages through interacting with peers.
Being able to get in touch with their friends through SMS.
Gaining opportunities to express their selves better.
Making contributions to establish a better friendship with peers.
Providing opportunities to plan social activities with friends.

The factors which motivate the participants to use PDAs in the interaction with their instructor were listed in Table 3 below.

Table 3: The motivating factors in the use of PDAs in interaction with their instructor

Motivating Factors
Getting immediate feedback
Getting in touch with SMS
Getting in touch with e-mail
Able to ask questions and get answer whenever they want

The motivating factors for the use of PDA in instructional activities were summarized in the following table;

Table 4: The motivating factors for the use of PDAs in instructional activities

Motivating Factors
Enabling learning from their peers
Accessing to the taget information everywhere and every time
Providing chance to keep in touch with the information they missed
Continual access to the course materials
Contribution to the vocabulary knowledge related to the technical jargon

On the other hand, Table 5 illustrates the motivating factors for the use of PDA in the participants' daily lives.

Table 5: The Motivating factors for the use of PDA in the praticipants' daily lives

Motivating Factors
Giving the sense of value
Contributing to the vocabulary knowledge in the social life
Contributing to the interaction with environment
Arousing the desire not to fail

Contributing to the interaction with the family
Providing the opportunity to record the events in the environment

In the analysis of the motivating factors for the participants to use the PDAs, as a different perspective, the three factors, namely; the use of PDA in daily lives, in the interaction with each other and interaction with the instructors, as apart from the factor related to the use of PDAs in the instructional activities, were analyzed under two sub-factors as in terms of teaching and social interaction. For instance; the participants could have interaction with the purpose of teaching as well as for the purpose of social interaction. In that case, it is possible that a questionnaire item can be involved under more than one dimension. Once the items concerning the three main dimensions were also examined in terms of teaching and social interaction, it was obtained that the PDAs were used in the daily life for the purpose of teaching, with mean value of 2,46 but for the purpose of social interaction, with the mean value of 2,32. Additionally, it was found that the participants used PDAs in their interaction with each other for the purpose of teaching at 2, 64 mean, on contrary for social interaction purpose, 2,55. Likewise, the mean score for the participants' use of PDAs in the interaction with the instructors for the purpose of teaching was obtained as 2,55 while for the purpose of social interaction, it was 2,44. Under all three dimensions, it was observed that the use of PDAs for the purpose of teaching was more important than for the purpose of social interaction. These findings had similarities with the ratings of the items in the questionnaire individually according to their scores regardless of the sub-dimensions.

In the second part of the questionnaire on the Use of PDAs, firstly the participants' overall scores were calculated. In order to test whether the data met the requirement of the normal distribution to use parametric tests (Pallant, 2001), Kolmogrov-Smirnov (K-S) test and Shapiro Wilk-tests were employed on the participants' overall scores through SPSS 15.0.

For K-S test, the test statistics was D=.165 and at the significance level of .05, it was found as $p>0.05$ while for Shapiro-Wilk statistics was W=.95 and similarly at the significance level of .05, it was found as $p>0.05$. Additionally, Q-Q and P-P diagrams were examined. Besides, it was observed that the skewness (-.092) and kurtosis (-1,17) values of the distribution was within the normal distribution values. Considering these findings, it was assumed that the data had normal distribution.

The mean score obtained from the second part of the Use of PDA questionnaire was 91. There were 37 items in this part. While the minimum score was 37, the maximum score was 111 for this part. The hypothetic mean score that can be obtained from the scale (questionnaire) was 74. According to one sample t-test which was conducted to test the difference between the mean score and hypothetic mean score, it was found that the mean score (91) was statistically significant than the hypothetic mean (74) at the significance level of .05 ($t=5,62$; $p<.05$) and considering that the score obtained from the scale was higher than the hypothetic score, it was concluded that the students' motivation to use PDAs was high. When each participant's mean score was examined (see Table 5), it was seen that none of the participants got lower score than the hypothetic mean. Thus, it can be claimed that all of the participants' motivation levels to use PDAs were higher.

Table 6: The motivation factors to use PDA in terms of technical features at HP IPAQ 6915 brand and model

No	Item	N	Mean	SD
3	Having camera at PDA motivated me to carry PDA with me.	12	2,92	0,29
34	Having some features that are not included in the mobile phone but at PDAs tempted me to use PDA	12	2,92	0,29
35	Having Windows at PDA influenced me to use PDA	12	2,92	0,29
6	The idea that it can help me at lessons enabled me to use PDA	12	2,83	0,58
10	Carrying my files and data with PDA encouraged me to use PDA	12	2,83	0,39
18	Having keyboard at PDA influenced me to use PDA	12	2,83	0,58
24	Being a mobile phone at the same time motivated me to use PDA	12	2,83	0,39
29	Having MSN Messenger at PDA was effective for the use of PDA	12	2,83	0,58
7	The function of Contacts at PDA influenced me to use PDA	12	2,75	0,45
12	The function of Calculator influences me to use PDA	12	2,75	0,62
13	Participating to a scientific project made me enthusiastic	12	2,75	0,45
15	Taking Notes easily with PDA motivated me to use PDA	12	2,75	0,62
20	Receiving my e-mails through PDA made me encouraged to use PDA	12	2,75	0,62

No	Item	N	Mean	SD
23	Evaluating PDA activities with marks motivated me to use PDA	12	2,75	0,45
16	Watching video through PDA motivated me to use PDA	12	2,67	0,65
22	Working in cooperation with my instructor tempted me to use PDA	12	2,67	0,65
1	The instructor's using PDA also made me tempted to use PDA	12	2,58	0,67
19	Playing games at PDA encouraged me to use PDA	12	2,58	0,79
31	Sharing files through Bluetooth at PDA encouraged me use PDA	12	2,58	0,79
28	Connecting Internet through GPRS at PDA motivated me to use PDA	12	2,50	0,80
17	Listening to music at PDA made me enthusiastic to use PDA	12	2,42	0,90
27	The idea of helping my peers motivated me to use PDA	12	2,42	0,90
30	Difficulty to pass through different programs at PDA decreased my interest in PDA	12	2,42	0,67
4	Using earphones at PDA influenced me to use PDA	12	2,33	0,89
32	Having technical problems frequently decreased my desire to use PDA	12	2,33	0,89
37	Having small screen at PDA demotivated me to use PDA	12	2,33	0,89
21	Fear to damage PDA decreased my interest İN PDA	12	2,25	0,86
26	Having short charging time decreased my interest in using PDA	12	2,25	0,97
25	Difficulty to see PDA screen under sunlight limited my use of PDA	12	2,17	0,58
33	Economical difficulty caused by PDA use decreased my interest in PDA	12	2,17	0,84
36	Having English as the program language decreased my interest in using PDA	12	2,17	0,84
5	The difficulties in uploading program to PDA decreased my interest to PDA	12	2,00	0,85
8	Using some programs only through STYLUS decreased my interest in using PDA	12	1,92	0,79
9	Not finding PDA versions of the programs I want, demotivated me to use PDA	12	1,92	0,67
2	Interference occurred during phone call at PDA decreased my interest in using PDA	12	1,67	0,49
11	Difficulty to run a program at PDA decreased my interest in using PDA	12	1,67	0,78
14	Difficulty to enter numbers to PDA made the use of PDA harder	12	1,58	0,79

As seen at Table 6, the most important hardware factors that motivated the participants to use PDA were; the function of camera at PDAs, some features that are not included in the mobile phones but at PDAs, using Windows operating system to which the participants were familiar. Additionally, carrying files and data with PDAs, having keyboard on PDAs, and using them as the mobile phones at the same time, having MSN Messenger program, function of e-mail sending options, calculator and taking notes easily through PDAs were some other motivating factors.

The factors that inhibited the students to use PDAs were questioned through only five items out of 37 items in the scale and the mean scores of these items were under 2.00. These were; using some programs only through STYLUS at PDAs, not finding PDA versions of some programs that the students use, hearing disturbing interferences during phone calls at PDAs and running programs at PDAs with difficulty, and finally the difficulty to enter numbers to PDAs.

While practicing the critic event approach to the students at the end of the term, the students were asked to write the situations/moments they felt best and worst while studying with PDAs. The qualitative data obtained from this measurement instrument was analyzed inductively. The themes emerged related to the situations that the students felt best while studying PDAs could be accepted as the factors motivating the students to use PDAs while the themes regarding the situations they felt worst could be accepted as hindering factors.

A total of 52 opinions were stated related to the most favorable (best) moments/ situations while the participants are using PDAs. The data that were collected in this section can be grouped under three main motivating factors, which are the factors related to the Internet, the factors related to hardware/software and psychological factors. These factors were tabularized in the Table 7 below.

Table 7: The participants most favorable moments/cases while using PDAs

Themes	Frequencies (f)
Factors related to the Internet	**30**
Preparing/sending/sharing homework	8
Chatting	7
Mobile access to Internet	6
Searching on the net	5
Sending e-mail	1
Using GPS (Internet map)	1
Discussing on the Blog	1
Reading News	1
Hardware/ Software Factors	**15**
Playing Game	4
Taking Photograph	4
Carrying documents	4
Recording Video	2
Preparing homework	1
Psychological Factors	**7**
possession /care about	3
Feeling prestigious	3
Recreation (spending leisure time)	1

As Table 7 indicates that the situations that the participants felt best were the situation in which they conducted the Internet activities. The total frequency of the factors related to Internet was two times of hardware/software factor and 4,5 times of the psychological factors. In a similar way, the total frequency of hardware/software factor was two times of psychological factors.

The situations like preparing the homework on PDA and sending it to the instructor, also sharing it with their peers, chatting with friends and instructors through Internet, sharing their ideas in blog environment, searching on Internet, having Internet access wherever and whenever they want also overlapped with the motivating factors for the participants' use of PDAs. Moreover, "feeling valuable by means of possession" as one of the psychological factors was also compatible with "providing sense of valuing" as one of the motivating factor for the use of PDAs in instructional activities. Moreover, playing games, taking photos, carrying files, recording videos, sending e-mail and chatting are also consistent with the hardware factors motivating to use of PDAs.

On the other hand, regarding the situations in which the students felt worst while studying with PDAs, there were totally 28 opinions, yet two of these opinions explained that there was not any situation in which they felt worst. The data obtained from these opinions could be gathered under three main factors hindering the use of PDAs, as hardware/software factors, psychological factors and Internet-related factors. This classification was given in the following table;

Table 8: The factors related to participants most unfavorable moments while using PDAs

Themes	Frequencies (f)
Hardware/ Software Factors	**16**
Unable to play games	1
Unable to take photos or video recording	2
Unable to send documents via Bluetooth	1
Interference while using it as a phone	1
Unable to run some programs	1
The synchronization problems with computers	1
Run out of battery very soon	2
The problems while making homework	1
Break down of the PDA	4
Carrying the PDAs (being big size)	2
Psychological Factors	**6**
Fear of losing/or the stealing of PDA	4
Returning the sim card	1

Having higher phone bills	1
Factors related to the Internet	**4**
Unable to access Internet	3
Unable to send homework	1

When the Table 8 is examined, it was observed that the factors related to participants' most unfavorable moments while using PDAs was hardware/software factors. The total frequency of this main factor was calculated as 16, which is three times bigger than total frequency of psychological factors and four times bigger than the Internet related factors. When the data obtained from this section was compared to the data related to the participants' most favorable moments/situation while using PDAs, it was found that Internet play an important role in both cases. That is, the Internet related factors were the most favorable and most unfavorable moments that the participants felt while using PDAs. Therefore, as it was expected, the most unfavorable moments of the participants should be at the bottom level. In this respect, the result was found coherent. Although the factors related to hardware/software was found as the second important factor among the favorable moments of the participants while using PDAs, the same factors were found as the first important factor among the most unfavorable moments of the participants while using PDAs. Another significant aspect in this point was that although the hardware/software factors were almost half of the Internet related factors among the most favorable moments that participants felt while using PDAs, they were two times bigger among the most unfavorable moments that participants felt while using PDAs. This finding can be explained by the fact that participants have encountered a number of problems based on the hardware/software characteristics of the PDAs. When the findings obtained in this section were compared to the problems that the participants experienced while using PDAs, it is found that there is coherence between findings of the two sections. That is, participants stated that they have experienced technical problems while taking photos and recording videos, they had problems while playing games in PDAs, they heard interference while using PDAs as a phone, they had problems in carrying PDAs due to their bigger sizes, they had problems while using PDAs since they run out of battery very soon, they had problems due to PDAs synchronization problems with the desktop computers, they felt the fear of breaking down the PDAs, they had problems related to Internet access, they had problems in preparing and sending their homework and they had problems due to the having higher phone bills.

For the situations in which they felt worst while using PDAs, the factors such as having interference during phone calls and not running some program, got on with two of the five hardware factors that inhibited the students to use PDAs. Having interference during phone calls at PDAs was observed as among the hindering factors, also among the problems faced with the use of PDAs as well as among the worst moments while using PDAs. Although the interference during the phone calls cannot be considered as a great problem for the hearing students, even they will not realize such a problem, such interference could be disturbing for the hearing impaired students since their hearing aids produces the voices higher and the sounds that cannot be heard by the hearing people can disturb them. For instance; these students reported that the sound of tearing PDAs coverage disturbed them. The instructor of the lesson also confirmed that due to booster function of these hearing aids, such sounds could disturb them.

CONCLUSION AND DISCUSSION

The results of the study revealed that all of the participants have high level of motivation for PDA use. According to the average points of each item of the questionnaire, "using PDAs in instructional activities" is the most important factor that motivates students to use PDA. Using PDA for interacting with each other follows this. While using PDAs to interact with their instructors is in the third rank, using PDAs in their daily lives is the least motivating factor. When we look at the total average point of each aspect, we see that the most important factor that motives participants to use PDA is "interaction". The third important factor is using PDAs in instructional activities whereas the last factor is using PDAs in daily lives.

Following courses that the participants missed by means of PDAs, accessing the information they look for at any time and place they want, getting information they do not know or missed from their peers, getting immediate response to the messages they send, benefiting from their friends in solving problems related to the course and carrying the lecture notes with them all the time are the most motivating factors to use PDA. Learning more effectively in the discussions they hold on the net, expressing themselves better in these discussions, and reinforcing what they have learned during the lesson via accessing the main resource and materials of the course through Web are among other factors that motivate participants to use PDA.

Not making new friends by using PDAs, having extra burden due to PDA aided course, feeling obliged to using PDA for lessons all the time, feeling uncomfortable since other people get interested in them while using PDA, and the difficulties they experience in sending messages are the factors that hinder the participants from using PDA.

In terms of equipment properties of PDA, it was found that all the participants have high level of motivation to use PDA. The most important equipment factors that motivate participants to use PDA are camera feature of PDAs, having some features not included in cell phones, and using Windows operating system which the participants are accustomed to from their computers. Carrying files and data with PDA, keyboard feature, its use as cell phone, running MSN Messenger program, sending e-mails, having calculator and taking notes easily on it are the other motivating factors.

The compulsory use of writing pen (Stylus) in some of the software in PDAs, the lack of PDA version of some programs that participants are accustomed to use in computer environments, the interference while talking on the phone, difficulty in running a program on PDA and difficulty in entering numbers in PDA were the principal hindering factors that emerged as a result of the equipment properties of PDAs.

The success of current technologies is based on the practicality of that technology when it is used in any field. The new-world concept, which gives importance to the new developments in social life, to the individual differences and to the educational issues rather than economic wealth of the nation, especially paying attention to the special education might lead the handicapped individuals to get their share from the application of technology into their education sufficiently. The new technologies, which also called mobile technologies, will be the indispensable source of the twenty-first century's technology through conveying their time and place independent features into mobile environments. The handicapped individuals who need special education may even follow the current issues by means of such technologies. The learners especially the ones who need special education, such as handicapped individuals, the students who have to stay at the hospital for their treatments might continue their education by the help of mobile technologies, thus, they can follow the courses without any time and place limitations, they can access the needed information whenever and wherever they want, they can get information about the courses hey missed from their classmates and they can ask and get answers to their questions immediately. Thanks to the Web nets, the mobile technologies have the potential to simultaneously transmit the information that the individuals need.

Like all of the new technological application, the mobile technologies might also have some limitations such as the cost, accessibility and acceptability. However, through practicing new governmental policies for the education of handicapped people, it could be increased the use and availability of mobile technologies in the field of special education. Likewise, through conducting studies similar to the present study, the acceptability, compatibility, effectiveness and practicality of the technology could be examined. The motivating or hindering factors for the students might be identified along with the different special education fields. Thus, the present study revealed that the greatest problem that the hearing impaired students encountered during their use of PDAs, was using the PDAs with hearing aid caused interference (noise). However, orthopedically handicapped students might complaint about the small size key pad of the PDAs. Being the first initiative in cooperation with special education and mobile technology was inspired the researcher of the present study. The researcher believes that a lot more studies can be conducted on this issue in Turkish context. The forthcoming studies on this issue might contribute to enhance the quality of life of the handicapped people as well as contribute to the sustainable development of the country.

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THE INTER-REGIONAL INEQUALITY OF ACCESS TO INFORMATION AND COMMUNICATION TECHNOLOGY IN TURKEY BASED ON PISA 2009 DATA

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ABSTRACT
The purpose of this study was to investigate the extent to which students from Turkey have access to a computer and the internet at school and at home, and differences in ICT accessibility by geographic region based on the data obtained from the PISA 2009. Data collected through the ICT questionnaire were analyzed by descriptive statistical indexes such as percentage technique. Important findings from the study indicated (i) access to a computer and the internet at school and at home in Turkey is still very low; (ii) Western Marmara is the best region. The region is above the average of country in the accessibility of ICT; (iii) South Eastern Anatolia is the worst region. The region is below the average of country in the accessibility of ICT. These findings confirm that developing countries in general tend to have limited computer and the internet access at school and at home.
Keywords: Information and communication technology, inter-regional differences, NUTS, PISA 2009, Turkey.

INTRODUCTION
Information and Communication Technology (ICT) has provided enormous opportunities for developments all around the world (Kari, 2007). Rapid growth and development in ICT has conduced to the diffusion of technology in education (Corbett & Willms, 2002); therefore, ICT is nowadays indispensable for educational studies, such as surveys, presentations, project work or research, online and distant learning. Not only is ICT the basis of learning environment, but also it provides individuals to have lifelong learning, to improve educational outcomes, to learn new occupational skills and to decrease inequities between groups (Çavaş, Kışla, & Twining, 2004). Having access to and using ICT at home and at school is played a crucial role in developing technical skills, processing information, getting source material and new information (Sinko & Lehtinen, 1999; Symons, 1997) Similarly, equitable and high-level access to ICT at home and at school play an important role of child development (Corbett & Willms, 2002).

People from Turkey continue to have a slow uptake of new technology. For example, the percentage of computer access in home was 67.9 and the percentage of internet access in home was 41.6 based on Turkish Statical Institute 2010 data. According to PISA 2003 data, computer access in Turkish schools were much lower compared to OECD average (Aşkar & Olkun, 2005) and students in developing countries such as Mexico, Turkey and Tunisia had the highest proportion of students who had never used a computer with 13 per cent, 14 per cent and 39 per cent of students respectively in this category and the largest gender differences was found in Turkey where 21 per cent of females and 9 per cent of males reported never having used a computer. The results showed that approximately 50 per cent of students from Turkey had access to a computer at school and fewer than 40 per cent of students from Turkey had access to a computer at home (Thomson & De Bortoli, 2007). From these data, it was found that only 14 per cent of students from Turkey had a link to the internet at home (Ainley & Searle, 2005).

Arnas-Aktaş (2005) performed a study in order to investigate the access to a computer and the internet at home in a sample of 933 Turkish children and students from ages 3-18. The results indicated that 35.7 per cent of these children and students had access a computer at home and 21.7 per cent of them also had an internet connection in their home. Another study of similar type was conducted by Orhan and Akkoyunlu in 2004 who found that 12.5 per cent of Turkish students had a link to the internet at home and also 15 per cent of Turkish students had a link to the internet at school.

In Turkey, there is about 15 million students enrolling in grades K-12, we would anticipate that a considerable number of K-12 students do not have access to a computer and the internet from their school and home. The under use of ICT in education may be arisen from illiteracy, inequality, low levels of living, low productivity, poverty (Kessy, Kaemba, & Gachoka, 2006) and inter-regional differences. Students of inequality of access to ICT are called the "digital divide" (Becker, 2000; Wolff & MacKinnon, 2002). Several researches (Ainley &

Searle, 2005; Aşkar & Olkun, 2005; Aypay, 2010; Corbett & Willms, 2002; Gündüz, 2010; Mallon, Monseur, Quittre, & Wastiau, 2010; Rodrigo, 2004; Thomson & De Bortoli, 2007) related to digital divide were examined to access and use of ICT in participant countries by gender, by socioeconomic background, by geographic location and by state using data from international benchmarking studies. For example, Gündüz (2010) carried out a research to assess the digital divide conditions in Turkey. This study provided findings that in Turkey, there was a digital divide between primary school students. It was believed that, this situation showed parallelism with the socio-economic background of the families. According to PISA 2006 data, from the Turkey showed that there were no longer inequalities in the number of females and males accessing the computer at home, and thus a decrease in the digital divide between groups (Aypay, 2010). Berberoğlu (2010) performed a research so as to examine the roles of lifelong learning and ICT in the path of creating a knowledge society and building a knowledge economy and she analysed the common efforts and achievement of 25 European Community Members and Turkey in this path. Results indicated that Sweeden, Finland and Denmark were more successful, but Turkey was positioned in the lowest cluster with some EU Members such as Romania and Bulgaria without creating any difference. Rodrigo (2004) conducted a study in order to quantify the digital divide that existed between schools in Metro Manila, Philippines and schools in countries surveyed by the International Association for the Evaluation of Educational Achievement (IEA-surveyed). The results implied that unlike students in other countries, students in Metro Manila schools are among the digital poor, with fewer opportunities to access, and process.

International benchmarking studies such as the Programme for International Student Assessment (PISA), the Progress in International Reading Literacy Study (PIRLS) and the Trends in International Mathematics and Science Study (TIMSS), which determine the achievement levels of students, shed light on the current situation with regard to the education systems in the participant countries. Students' performances in these exams help them to assess their education systems and to be able to look at the current education systems in the participant countries with a critical eye.

The PISA, which was conducted with the support of Organization for Economic Cooperation and Development (OECD), is the largest international benchmarking study focusing on curriculum based learning outcomes. The survey has been conducted every three years since 2000 and the PISA was carried out with the participation of 43 countries in 2000, 41 countries in 2003, 56 countries in 2006 and lastly, 65 countries in 2009. Each cycle evaluates the three domains concurrently, with the importance to the one particular domain each time: reading literacy in 2000, mathematical literacy in 2003, and scientific literacy in 2006 and again reading literacy in 2009. With its student and ICT questionnaire, the PISA also collects data concerning students' socio-demographic status, school environments, learning styles, parents, views about themselves, motivation to perform well in related domains, and computer familiarity.

Aim of the Study

The purpose of this study was to examine the extent to which students from Turkey have access to a computer and the internet at school and at home, and differences in ICT accessibility by geographic location based on the data obtained from the PISA 2009.

METHOD

The study adopted the descriptived survey research method with the student ICT questionnaire in PISA 2009 as the instrument. The data used in this study were provided by the international PISA web site. Data of the study were analysed with SPSS 13.0 program. The percentage technique is used to present and analyse data with appropriate tables.

Participants

The tests and surveys of PISA 2009 project were conducted in April 2009 among 4996 students from Turkey. The students were randomly selected from 170 schools, from 12 NUTS (Nomenclature of Territorial Units for Statistics) regions in Turkey. According to the NUTS regions in Turkey which take part in PISA 2009 study the percentages and numbers of the students were as follows; Istanbul Region 800 (16.0%), Western Marmara Region 244 (4.9%), Aegean Region 620 (12.4%), Eastern Marmara Region 525 (10.5%), Western Anatolia Region 481 (9.6%), Mediterranean Region 637 (14.8%), Central Anatolia Region 296 (5.9), Western Black Sea Region 375 (7.5%), Eastern Black Sea Region 216 (4.3%), North Eastern Anatolia Region 142 (3.8%), Central Eastern Anatolia Region 218 (4.4%), South Eastern Anatolia Region 442 (8.8%), [total 4996, 100%].

RESULTS

Access to ICT Resources at School and at Home

Access to a Computer at School

In many countries school plays a crucial role in providing equitable access to ICTs (Thomson & De Bortoli, 2007). Table 1 presents the regional disparities in access to a computer at school for the twelve NUTS regions in Turkey. As can be seen in Table 1, access to a computer at school in Turkey (49.1%) is still very low. Overall, 49.1 per cent of students from Turkey have access to a computer at school; this range from 38.0 per cent in Mediterranean Region to 72.5 per cent in North Eastern Anatolia Region. Students from North Eastern Anatolia Region, Western Marmara Region, Central Eastern Anatolia Region reported the highest proportion of students accessing to a computer at school, quite above Turkey's average and students from Eastern Marmara Region, Western Black Sea Region, Central Anatolia Region and Aegean Region reported reasonable accessing to a computer at school, slightly above Turkey's average. In Istanbul Region, Eastern Black Sea Region and Western Anatolia Region less than 50 per cent of the students indicated accessing to a computer at school, slightly below Turkey's average. However, results showed that the lowest access with approximately 40 per cent of the students from Mediterranean Region and South Eastern Anatolia Region had access to a computer at school, quite below Turkey's average.

Table 1. Students' from Turkey access to a computer at school and at home

The NUTS regions in Turkey	School (%)	Home (%)
Istanbul Region	46.6	73.4
Western Marmara Region	65.6	63.1
Aegean Region	50.5	63.4
Eastern Marmara Region	54.7	63.8
Western Anatolia Region	44.9	65.9
Mediterranean Region	38.0	40.2
Central Anatolia Region	51.0	47.6
Western Black Sea Region	54.7	49.6
Eastern Black Sea Region	45.4	44.9
North Eastern Anatolia Region	72.5	35.9
Central Eastern Anatolia Region	61.5	31.7
South Eastern Anatolia Region	38.5	28.7
Turkey's average	49.1	54.3

Access to a Computer at Home

Almost all of the Turkish PISA 2009 students showed they had less access to a computer at home. Overall, 54.3 per cent of students from Turkey had access to a computer at home; this ranged from 28.7 per cent in South Eastern Anatolia Region to 73.4 per cent in Istanbul Region (Table 1). Students from Istanbul Region, Western Anatolia Region, Eastern Marmara Region, Aegean Region and Western Marmara Region reported the highest proportion of students accessing to a computer at home, quite above Turkey's average. However, in Western Black Sea Region, Central Anatolia Region and Mediterranean Region less than 50 per cent of the students indicated accessing to a computer at home, slightly below Turkey's average and results indicated that the lowest access with approximately 30 per cent of the students from South Eastern Anatolia Region, Central Eastern Anatolia Region and North Eastern Anatolia Region had access to a computer at home, quite below Turkey's average.

These percentages implied that students from Istanbul Region, Aegean Region, Eastern Marmara Region, Western Anatolia Region and Mediterranean Region had less access to a computer at school than at home, and students from Western Marmara Region, Central Anatolia Region, Western Black Sea Region, Eastern Black Sea Region, North Eastern Anatolia Region, Central Eastern Anatolia Region and South Eastern Anatolia Region had more access to a computer at school than at home. All in all, students from Turkey had less access to a computer at school than at home.

Access to the Internet at School

Table 2 indicated that similar regional disparities were evident for access to the internet at school for the twelve NUTS regions in Turkey. Link to the internet at school in Turkey (44.4%) is still low-level. Overall, 44.4 per cent of students from Turkey also had access to the internet at school; North Eastern Anatolia Region had the highest percentage of students with access: over 70% of students in North Eastern Anatolia Region reported accessing to the internet in their school. In contrast, only about 30% of students in South Eastern Anatolia and Mediterranean Regions had access to the internet at school. Students from Central Eastern Anatolia Region, Western Marmara Region, and Western Black Sea Region had an internet connection at home, quite above

Turkey's average, and in Aegean Region, Eastern Marmara Region and Central Anatolia Region, less than 50 per cent of the students indicated accessing to internet at school, slightly above Turkey's average. But, in Istanbul Region and Western Anatolia Region less than 40 per cent of the students indicated a link to the internet at school. This was lower than the Turkey's average.

Table 2. Students' from Turkey access to the internet at school and at home

The NUTS regions in Turkey	School (%)	Home (%)
Istanbul Region	39.4	74.0
Western Marmara Region	57.0	61.5
Aegean Region	49.8	60.3
Eastern Marmara Region	49.1	60.6
Western Anatolia Region	39.7	60.3
Mediterranean Region	33.3	40.0
Central Anatolia Region	47.0	43.2
Western Black Sea Region	53.9	48.5
Eastern Black Sea Region	44.0	44.9
North Eastern Anatolia Region	72.5	31.0
Central Eastern Anatolia Region	58.3	27.1
South Eastern Anatolia Region	29.4	26.9
Turkey's average	44.4	52.2

Access to the Internet at Home

Table 2 showed that there were regional disparities in link to the internet at home. Overall, 52.2 per cent of students from Turkey also had a link to the internet at home; in Istanbul region nearly 75% of students had a link to internet at home, whereas the average was lower amongst the South Eastern Anatolia Region, and lower still – about 30% – in Central Eastern Anatolia Region and North Eastern Anatolia Region. About this percentage is still half that of Western Anatolia Region, Aegean Region, Eastern Marmara Region and Western Marmara Region. Students from Istanbul Region, Western Anatolia Region, Eastern Marmara Region, Aegean Region and Western Marmara Region reported the highest proportion of students accessing to the internet at home, quite above Turkey's average. But, in Western Black Sea Region, Eastern Black Sea Region, Central Anatolia Region and Mediterranean Region less than 50 per cent of the students indicated a link to the internet at school. This was lower than the Turkey's average.

These findings showed that students from Istanbul Region, Western Marmara Region, Aegean Region, Eastern Marmara Region, Western Anatolia Region, Mediterranean Region and Eastern Black Sea Region had less access to the internet at school than at home, and students from Central Anatolia Region, Western Black Sea Region, Eastern Black Sea Region, North Eastern Anatolia Region, Central Eastern Anatolia Region and South Eastern Anatolia Region had more link to the internet at school than at home. All in all, students from Turkey had less link to the internet at school than at home.

DISCUSSION

In this study, inter-regional inequalities examined in terms of ICT accessibility at school and at home in Turkey based on the data obtained from the PISA 2009. According to the results of the study it was found that: i) 49.1 per cent of students from Turkey overall reported having access to a computer at school, and 38.0 per cent in Mediterranean Region to 72.5 per cent in North Eastern Anatolia Region; ii) 44.4 per cent of students from Turkey overall reported having link to the internet at school, and 29.4 per cent in South Eastern Anatolia Region to 72.5 per cent in North Eastern Anatolia Region; iii) 54.3 per cent of students from Turkey overall reported having access to a computer at home, and this ranged from 28.7 per cent in South Eastern Anatolia Region to 73.4 per cent in Istanbul Region; iv) 52.2 per cent of students from Turkey overall reported having link to the internet at home, and this ranged from 26.9 per cent in South Eastern Anatolia Region to 74 per cent in Istanbul Region; v) The access to a computer and the internet at school was highest in the North Eastern Anatolia Region and lowest in Mediterranean and South Eastern Anatolia Regions; vi) The access to a computer and the internet at home was highest in the Istanbul region and lowest in South Eastern Anatolia Region; vii) All in all, students from Turkey had less access to a computer at school than at home. Similarly, students from Turkey had less access to the internet at school than at home; viii) Western Marmara is the best region. The region is above the average of country in the ICT resources; ix) South Eastern Anatolia is the worst region. The region is below the average of country in the ICT resources.

These findings supported the findings of previous studies (e.g., Gök, 2004; Koçberber & Kazancık, 2010; Sarıer, 2010) which revealed that the South Eastern Anatolia region was below the average of country in the educational opportunities, in particular, in terms of educational investments. Student selection examination (ÖSS), high school entrance exams (OKS-SBS) and PISA results showed that, students performance in Turkey had significant differences between genders and regions, and the students from South Eastern Anatolia Region performed below the Turkey average scores in measures of mathematics literacy, scientific literacy, reading literacy and problem solving (Berberoğlu & Kalender, 2005; Sarıer, 2010). These results were consistent with Koçberber and Kazancık's (2010) study, which indicated that Western Marmara was above the average of country in the educational opportunities and investments. Similarly, Berberoğlu and Kalender(2005), and Sarıer's (2010) studies which showed that students from Marmara Region performed above the Turkey average scores in measures of mathematics literacy, scientific literacy, reading literacy and problem solving.

In PISA 2003, countries with academically higher performing students had five or fewer student per computer, whereas Turkey had ten or more students per computer (Aypay, 2010) . According to the results of the PISA 2009 it was found that access to a computer and the internet at school and at home in Turkey was still very low. At this point students from Turkey are still among the world's digital poor. Students in developing countries such as Tunisia, Turkey, Philippines and Mexico had the highest proportion of students who had not access to a computer and the internet at school and at home (Rodrigo, 2005; Thomson & De Bortoli, 2007). The results indicated that students from Turkey can not access and link to ICT resources to the same extent as their international counterparts and Turkey has inter-regional differences in terms of ICT resources. These findings confirm that medium human development countries in general tend to have limited computer and the internet access at school and at home, and students from developing countries can not participate fully in the digital world (Rodrigo, 2005; Thomson & De Bortoli, 2007).

CONCLUSION

Nowadays, although information and communication technology is used a lot in every field, the results of PISA 2009 show that in Turkey, access to a computer and link to the internet at school and at home is still too low. These findings imply that information and communication technology (ICT) in Turkey is not completely integrated into learning environment and students' life. Aypay (2010) gave out that Turkey needs to lower the differences among schools. Turkey also needs to improve the use of ICT in educational system by adapting the technology in the content of the courses. Results from the current study supported the finding that students from Turkey students had access to computers but their access was limited (Aypay, 2010). Delen and Bulut (2011) also stated that ICT is an important factor that should be taken into consideration when designing classroom environments. The results of this research and studies (e.g., Aypay, 2010; Berberoğlu, 2005; Delen & Bulut, 2011) on this topic indicated that there is stil a great achievement and accessibility of ICT gap between regions and schools in Turkey. The under use of ICT in education and in home may be arisen from illiteracy, inequality, low levels of living, low productivity, poverty (Kessy, Kaemba, & Gachoka, 2006) and inter-regional differences. In order to improve the quality of learning environment for students who have not access to computers and the internet at home and at school; obstacles to the access to computers and internet at home and at school should be removed as soon as possible, while investments should be encouraged. These results also provide potential insights for the conduct of the future research and they can be used for international benchmarking.

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THE UNIFIED PHONETIC TRANSCRIPTION FOR TEACHING AND LEARNING CHINESE LANGUAGES

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ABSTRACT
In order to preserve distinctive cultures, people anxiously figure out writing systems of their languages as recording tools. Mandarin, Taiwanese and Hakka languages are three major and the most popular dialects of Han languages spoken in Chinese society. Their writing systems are all in Han characters. Various and independent phonetic transcriptions have been thus developed to be as the mapping mechanisms between Chinese mother tongue languages and Han characters. For teaching and learning facilitation purposes, we really require a convenient phonetic transcription system between daily Mandarin, Taiwanese and Hakka to speed Han characters data processing applications. The Roman spelling system is a universal tool that owns the one and only one spelling rule. By studying and analyzing the Roman spelling system, we have disclosed that 4135 Romanized phonetic transcriptions can be adequately applied to handle Han characters' mappings of Mandarin, Taiwanese and Hakka spoken dialects. In this paper, we propose a minimal perfect hashing function to process unified 4135 Mandarin, Taiwanese and Hakka Romanized phonetic transcriptions to their corresponding Han characters simultaneously. The unified phonetic transcription can be used to promote Chinese mother tongue languages applications and developments. Furthermore, it can be applied as a mechanism to popularize digital learning and teaching of Chinese mother tongue languages.

INTRODUCTION

People generally recognize that it is valuable to teach and learn mother tongue languages in today societies. People anxiously figure out writing systems of their languages to record and preserve their distinctive cultures. Mandarin, Taiwanese and Hakka languages are the three major spoken dialects in Chinese society. There are many speakers of the languages in China, Malaysia, Singapore, Philippine, Thailand and Indonesia.

Mandarin is the widest spoken language in the world and there are about 1300 millions people worldwide. Pinyin, more formally Hanyu Pinyin, is the most common Standard Mandarin Romanization system in use. Hanyu means the Chinese language. pin means "together, connection, annotate" and yin means "sound". Pinyin uses the Latin alphabet to represent sounds in Standard Mandarin. Taiwan has adopted Tongyong Pinyin on the national level since October 2002. Tongyong Pinyin is a modified version of Hanyu Pinyin. Based on the Chinese remainder theorem, Chang and Wu (Chang & Wu, 1988) designed the hashing function to process 1303 distinct Mandarin phonetic transcriptions of Han characters.

Minnanyu refers to a family of Chinese languages which are spoken in southern Fujian and neighboring areas, and by descendants of emigrants from these areas in diasporas. It is usually called Taiwanese by residents of Taiwan, and Hokkien by residents of Southeast Asia. Taiwanese can be written with the Latin alphabet using a Romanized orthography which was developed first by Presbyterian missionaries in China and later by the indigenous Presbyterian Church in Taiwan; use of the orthography has been actively promoted since the late 19th century. Taiwanese is one of the most used dialects spoken in Taiwan, and evolved from the ancient languages of China, the Ho-Lo language family. According to the traditional but representative and authoritative Taiwanese dictionary (Shen, 2001), Shieh (2003) developed the hashing function of 3028 Taiwanese phonetic transcriptions of Han characters.

Hakka dialect is one of the seven major spoken dialects in Chinese Society. The Hakka language has numerous dialects spoken in southern provinces of China, Taiwan, Singapore, Philippine and Indonesia. It is the 32nd widest spoken language in the world and there are about 100 millions Hakka speakers worldwide. Hakka is not mutually intelligible with Mandarin, Cantonese, Minnan and most of the significant spoken variants of the Chinese language. The Hakka dialects across various China provinces differ phonologically, but the Meixian dialect of Hakka is considered the archetypal spoken form of the language. Shieh and Hsu (Shieh & Hsu, 2007) proposed a minimal perfect hashing function for the 1428 Hakka phonetic transcriptions of Han characters from authoritative Meixian Hakka dialect dictionary (Lee, 1995).

Many researchers have enthusiastically endeavored to study related the spoken languages subjects such as language curriculums in multicultural society (Kilimci, 2010), typologies of spoken language learning aids (Kartal, 2005), mappings between spoken language and its writing system (Chang & Wu, 1988; Shieh, 2003;

Shieh & Hsu, 2007) (as depicted in Figure 1), etc. They are striving to protect and promote their individual native cultures, and make them widespread utilization.

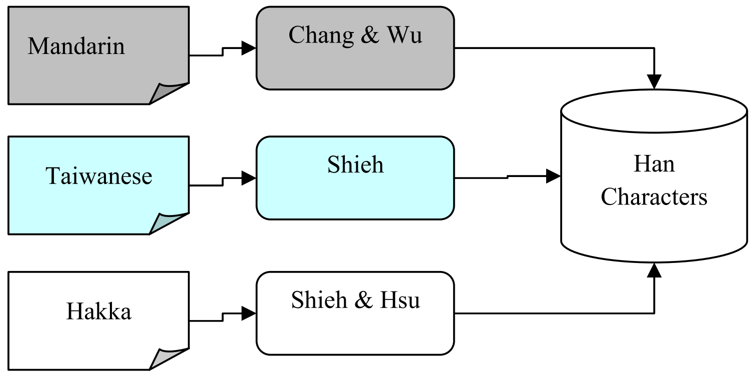


Figure 1: Various and Independent Han characters mappings for Chinese Languages

In Chinese societies, for teaching and learning facilitation purposes, we really require a convenient phonetic transcription system between daily Mandarin, Taiwanese and Hakka to speed Han characters data processing applications. These spoken languages are all with their respective Romanized phonetic transcriptions. Pleasantly surprised, the Roman spelling system is a universal tool that owns the one and only one spelling rule and can be generally and simultaneously applied to different languages applications. By studying and analyzing the Roman spelling system, we have disclosed that 4135 Romanized phonetic transcriptions can be adequately applied to handle Han characters' mappings of Mandarin, Taiwanese and Hakka spoken dialects. The 4135 integrated phonetic transcriptions are composed of 7 tones, 29 consonants, and 120 vowels at most. For language application purposes, it is much important for us to establish a mechanism to efficiently retrieve different Han characters and their corresponding pronunciations from its vocabulary repository, as illustrated in Figure 2. Many Chinese language learning applications, such as on-line or mobile dictionaries, translations, text-to-speech conversions, e-books, etc., can be further developed to help learners and teachers.

In this paper, we apply the Chinese remainder theorem to design a fast and efficient hashing function (Knuth, 1998) to map the unified 4135 phonetic transcriptions to corresponding Han characters of Mandarin, Taiwanese and Hakka languages. We also give a proof that the loading factor is more than 0.887, which is the best one when applying the Chinese remainder theorem to the design of hashing functions for the word sets.

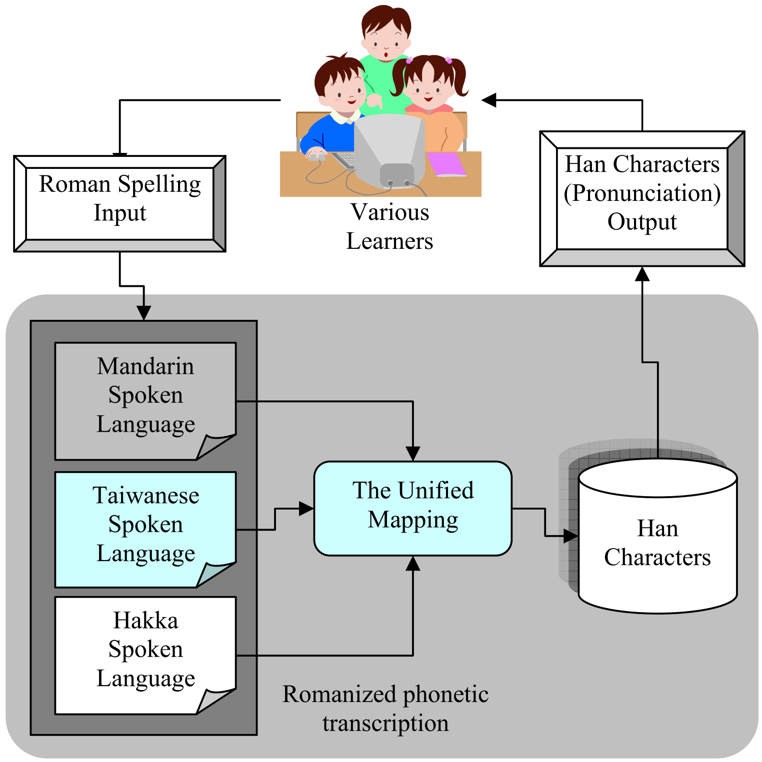


Figure 2: The Unified Mapping for Chinese Languages

Hashing Functions Based on the Chinese Remainder Theorem

In this section, we first introduce the Chinese remainder theorem and its application to hashing function designs of character data sets. Then we review the hashing function designs of Mandarin, Taiwanese and Hakka phonetic transcriptions based on the theorem.

The Chinese remainder theorem (Chang & Lee, 1986)

Theorem 1. Let r_1, r_2, ..., r_n, be n integers. There exists an integer C such that $C=r_1 \pmod{m_1}$, $C=r_2 \pmod{m_2}$, ..., $C=r_n \pmod{m_n}$, if m_i and m_j are relatively prime to each other for all $i\neq j$.

For example, let $r_1=1$, $r_2=2$, $r_3=3$, $r_4=4$ and $m_1=4$, $m_2=5$, $m_3=7$, $m_4=9$. Here m_i and m_j are relatively prime for $i\neq j$, $1< i, j< 4$. By the Chinese remainder theorem, there exists an integer C=157 such that C mod m_1=157 mod $4=1=r_1$, C mod m_2=157 mod $5=2=r_2$, C mod m_3=157 mod $7=3=r_3$, C mod m_4=157 mod $9=4=r_4$.

The following theorem results easily from the Chinese remainder theorem.

Theorem 2. Given a finite integer key set $K=\{L_1, L_2, ..., L_n\}$. If L_i and L_j are relatively prime to each other for all $i\neq j$, there exists a constant C such that $h(L_i)=C \bmod L_i$ is a minimal perfect hashing function (Chang & Lee, 1986).

Hashing scheme based on the Chinese remainder theorem

Based on the Chinese remainder theorem, Chang and Lee (1986) proposed a letter-oriented minimal perfect hashing scheme for a set of words. For a finite word set $K=\{L_1, L_2 , ..., L_n\}$, it is heuristically assumed that there exist s_1 and s_2 such that the extracted letter pairs (L_{i1}, L_{i2}) are distinct, where L_{i1} and L_{i2} are the s_1-th and s_2-th characters of the word L_i, i= 1, 2, ..., n. Chang and Lee's hashing function is defined as $h(L_i) = H(L_{i1}, k_{i2}) = d(L_{i1}) + C(L_{i1}) \bmod p(L_{i2})$, where d and C are integer value functions, and p is a prime number function. Chang and Lee's applied the hashing scheme to 12 months and 9 major planets with 0.154 and 0.103 loading factors respectively.

When applying the Chinese remainder theorem to the design of letter-oriented minimal perfect hashing functions, we often encounter the intractable issue of extracting letters from the word sets to form distinct letter pairs, especially from large data sets. Chang and Shieh (1985) used a zero value rehash index to resolve the problem. They successfully applied the technique to rehash the 59 reserved words for data-flow language VAL, the 65 Z-80 commands, and the 256 frequently used words. Furthermore, Chang and Wu (1988) utilized the characteristics of Mandarin phonetic symbols to cluster the word set and then produced 1303 distinct letter pairs. The hashing scheme is introduced in the next section.

Mandarin phonetic symbols hashing scheme (Chang & Wu, 1988)

Chinese characters are constructed by 37 Mandarin phonetic symbols accompanied by one of the five tones. There are a total of 1303 distinct Mandarin phonetic transcriptions of Chinese characters. The phonetic symbols are divided into three categories: (1) the consonant, (2) the first vowel, and (3) the second vowel. For each symbol x in the symbol set, we have its order O(x). In the hashing scheme, Chang and Wu translate all the phonetic transcriptions to letter pairs of two phonetic symbols.

Chang and Wu (1988) then cluster all letter pairs according to the five tones. In each equal-tone cluster, letter pairs with the same leading character are further grouped together. We see that the maximum number of character pairs in one group might go up to 33. From the experiment, as applying the Chinese remainder theorem, this would make the constant C quite large. By dividing the character pairs into three sets, they thus can assign the least 11 prime numbers to the corresponding characters in each group of the three sets. The minimal perfect hashing function is defined as $H_j(L_{i1},L_{i2})=d_{jk}(L_{i1}) + C_{jk}(L_{i1}) \bmod p(L_{i2})$, where d_{jk} and C_{jk} are integer value functions of each L_{i1} in the k-th set of each j-tone cluster, and p is a prime number function of each L_{i2}. The total size of space used is 38*(3*(5*2+1)+3)+1303=2671, where 38 stands for 37 phonetic symbols and 1 dummy symbol; 3*(5*2+1) stands for d_{jk} and C_{jk} of 5 clusters and index k in three sets. The number 3 is for the functions O, p, and W. Thus, the loading factor is about 0.4878. If only the contiguous space is considered, the size of the space that is used becomes 38*3*14+1303= 2899; the loading factor is about 0.45.

Taiwanese phonetic transcriptions hashing scheme (Shieh, 2003)

The Taiwanese phonetic transcription system, referred to a traditional but representative and authoritative Taiwanese dictionary (Shen, 2001), is composed of 7 tones (Table 1), 15 consonants (Table 2), and 45 vowels (Table 3). Each Taiwanese phonetic transcription consists of a vowel, a consonant, and a tone. Theoretically there are a total of 4725 transcriptions. However, only 3028 of the transcriptions are associated with Han characters. Shieh (2003) takes these 3028 transcriptions as study word set.

Table 1: Taiwanese Seven Tones

Code k_{i1}	1	2	3	4	5	6	7
Tone	kun	kún	kùn	kut	kûn	kūn	ku̍t

Table 2: Taiwanese Fifteen Consonants

Code k_{i2}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Consonant	liú	pinn	kiû	khì	tē	phó	thann	tsan	ji̍p	sî	ing	mn̂g	gí	tshut	hí
Assigned Prime $P(k_{i2})$	2	3	5	7	11	13	17	19	23	29	31	37	41	43	47

Table 3: Taiwanese Forty-five Vowels

Code k_{i3}	Vowel	Code k_{i3}	Vowel	Code k_{i3}	Vowel	Code k_{i3}	Vowel	Code k_{i3}	Vowel
1	kun	10	kuan	19	kam	28	ka	37	kong
2	kian	11	ko	20	kue	29	ki	38	ḿ
3	kim	12	kiau	21	kang	30	kiu	39	muê
4	kui	13	ki	22	kiam	31	kenn	40	îng
5	ka	14	kiong	23	kau	32	kng	41	kiaunn
6	kan	15	kau	24	khia	33	kiô	42	tsim
7	kong	16	kai	25	kuè	34	kiunn	43	ngâu
8	kuai	17	kin	26	kam	35	kuan	44	kiann
9	king	18	khiong	27	ku	36	koo	45	kuan

Shieh handled 3028 distinct letter pairs of (k_{i1}, k_{i2}, k_{i3})'s, each with k_{i1} tones, k_{i2} consonants, and k_{i3} vowels. He sorted these letter pairs by their lexical orderings and then assigned each (k_{i1}, k_{i2}, k_{i3}) a unique address. According to k_{i1}, Shieh got seven groups and computed their starting addresses $d(k_{i1})$. For each group k_{i1}, based on 15 consonants, he produced 15 tone/consonant subgroups and computed their corresponding relative subgroup starting addresses $d_{ki1}(k_{i2})$. For each subgroup, there are at most 45 letter pairs. He clustered the subgroup into 5 bunches by $b(k_{i3})$ and also calculated each relative starting address $d_{ki1,ki2}(b(k_{i3}))$, where each k_{i1} is associated with $b(k_{i3})$. Then he sequentially assigned the least 9 prime numbers $P(k_{i3})$'s to k_{i3} cyclically in each tone/consonant/vowel cluster. Finally, for every cluster, he applied the Chinese remainder theorem to compute constant $C_{ki1,ki2}(b(k_{i3}))$ such that $C_{ki1,ki2}(b(k_{i3}))$ mod $P(k_{i3})$ equals the relative address of the cluster. The corresponding minimal perfect hashing function is defined as $H(k_{i1}, k_{i2}, k_{i3}) = d(k_{i1}) + d_{ki1}(k_{i2}) + d_{ki1,ki2}(b(k_{i3})) + C_{ki1,ki2}(b(k_{i3})) \bmod P(k_{i3})$. Totally, it takes 4235 spaces: 3028 for key words, 7 $d(k_{i1})$'s, 7*15 = 105 $d_{ki1}(k_{i2})$, 7*15*5 = 525 $d_{ki1,ki2}(b(k_{i3}))$'s, 7*15*5 = 525 $C_{ki1,ki2}(b(k_{i3}))$'s and 45 $P(k_{i3})$'s. The loading factor is 3028/4235 = 0.715.

Hakka phonetic transcriptions hashing scheme (Shieh & Hsu, 2007)
According the selected Meixian Hakka dialect dictionary, the Hakka phonetic transcription system is composed of 6 tones (Table 4), 17consonants (Table 5), and 72 vowels (Table 6). Each Hakka phonetic transcription consists of a tone, a consonant, and a vowel. However, only 1428 of the transcriptions are associated with Han characters. Shieh and Hsu took these 1428 transcriptions as study word set.

Table 4: Hakka Six Tones

Tone	Yin Ping	Yang Ping	Shang	Qu	Yin Ru	Yang Ru
Code k_{i1}	1	2	3	4	5	6

Table 5: Hakka Seventeen Consonants

Consonant	p	p'	m	f	v	t	t'	n	l	ts	ts'	s	k	k'	ŋ	h	Ø
Code k_{i2}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

Table 6: Seventy-three Vowels

Code k_{i3}	Vowel	Code k_{i3}	Vowel	Code k_{i3}	Vowel	Code k_{i3}	Vowel	Code k_{i3}	Vowel	Code k_{i3}	Vowel
1	i	13	eu	25	ok	37	e	49	ip	61	uo
2	au	14	uŋ	26	at	38	iap	50	əm	62	n
3	u	15	on	27	uk	39	iun	51	iai	63	uaŋ
4	oŋ	16	oi	28	ap	40	ot	52	ət	64	ep
5	a	17	en	29	it	41	iuk	53	ua	65	uat
6	o	18	iam	30	et	42	ʅ	54	uai	66	uet
7	ai	19	ui	31	ak	43	iet	55	uan	67	iut
8	un	20	aŋ	32	im	44	iak	56	ion	68	m
9	iau	21	iaŋ	33	iuŋ	45	iok	57	əp	69	iui
10	an	22	ien	34	ian	46	em	58	io	70	uen
11	in	23	ioŋ	35	ut	47	ən	59	uon	71	uak
12	am	24	iu	36	ia	48	iat	60	uoŋ	72	uok

They handled 1428 distinct letter pairs of (k_{i1}, k_{i2}, k_{i3})'s, each with k_{i1} tone, k_{i2} consonant, and k_{i3} vowel. Shieh and Hsu sorted these letter pairs by their lexical orderings and then assigned each (k_{i1}, k_{i2}, k_{i3}) a unique address. According to (k_{i1}, k_{i2}), they had 6*17 groups and compute their starting addresses $d(k_{i1}, k_{i2})$'s. Then, they assigned appropriate prime numbers $P(k_{i3})$'s for k_{i3}. Finally, for every group, they applied the Chinese remainder theorem to compute constant $C(k_{i1}, k_{i2})$ such that $C(k_{i1}, k_{i2})$ mod $P(k_{i3})$ equals the relative address of character pair (k_{i1}, k_{i2}, k_{i3}) in group headed with (k_{i1}, k_{i2}). The corresponding minimal perfect hashing function is defined as $H(k_{i1}, k_{i2}, k_{i3}) = d(k_{i1}, k_{i2}) + C(k_{i1}, k_{i2}) \bmod P(k_{i3})$. It takes 1704 spaces: 1428 key words, 6*17 $C(k_{i1}, k_{i2})$'s, 6*17 $d(k_{i1}, k_{i2})$'s, and 72 $P(k_{i3})$'s. The loading factor is 1428/1704=0.838.

The Unified Phonetic Transcription Design
Hashing Function Design
The unified Mandarin, Taiwanese and Hakka Romanized phonetic transcription is composed of 7 tones (Table 7), 29 consonants (Table 8), and 120 vowels (Table 9) associated with a prime number $P(k_{i3})$. Each phonetic transcription (k_{i1}, k_{i2}, k_{i3}) consists of a tone ki1, a consonant k_{i2}, and a vowel k_{i3}. There are totally 24360 combinations of (k_{i1}, k_{i2}, k_{i3})'s. According to our further analysis, we worked out that we can use exactly 4135 phonetic transcriptions to associate their corresponding Han characters.

Table 7: Tones

Tone	1	2	3	4	5	7	8

Code k_{i1}	1	2	3	4	5	6	7

Table 8: 29 Consonants

Consonants	b	c	ch	chi	d	f	g	h	j	ji	k	kh	l	m	n
Code k_{i2}	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Consonants	ng	p	ph	r	s	sh	shi	t	th	ts	tsh	tz	v	null	
Code k_{i2}	16	17	18	19	20	21	22	23	24	25	26	27	28	29	

Table 9: 120 Vowels

Vowel	Code k_{i3}	$P(k_{i3})$	Vowel	Code k_{i3}	$P(k_{i3})$	Vowel	Code k_{i3}	$P(k_{i3})$
a	1	2	iat	41	2	mh	81	2
ah	2	3	iau	42	3	ng	82	3
ai	3	5	iauh	43	5	ngh	83	5
ainn	4	7	iaunn	44	7	o	84	7
ak	5	11	ie	45	11	oh	85	11
am	6	13	iem	46	13	oi	86	13
an	7	17	ien	47	17	ok	87	17
ang	8	19	iet	48	19	on	88	19
ann	9	23	ieu	49	23	ong	89	23
annh	10	29	ih	50	29	onn	90	29
ap	11	31	ii	51	31	onnh	91	31
at	12	37	iim	52	37	oo	92	37
au	13	41	iin	53	41	ot	93	41
auh	14	43	iip	54	43	ou	94	43
aunn	15	47	iit	55	47	u	95	47
aunnh	16	53	ik	56	53	ua	96	53
e	17	59	im	57	59	uah	97	59
eh	18	61	in	58	61	uai	98	61
ei	19	67	ing	59	67	uainn	99	67
em	20	71	inn	60	71	uan	100	71
en	21	73	innh	61	73	uang	101	73
eng	22	79	io	62	79	uann	102	79
enn	23	83	ioh	63	83	uat	103	83
ennh	24	89	iok	64	89	ue	104	89
ep	25	97	ion	65	97	ueh	105	97
er	26	101	iong	66	101	uei	106	101
et	27	103	iou	67	103	uen	107	103
eu	28	107	ip	68	107	uenn	108	107
i	29	109	it	69	109	uet	109	109
ia	30	113	iu	70	113	uh	110	113
iah	31	127	iuan	71	127	ui	111	127
iai	32	131	iue	72	131	uih	112	131
iak	33	137	iuh	73	137	uinn	113	137
iam	34	139	iui	74	139	uk	114	139
ian	35	149	iuk	75	149	un	115	149
iang	36	151	iun	76	151	ung	116	151
iann	37	157	iung	77	157	uo	117	157
iannh	38	163	iunn	78	163	ut	118	163
iaong	39	167	iut	79	167	yu	119	167
iap	40	173	m	80	173	Null	120	173

We handle 4135 distinct letter pairs of (k_{i1}, k_{i2}, k_{i3})'s, each with k_{i1} tone, k_{i2} consonant, and k_{i3} vowel. We sort these letter pairs by their lexical orderings and then assign each (k_{i1}, k_{i2}, k_{i3}) a unique address. According to (k_{i1}, k_{i2}), we have 7*29 groups and compute their starting addresses $d(k_{i1}, k_{i2})$'s. There are at most 120 characters k_{i3} in each group (k_{i1}, k_{i2}). Then, we heuristically assign appropriate prime numbers $P(k_{i3})$'s for k_{i3}. Finally, for every group, we apply the Chinese remainder theorem to compute constant $C(k_{i1}, k_{i2})$ such that $C(k_{i1}, k_{i2})$ mod

$P(k_{i3})$ equals the relative address of character pair (k_{i1}, k_{i2}, k_{i3}) in group headed with (k_{i1}, k_{i2}). The corresponding minimal perfect hashing function is defined as $H(k_{i1}, k_{i2}, k_{i3}) = d(k_{i1}, k_{i2}) + C(k_{i1}, k_{i2}) \bmod P(k_{i3})$.

The hashing function design of the unified phonetic transcription is summarized as follows:
Step 1: Using tone k_{i1}, consonant k_{i2} and vowel k_{i3} , we can have 4135 distinct letter pairs (k_{i1}, k_{i2}, k_{i3}). We sort them in their lexical orders and assign each a unique address.
Step 2: We allocate each (k_{i1}, k_{i2}) group a $d(k_{i1}, k_{i2})$, the first address of the letter pairs headed with (k_{i1}, k_{i2})'s.
Step 3: Associated with each group (k_{i1}, k_{i2}), we assign each (k_{i1}, k_{i2}, k_{i3}) a relative address.
Step 4: We assign appropriately the prime numbers $P(k_{i3})$'s to k_{i3}.
Step 5: Consider the letter pairs (k_{i1}, k_{i2}, k_r), $1 \le r \le n$, with the same (k_{i1}, k_{i2}), that is they are in the same group (k_{i1}, k_{i2}), and the corresponding assigned prime numbers of k_r's are $P_1, P_2, \ldots, P_n$, where $P_1 < P_2 < \ldots < P_n$. Applying the Chinese remainder theorem to find a constant $C(k_{i1}, k_{i2})$ such that $C(k_{i1}, k_{i2}) \equiv 1 \bmod P_1$, $C(k_{i1}, k_{i2}) \equiv 2 \bmod P_2$, …, and $C(k_{i1}, k_{i2}) \equiv n \bmod P_n$. Our proposed minimal perfect hashing function is simply defined as $H(k_{i1}, k_{i2}, k_r) = d(k_{i1}, k_{i2}) + C(k_{i1}, k_{i2}) \bmod P(k_r)$. The values of all $C(k_{i1}, k_{i2})$'s are illustrated in the Appendix.

Loading Factor Comparisons

Loading factor is used to measure the efficiency of memory usage in hashing design. It is defined as a ration of the number of data and the total size of memory used. The loading factor of the hashing function designed in this paper is derived as follows: (1) Used spaces, 4135 key words, 7*29 $C(k_{i1}, k_{i2})$'s, 7*29 $d(k_{i1}, k_{i2})$'s, and 120 $P(k_{i3})$'s. We take 4661 spaces in total. (2) The loading factor is 4135/4661=0.887. The following table (Table 10) shows the loading factors of various minimal perfect hashing functions designed for diverse word sets by the Chinese remainder theorem. Obviously, it can be shown that our hashing function is superior to others.

Table 10: Comparisons of Loading Factors

Word Sets	Loading Factor	
Names of 12 months	0.154	Chang & Lee, 1986
59 VAL reserved words	0.312	Chang & Shieh, 1985
65 Z-80 commands	0.263	Chang & Shieh, 1985
256 frequently used words	0.472	Chang & Shieh, 1985
1303 Mandarin phonetic transcriptions	0.448	Chang & Wu, 1988
3028 Taiwanese phonetic transcriptions	0.715	Shieh, 2003
1428 Hakka dialect phonetic transcriptions	0.838	Shieh & Hsu, 2007
4135 unified Mandarin, Taiwanese and Hakka phonetic transcription	0.887	This paper

Number C Analysis

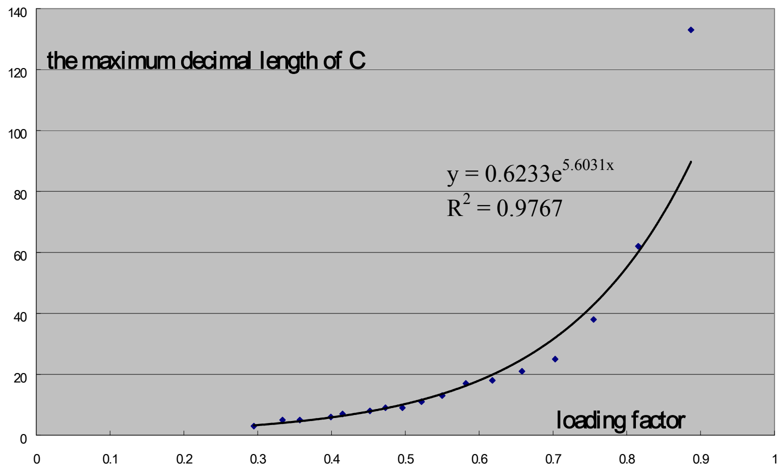
The numbers C's are the most intractable ones as applying the Chinese remainder theorem to design hashing functions for data sets. On observing variations of C's resulted by the experimental designs for the unified Romanized phonetic transcriptions, we have concluded that the size of C is dependent on the number of associated primes that we have used in each vowel group. In fact, during the hashing design, we can group k_{i3}'s vowels for each (k_{i1}, k_{i2}) in different sizes to have alternate C's results. The smaller size each vowel group has, the smaller constant C we result. However, what we should pay for is loading factor. There is a tradeoff between the size of constant C and the loading factor. The following table (Table 11) shows the experiments.

Table 11: The C's and Loading Factors of Different Groups

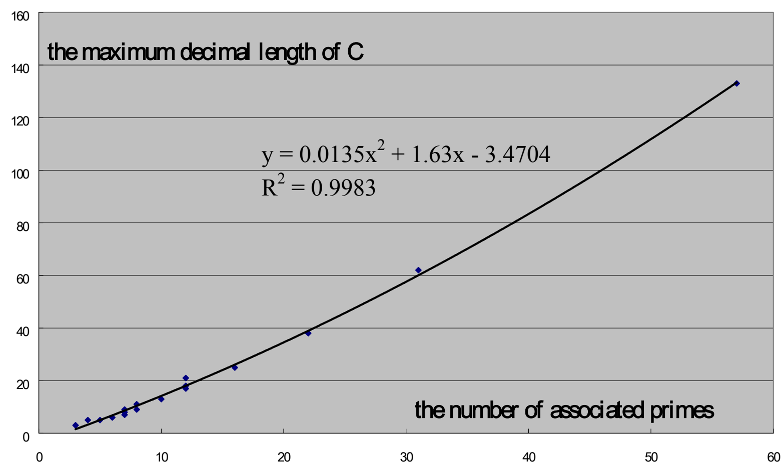
Number of vowel groups	Number of associated primes	Loading factors	The maximum length of C's
1	57	0.887	133
2	31	0.816	62
3	22	0.755	38
4	16	0.703	25
5	12	0.658	21
6	12	0.618	18
7	12	0.582	17
8	10	0.550	13
9	8	0.522	11
10	7	0.496	9
11	8	0.473	9
12	7	0.452	8
14	7	0.415	7
15	6	0.399	6

18	4	0.357	5
20	5	0.334	5
24	3	0.295	3

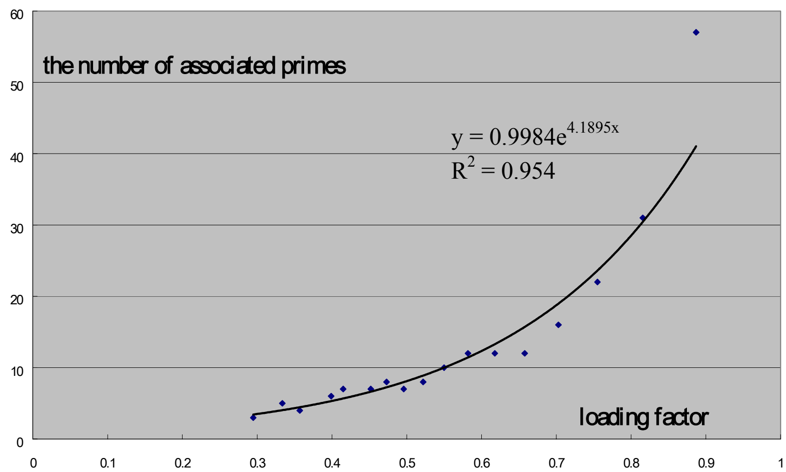
Next, we apply the statistical regression analysis to the experimental data to profile the correlations between the above parameters: loading factor vs. the decimal length of constant C, the number of associated primes vs. the decimal length of C and loading factor vs. the number of associated primes. The results are shown in the following Figure 3, where R^2 is the coefficient of determination and its value is between 0 and 1.



(a) Loading factor and the maximum decimal length of C



(b) The number of associated primes and the maximum decimal length of C



(c) Loading factor and the number of associated primes

Figure 3: The Regression Analysis of Effective Factors .

What the preferred situation is to have high loading factor with short decimal length of C. However, from the regression analysis, we have the fact that there is a tradeoff between two parameters. This will give us the concrete suggestion as we apply the unified phonetic transcription on diverse learning and teaching devices.

CONCLUSIONS

With the unified phonetic transcription system for mapping Mandarin, Taiwanese and Hakka mother tongue languages to their Han characters, people will be convenient to promote their learning and teaching activities, as well as to record and preserve their particular cultures. In this research, we have successfully applied the Chinese remainder theorem to design a novel minimal perfect hashing function for 4135 integrated Mandarin, Taiwanese and Hakka Romanized phonetic transcriptions of Han characters. We have achieved significant results in terms of loading factors. We further give experimental investigation and mathematical regression analysis for considered factors of hashing effectiveness. We get the conclusion that the size of number C is dependent on the number of associated primes. For the unified Romanized phonetic transcriptions case, we propose the grouping technique to promote the effective applications as concerning the practicability of accessing constants C's. However, we have explored that there is a tradeoff between the loading factor and the size of C. The unified phonetic transcription can be used to promote Chinese mother tongue languages applications and can be applied as a tool to popularize digital learning of the languages further.

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Appendix: The Values of $C(k_{i1}, k_{i2})$'s

Tonek$_{i1}$	Vowel k$_{i2}$	*d* Address	C(k$_{i1}$, k$_{i2}$) Value
1	1	0	64944529802520314615071967316445377
1	3	18	22072260041420641168670456121911469647357
1	4	37	2341262191069822373794511463164075
1	5	51	17826075993273201357220661350819824012907
1	6	70	36750251768899802683830396935
1	7	84	853423971975501060369045480800064457
1	8	102	3230888234697313835737580133054940934078475906950640513415884192033547021854450796594050419155655911774608617063627
1	9	153	2811216111161579226740265389366581840581217
1	10	173	2341262191069822373794511463164075
1	11	187	55806471626116507741506184193402139761763449148176938660322244270242937251421132853009341113616024428807332733392463007
1	12	239	59928711375561357894756570673864159244561695449833894341282590670541979389250807654745457
1	13	279	241972173536501632177711495963098094491535508582132838475657383488099190217
1	14	313	397741827817089411786588317469334870967845192212767
1	15	339	696097658238809533265458610083531288767
1	16	359	837645492417954537087209440
1	17	371	9256816887250690574107803504585337791212251648534025093024420752547647
1	18	403	53029176958893610960599612722517469788043181707822176722777
1	19	430	1
1	20	431	9139333575553435344217573681380336055117755848887409600788146471592850011562821340368831324944895896180387845109617
1	21	482	295741854374958593532533406802157
1	22	498	2341262191069822373794511463164075
1	23	512	71078163204701162494320127676529158963307127236180232942362905093585975451695572232441855417
1	24	554	10159740356428895920107347265669280117663964827424965345545544520122099986242077
1	25	590	256808312066942997881872814629790501278713140659136804342724010725665779078765660014407226390607862742466451591047
1	26	640	496491340738588531454645931319774000664394565338843097797541044913863962802531791645790796217
1	27	682	71711593239345115255790093017
1	28	696	12678327602740390681
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2	3	784	4081499448220247076582253363034397

2	4	800	22492123753135128914677172498929
2	5	813	18918548605449
2	6	820	15656398053976404884240051025293
2	7	835	32478880744933868806045498990713283027
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2	10	908	46991006860557
2	11	914	78393788072040545161479883632339493312614494804521543383818411446409126296404252400573506901816689336887
2	12	960	7712718818069213264262424523835158900799430218587906050597966600767581607
2	13	993	1514316853780982837710041954454136582163357047154489327522740884312427908550466792087
2	14	1031	4659130194219555724727590242215279123970263126843386987416675537
2	15	1062	15976545590443589577964218020515479236044241387594606870299138871861
2	16	1094	188459278322167127153310528405995558315107
2	17	1113	7703351501819123908547394978381198438297936947366177839853089887
2	18	1143	33551547097592679892970230932194841
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2	22	1219	8100153285279498757088758568809
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2	28	1390	1610599946459446681057
2	29	1400	1083206920889392469867123942521147945249568040525746241590711566913726029550632193205119638976243974173060877007869777
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3	3	1466	322241013048720509746348605415
3	4	1481	38996819222356748983769636
3	5	1492	1283654813299438293278779569397703907
3	6	1510	12944896164105491213843598330327
3	7	1526	115686602028041351850558986590963196427080136
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3	16	1790	129857631503867593810398312613400562127
3	17	1809	13242427544888002817143591221268516400798447700959730454708332410405727
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4	23	2678	56489372725693140581528568809536440159445884725284672118178475285043823045997390009233428753
4	24	2721	619401890263600802564735186852281568028143620
4	25	2742	15994428068795413828218144417715498169511362061528447687174623669850044300383819359940711176127
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4	28	2822	5257164150129
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5	4	2905	1
5	5	2906	1
5	6	2907	338826979773502888683565267
5	7	2921	546346856133854386461919403582789822821185162228595017
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5	17	3194	166952119380130192967631028436272861175018316020 7
5	18	3217	39456471054531983303920781002795535348650486549280944903607
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5	21	3285	31790087
5	22	3287	1
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5	27	3440	1
5	28	3441	628460247148862403 6687
5	29	3452	10635120913382026068213653618211059095557541333041118183268416172585224888185959625486255 84587
6	1	3494	99129192404303269436694056506835422714 3
6	7	3512	1893356130451776040543074010092765 17
6	8	3529	1524817751545235818196122522779085103067082177245 19932343078540547
6	9	3559	77231424308070559
6	11	3566	59401758626585618088870537074886995150214030086871800571087
6	12	3592	35412161870767049414814
6	13	3602	1522525697674741080103176998268905023366602539287170193797867
6	14	3630	10326977934158301764669 38
6	15	3641	28957850334195586632265 7
6	16	3653	3006263
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6	25	3772	9627014677185898406282200050135665841754518693784395117178697103 2177
6	26	3803	80112836839824269512341 7
6	29	3816	518981313450746323634795704081062732948640388230955165947293660127 3
7	1	3846	21464379162989113065268673575923 7
7	6	3861	182287063653
7	7	3866	50681484602829005943633225742 01

7	8	3879	73682591563608850472748865300829284731733
7	9	3898	3452032766467
7	11	3903	124403403267415881506160389626
7	12	3916	4935409942089541429388313310860735781
7	13	3933	448262844756617376732919993147055527267577256535570497949
7	14	3959	25629913937977764131711391
7	15	3971	1661275737352881
7	16	3978	1456363052715719456
7	17	3986	12172994738807119694929487674
7	18	3999	16222681315494410513594737121487
7	20	4013	3718892506217348358334646674903246426744707814296385
7	23	4036	7166523818239668976161736537297480181038766848
7	24	4057	200218239419106128490513795004
7	25	4071	161345243787280869196121178765709531548367864303581037
7	26	4095	33287520344187096554000336156494463862
7	28	4112	175858486
7	29	4116	10966326177647918930460307313434677092766934

TPACK: AN EMERGING RESEARCH AND DEVELOPMENT TOOL FOR TEACHER EDUCATORS

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ABSTRACT
TPACK (technological pedagogical content knowledge) has emerged as a clear and useful construct for researchers working to understand technology integration in learning and teaching. Whereas first generation TPACK work focused upon explaining and interpreting the construct, TPACK has now entered a second generation where the focus is upon using the construct in both research and development projects. In this paper, the TPACK construct is defined and several current research and development projects that use the TPACK framework are described. The strength of the TPACK framework in research and evaluation work in technology integration is discussed, along with future directions for this work.

INTRODUCTION
TPACK (technological pedagogical content knowledge) has emerged as a clear and useful framework for researchers working to understand technology integration in learning and teaching. Building on Shulman's (1986) idea of PCK, Mishra and Koehler (2006) added technology to PCK and described the resulting TPCK as the interweaving of technology, pedagogy, and content. Renamed TPACK (technological pedagogical content knowledge), the combination of subject content, pedagogical, and technological knowledge "form an integrated whole, a 'Total PACKage'" (Thompson & Mishra, 2008, p. 38). TPACK is a framework that focuses on the complex interactions between a teacher's knowledge of content (CK), pedagogy (PK), and technology (TK). The combination of technology with pedagogy in a particular subject area must take into account the dynamic intersections such as TPK (technological pedagogical knowledge), PCK (pedagogical content knowledge), and TCK (technological content knowledge). A teacher who can navigate between these interrelations acts as an expert who is different than a sole subject matter, pedagogy, or technology expert (Mishra & Koehler 2006).

TPACK explains that teachers are able to make sensible and creative choices in their use of technology in the classrooms. Whereas first generation TPACK work focused upon providing a theoretically grounded definition of TPACK (Mishra & Koehler, 2006), explaining and interpreting the construct and discussing characteristics of TPACK and TPACK in different content areas (AACE, 2008), TPACK has now entered a second generation in which the focus is upon using the construct in both research and development projects (Thompson & Schmidt, 2010). In this paper a review is presented followed by a definition of the TPACK construct and then illustrations of several recent exemplary current research and development projects that use TPACK as a framework. The paper concludes with a discussion of promising future directions for this work.

TPACK (Technological Pedagogical Content Knowledge)
With the emergence of digital technologies, technology has become an indispensible part of educators' and students' lives, changing the way teachers and students interact and learn in a technology-rich environment. Early attempts at technology integration treated technology as an entity that needed to be learned separately from pedagogy and content. This notion was reflected in preservice and inservice teacher education programs, which maintained isolated technology courses or workshops that focused upon technologies separate from content and pedagogies in teaching contexts. Recently, however, arguing a need for a situated teacher knowledge required for effective technology integration, researchers have started using TPACK as a framework for designing and developing programs to equip teachers with a more interconnected knowledge that is concentrated on student

learning in various content areas—technological pedagogical content knowledge (American Association of Colleges of Teacher Education, Committee on Innovation and Technology, 2008).
TPACK is a theoretical framework for understanding teacher knowledge required for effective technology integration (Mishra & Koehler, 2006). The TPACK framework was proposed in order to emphasize the need to situate technology knowledge within content and pedagogical knowledge. TPACK considers teachers' knowledge as complex and multifaceted, critiquing techno-centric approaches that focus on the attainment of technology skills separate from pedagogy and content.

TPACK acts as a useful framework for thinking about what knowledge teachers must have to integrate technology into teaching and how they might develop this knowledge. It recognizes the unique and interactive roles that content, technology, and pedagogy play in authentic teaching and learning environments and suggests the consideration of "an emergent form of knowledge" that goes beyond content, technology, and pedagogy alone (Mishra & Koehler, 2006, p. 1028). Seven components (see Figure 1) are included in the TPACK framework. They are defined as:

1. Technology knowledge (TK): Knowledge about various technologies, ranging from low-tech technologies, such as pencil and paper, to digital technologies, such as the Internet, digital video, interactive whiteboards, and software programs.
2. Content knowledge (CK): Knowledge about the actual subject matter that teachers must know about to teach.
3. Pedagogical knowledge (PK): Knowledge about the methods and processes of teaching such as classroom management, assessment, lesson plan development, and student learning.
4. Pedagogical content knowledge (PCK): Knowledge that deals with the teaching process (Shulman, 1986). Pedagogical content knowledge is different for various content areas, as it blends both content and pedagogy with the goal to develop better teaching practices in the content areas.
5. Technological content knowledge (TCK): Knowledge of how technology can create new representations for specific content.
6. Technological pedagogical knowledge (TPK): Knowledge of how various technologies can be used in teaching.
7. Technological pedagogical content knowledge (TPACK): Knowledge required by teachers for integrating technology into their teaching in any content area. Teachers, who have TPACK, act with an intuitive understanding of the complex interplay between the three basic components of knowledge (CK, PK, TK).

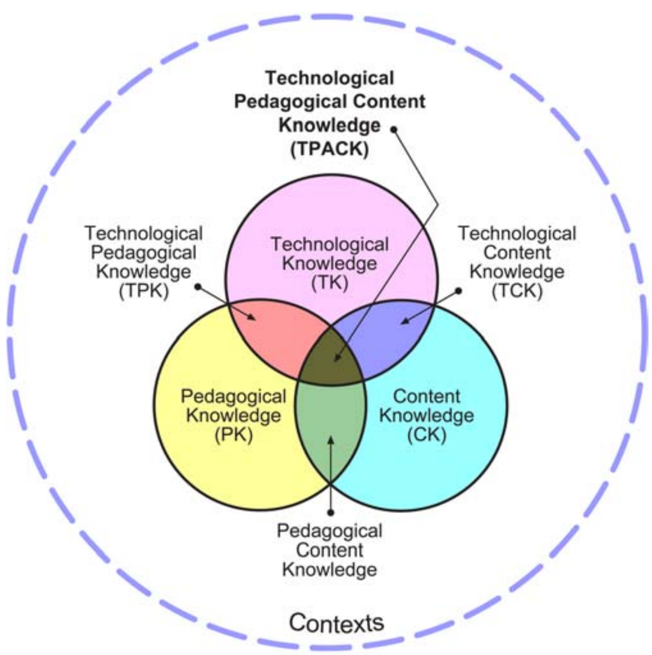

Figure 1: The components of the TPACK framework (graphic from TPCK - Technological Pedagogical Content Knowledge, 2010).

TPACK Survey Research

Building on a history of using survey methods to assess teachers' levels of technology integration, researchers have created survey instruments that assess preservice teachers' and in-service teachers' levels of TPACK. Existing surveys have tended to focus on teachers' self-assessment of their levels of technology use (e.g., Keller, Bonk, & Hew, 2005; Knezek & Christiansen, 2004). Following the development of the TPACK framework, researchers began to work on the problem of assessing both preservice and inservice teachers' levels of TPACK (Archambault & Crippen, 2009; Koehler & Mishra, 2005). Using the TPACK framework to guide the research design, Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009) developed an instrument with the purpose of measuring preservice teachers' self-assessment of their TPACK and related knowledge domains included in the framework.

The purpose of developing the instrument in the Schmidt et al. (2009) study was to use it to assess the development of TPACK in an introductory preservice teacher technology course in a longitudinal research study. Data are being gathered at specific checkpoints during the preservice teachers' preparation program. As part of this study, preservice teachers are being tracked during their teacher education program and asked to complete the survey after completing their instructional technology course, methodology courses (e.g., literacy, science, social studies, mathematics) and student teaching. Additional qualitative research studies are also being conducted to examine how these same preservice teachers demonstrate TPACK-related tendencies in PreK–6 classrooms during practicum and student teaching experiences. The research group has currently completed the first steps in the 3- to 5-year longitudinal research project by collecting the survey data from preservice teachers who took the technology integration course. These findings of preservice teacher classroom behavior will be compared with how they respond to the survey at various times during their preparation program.

The results reported below use the data gathered at the beginning and end of two semesters (Fall 2008 and Spring 2009) when about 180 preservice teachers were enrolled in an introductory instructional technology course. This stage of the research project, Phase 2, included two major goals: to continue the validation of an instrument that would help in predicting preservice teachers' classroom behaviors related to TPACK and to collect baseline data to provide a comparison for assessing preservice teachers' understanding and application of TPACK during their preparation program. Schmidt et al. (2009) provided a description of the instrument's initial development and validation process in detail (Phase 1 of instrument validation).

Overall reporting of the results indicated there were significant increases between the respondents' pre- and posttest means for all seven TPACK subscales (see Table 1). The differences were substantial for TK, PK, TCK, TPK and TPACK subscales as the effect sizes were greater than 0.5. The remaining four TPACK subscales all addressed participants' understanding of content knowledge (in literacy, math, science and social studies).

Table 1: T-test results for pre- and post-test mean score responses for TPACK subscales

TPACK subscale	Pretest: *M* (*SD*)	Posttest: *M* (*SD*)	Matched-pair *t* (*df* = 179)	*p* value	Cohen's *d*
TK (6 items)	3.52 (0.66)	3.85 (0.58)	8.95	<.001***	.67
CK					
Mathematics (3 items)	3.64 (0.68)	3.82 (0.69)	4.06	<.001***	.30
Literacy (3 items)	3.86 (0.54)	4.07 (0.48)	5.64	<.001***	.42
Science (3 items)	3.60 (0.61)	3.74 (0.55)	3.80	<.001***	.28
Social Studies (3 items)	3.74 (0.66)	3.90 (0.61)	3.75	<.001***	.28
PK (7 items)	3.71 (0.52)	4.04 (0.44)	9.71	<.001***	.72
PCK (4 items)	3.64 (0.61)	3.88 (0.57)	5.29	<.001***	.39
TCK (4 items)	3.20 (0.74)	4.08 (0.51)	14.39	<.001***	1.07
TPK (9 items)	3.85 (0.51)	4.23 (0.45)	9.06	<.001***	.67
TPACK (4 items)	3.43 (0.69)	4.03 (0.54)	10.77	<.001***	.80

***$p < .001$.

TPACK has the potential to provide a new framework for developing learning experiences for future teachers. Through developing and using the TPACK instrument, work to operationalize the TPACK concept for teacher educators and preservice teachers is progressing. Using this instrument and related classroom behavior measures, feedback is provided to both students and teacher educators on the impact of teacher education experiences in the development of TPACK. Ultimately, the assessment of TPACK can provide information that will help design TPACK learning experiences throughout teacher education programs.

Currently, work in Taiwan is expanding the TPACK survey work to answer questions about effective technology use in teacher education programs and the impact of technology modeling use in the teacher preparation stage on teachers' TPACK development when they enter their professional teaching career.

TPACK as a Tool for Modeling Research

The study conducted in Taiwan examined the relationship between the degree of technology modeling uses during the teacher preparation stage and the development of early childhood teachers' TPACK in Taiwan. In this study, Schmidt et al.'s (2009)' TPACK survey instrument was translated and adapted to fit into the existing context for early childhood teachers in Taiwan. After a rigorous pilot test, Chinese TPACK questionnaire items with good validity and reliability were developed (Chuang & Ho, 2010). The purpose was to explore the relationship between five technology modeling uses in early childhood preservice teacher education program and the early childhood teachers' present TPACK knowledge. A wide range of technology modeling uses was incorporated based on related literature, the specific situation of technology use in higher education in Taiwan, and consultation from the field experts. Five items were formed to be included in the technology use modeling section in the survey instrument. These items are: (a) the use of information technology (IT) hardware and software in teaching and learning, (b) the use of digital materials and multimedia educational software, (c) the use of online course platforms, (d) the use of online assessment, and (e) the use of CMC (computer-mediated communication) tools to facilitate interactions among learners and instructors.

Quantitative data were collected from a sample of 335 inservice early childhood teachers in Taiwan. Follow-up interviews were also conducted with 5 survey respondents. The interview protocols were developed based on the five technology modeling uses to gather richer and more detailed responses, probe for further information, and clarify any confusing issues regarding the five technology modeling uses in early childhood teacher education. Pearson correlation and multiple stepwise regression analyses were conducted with the early childhood teachers' self-assessed TPACK as the dependent variable and the five technology modeling uses by the teacher educators as the potential predictors. Qualitative data were transcribed and analyzed by the constant comparative method (Lincoln & Guba, 1985). First, the interview transcriptions were coded. Then the coded segments were constantly compared within the interview contents, and finally, the concepts and themes were compared across interviews until recurring themes emerged.

Quantitative data analysis results showed that the extent of the five technology modeling uses during the teacher preparation stage had a mean of 3.57 (SD = 0.74) on a 5-point Likert-type scale, indicating middle level exposure to technology use modeled by teacher educators for this group of early childhood teacher respondents. Furthermore, respondents' self-assessed TPACK and the extent of the five technology modeling uses during the teacher preparation stage was significantly correlated at the 0.01 level with the Pearson product–moment correlation (r) ranging from .4 to .628. In addition, a summary of stepwise regression results indicated that two technology modeling uses were significant predictors of the TPACK measure ($p < .001$). These two variables were (a) the use of CMC tools, such as e-mail, blogs, and web discussion forums, to facilitate interactions among learners and instructors and (b) the use of digital materials and multimedia educational software. The strongest predictor was the use of CMC, such as e-mail, blogs, and web discussion forums to facilitate interactions among learners, which accounted for 33.1% of the variance (see Table 2).

Table 2: Summary of stepwise regression results for TPACK measures

Model	R	R^2	Adjusted R^2	F	B	Beta (β)
1	.575[a]	.331	.329	164.480***	2.415	.389
2	.605[b]	.366	.362	95.803***	1.693	.265

[a]Predicator (constant): the use of CMC tools. [b]Predicator (constant): the use of CMC tools, the use of digital materials and multimedia educational software; [c]Dependent measures: TPACK.
***$p < .001$.

A careful examination of the qualitative data identified major themes that illustrate the technology modeling uses during early childhood teachers' teacher education. Those themes include the transfer of the modeling experiences to teachers' current teaching practice and reflection on the selection of appropriate technology uses for young children.

Transfer of the Modeling Experiences to Teachers' Current Teaching Practice

The social learning theory of Bandura (1977) emphasizes the importance of observing and modeling the behaviors, attitudes, and emotional reactions of others. Specifically, it focuses on the learning that occurs within a social context and considers that people learn from one another. Efforts to model how these technology-enhanced modeling lessons are used to support instructional objectives in the teacher preparation stage may result in stronger beliefs about the value of technology for teaching and learning. In turn, these stronger beliefs are more likely to translate into more frequent use of technology once a preservice teacher enters the profession. For instance, in this study, teachers mentioned that they learned to use digital picture books available on the web. One of the teachers indicated how she used to think that the Internet was for only older children and teenagers. However, when her professor guided them around several websites containing digital picture books with vivid animations and narrations, she witnessed how children of different learning styles attentively reacted to the multimedia digital picture books in their learning preferences. As a result, her professor's model had a big impact on the way she thinks about "reading" to young children. Another teacher recalled that she was really inspired by one of the teaching demonstrations on the web in one of her courses in the teacher education program where the teacher collaborated with the students to create a digital class book introducing vehicles. She has tried that idea several times in her own class with young children and with different topics.

Reflection on the Selection of Appropriate Technology Uses for Young Children

Teachers tend to teach the way they were taught. Teachers' attitude and behavior towards technology use in educational environments are highly influenced by their experiences regarding the perceived benefits of the adoption of educational technology use. Research has emphasized the importance of teacher education faculty modeling use of technology in the teacher preparation programs for the development of future teachers' confidence, attitudes, and adoption of technological innovations in the K–12 classroom (Adamy & Boulmetis, 2005; Pope, Hare, & Howard, 2002). In social learning theory, Bandura (1977) categorized the influences on human social behavior as personal, environmental, and behavioral factors. According to this theory, modeling serves an informational function by which observers cognitively organize and rehearse the observed movements and later translate the encoded information into action. As such, PowerPoint is one example. According to the interview data, PowerPoint is probably the most commonly used software application in the college classroom. Several of the early childhood teachers mentioned that they know that the way PowerPoint is used at college should be different from that in the kindergarten classroom. One said that the purpose of PowerPoint at the college level is to highlight key points of text in a lecture; however, in her own case she used PowerPoint to provide multimedia visual aids. She indicated,

> Graphics and illustrations are critical components at the stage of child development. I will not use PowerPoint the way I experienced at college. However, those experiences [at college] make me think how I can use them most appropriately for young children.

Others also commented that observing the professors' use of technology in the classroom was a starting point for them to reflect on the use of technology with young children in their classroom.

The teachers' reflection on the use of PowerPoint with young children is an example of a meaningful level of TPACK in early childhood classroom and also illustrates that teachers' professional development in technology integration should go beyond traditional technological skills. To teach with technology emphasizes the rich connections between content, pedagogy, and technology in a context. The professor's modeling of the use of PowerPoint provoked thoughts that showed a shift towards developing TPACK for early childhood teachers.

Results from this study reinforce and validate the significance of the effect of technology modeling in the teacher preparation stage. In addition, it echoed findings from previous research from Preparing Tomorrow Teachers to Use Technology (PT3) grant projects on the positive effects of modeling in technology use and integration in teacher preparation courses for preservice teachers' future use of technology in their professional career in K–12 schools (Adamy & Boulmetis, 2005; Casey & Casey, 2004).

TPACK in Development Work

The TPACK framework currently is being used in several projects aimed at improving technology integration work, both in K–12 classrooms and in teacher education programs. The framework provides a useful planning tool for work with faculty members and teachers in the area of technology integration. Whereas earlier faculty and teacher development work in the area of technology tended to focus upon learning the technology, the TPACK framework provides a structure to organize the development work around pedagogy and content as well as the technology. Harris, Mishra, and Koehler (2009) articulated:

> Typical approaches to technology-related professional development are based on the assumptions that it may be enough to just expose teachers to particular educational technologies and possible curriculum-based uses of those tools and resources. Approaches that teach only skills (technology or otherwise) are insufficient. Learning about technology is different than learning what to do with it instructionally. (p. 402)

In one of the most widely known development initiatives, researchers are using an activity-type approach to use TPACK to help teachers effectively integrate technology into their particular content area (Harris & Hofer, 2009). The focus of the research is upon teacher planning, and it encourages teachers to focus upon the content of their lessons as the starting point for technology integration. The activity-type work includes careful descriptions of the major activity types teachers use in each of the major content areas. Activity types focus upon what students will be doing in a lesson and include a wide range of activities such as role playing, answering questions, or taking a field trip. For their work, Harris and Hofer have created taxonomies of activity types in different content areas. Each of the activity types is then analyzed in terms of potential technology tools that might prove useful within that activity type (Harris et al., 2009). Teachers are encouraged to plan by beginning with content goals for instruction and then moving to activity types that will support these goals. Only after these decisions are made does technology enter the picture. More information and related articles about this innovative approach can be found at the *Welcome to the Learning Activity Types Wiki!* (n.d.) website.

A second practitioner-oriented approach to TPACK comes from the GeoThentic Project (2008), a National Geographic-sponsored project based in TPACK that creates opportunities for students and teachers to use geo-spatial technologies to solve complex and authentic problems within an online environment. Teacher TPACK assessment and development are integral parts of this project (Doering, Veletsianos, Scharber, & Miller, 2009).

At Arizona State University, researchers have created a faculty development program based in TPACK that helps faculty design uses of Web 2.0 and social networking capabilities for their teacher education courses. Results from this work suggest that faculty members appreciate the focus upon content and pedagogy, as well as technology, and that in some cases, faculty are altering their content and/or pedagogy as a result of the affordances of the technology (Archambault, Wetzel, Foulger, & Williams, 2010). The TPACK framework for this work has helped move the focus from using social networking tools to designing uses of social networking tools that enhance content and pedagogy.

At Iowa State University, TPACK is used as the framework for the introductory technology course taken by all preservice teachers. This course has been taught in the preservice teacher education program at Iowa State University for more than 25 years. In the early years, the course focused on teaching preservice teachers to use computers and computer-related technologies. In recent years, the focus has changed to that of helping preservice teachers design and implement content-based lessons and units using technology. Students become skilled at identifying the pedagogy and content they will include in a lesson and focus upon ways technology can provide affordances for different contents and pedagogies.

Similarly, some K–12 school districts in the United States are finding the TPACK framework useful for designing and structuring their technology integration programs. One particularly interesting piece of news is that San Diego Unified School District has recently adopted TPACK in their 5-year technology plan (Devaney, 2009).

CONCLUSIONS

The enthusiasm among both researchers and practitioners for the TPACK framework has been very strong in the United States. The framework has provided a valuable tool, both for designing teacher education experiences and for assessing teacher knowledge in the area of technology integration. The TPACK survey described in this paper provides a means for measuring teachers' self-assessed TPACK and is proving to be a valuable tool for researchers interested in the development of TPACK in both inservice and preservice teachers. The TPACK survey is currently being translated into different languages and adopted to different teacher education contexts around the world. The interest of using TPACK framework and the TPACK survey for designing and assessing teacher knowledge in various international teacher education contexts is a clear indication of the world wide impact of TPACK as an emerging research and development tool for teacher educators.

The Taiwan project's use of a modified version of this survey to evaluate the effects of faculty modeling on preservice teachers demonstrates the use of the TPACK survey to provide information on the effectiveness of approaches to technology use in teacher education programs. The activity-types approach suggested by Judi Harris and Mark Hofer (2009) provides another compelling example of the usefulness of the TPACK framework for conceptualizing specific integration activities.

Future research with TPACK will include more work in the assessment area, with further refinement of the survey using larger, diverse samples and work to create classroom observation tools to assess teachers' TPACK in authentic classroom environments. Other work foreseen, similar to the Taiwan modeling work, will use TPACK assessment as a means to measure effects of interventions designed to improve teachers' uses of technology in classrooms.

In general, the TPACK framework has provided a means for educational technology researchers and practitioners to communicate more accurately and effectively about the work they are doing. In addition to the work to clarify the knowledge to be developed in preservice and inservice teachers, TPACK can bring clarity to the specific interventions in research and development projects and thus improve the ability to design and test powerful technology approaches.

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USING SONGS AS AUDIO MATERIALS IN TEACHING TURKISH AS A FOREIGN LANGUAGE

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ABSTRACT
The use of songs as audio materials in teaching Turkish as foreign language is an important part of language culture and has an important place in culture. Thus, the transfer of cultural aspects accelerates language learning process. In the light of this view, it becomes necessary to transfer cultural aspects into classroom environment in teaching Turkish as a foreign language. Songs are one of the instruments which provide students with the information related to target culture. In foreign language teaching, activities which are created by using songs contribute to the development of a lot of language skills from grammar to pronunciation. Therefore, these activities can be carried out in all classes ranging from very basic levels to advanced ones. Additionally, as widely known, music and melody have a positive impact in terms of reducing stress and anxiety. Considering the current literature, the use of activities involving songs in foreign language teaching has positive effects on students within their language learning process and further help them to be encouraged toward foreign language and culture. in this study, the place and the importance of songs as one of the tools to transfer culture and used in Turkish as a foreign language courses will be questioned, and sample activities will also be presented.
Keywords: Teaching Turkish as a foreign language, audio materials, , songs, culture transfer

1. INTRODUCTION
With the progress of technology, the development of educational tools for foreign language teaching has started to contribute significantly to student progress while learning a foreign language. Therefore, the efforts to adapt these tools, which are developed by the technology of our day, to class environment has become of greater importance. At the same time, the increase in the number of approaches to develop students' skill of communication and cross-cultural interaction is an indicator of the fact that songs are audial and written tools essential for foreign language teaching.

Utilization of visual and audial tools is effective in concretizing the learning process. Using these tools in class environment not only enables students acquire the desired information more quickly, but also makes the information acquired more permanent. According to (Çakır, 2006), it is a well-known fact that audio-visual materials are a great help in stimulating and facilitating the learning of a foreign language That is to say, all audio-visual materials have positive contributions to language learning as long as they are used at the right time, in the right place. As multimedia consisting of tools appealing to human senses such as visual and audial tools used in foreign language teaching increase the amount of emotional input, the level and the quality of lingual skills of a person also increases Tarcan (2004),. Accordingly, the quality and the quantity of the output such as writing and speaking skills, which are of utmost importance for language learning, becomes higher. From this point of view, songs, which are audial tools, are important resources for students while developing lingual skills.

2. THE INFLUENCE OF SONGS IN FOREIGN LANGUAGE CLASSES
Using songs as tools for teaching a foreign language has many benefits. According to Lo and Li (1998), songs are able to change the monotonous mood in the class and with the smoothing effect of music; they provide a comfortable class environment so that students can develop their lingual skills more easily. Besides, utilizing songs in class environment amuses students, helps them feel relaxed and get rid of their negative attitudes towards a foreign language while learning a lingual structure through a song (Sarıçoban, 2000). In this direction, the amusing and relaxing mood brought by songs to the class eases the effects of certain emotional cases such as excitement, anxiety, lack of self-confidence and the feeling of being threatened, in addition to influencing learning process positively or facilitating it by stimulating the student emotionally (Kramsch,1993). Also songs help motivating the learners as they provide a pleasant atmosphere. The students are encouraged to actively involve in the learning process by making use of their musical knowledge. In this way songs help students to develop confidence for language learning.(Şahin, 2008)

In a survey conducted by Joly (1995), the question whether the in-class utilization of songs which were chosen in accordance with the goals of the lesson was helpful or not was directed to students attending a Japanese speaking course. The results of the survey show that the majority of the students favored using songs in the class.

In the light of this view of students, it can be said that songs amuse students; they reduce the level of boredom existing in ordinary language teaching and increase student enthusiasm towards studying.

According to Cheung (2001), as students more easily learn the things about which they have background knowledge, student motivation is increased when the elements belonging to the popular culture of the target language are involved in the class. Bringing a song listened by the student to the class environment increases students' desire to learn and enables them contribute to the process of learning by making use of their own musical knowledge.

Songs offer many codes that strengthen student memory such as choruses, rhymes and melodies (Maley,1987). Therefore, these codes in songs increase the functionality of songs in language teaching. When a student listens to and memorizes a song involved in the class, the lyrics are embedded in his/her long-term memory. Moreover, neurological researches have shown that musical and lingual processes occur in the same section of brain and that there are significant similarities between musical and lingual syntax (Maess & Koelsch: 2001).

Additionally, being authentic texts themselves, songs provide students with the opportunity of meeting authentic texts belonging to the target language. According to Schoepp (2001), as they feature examples of daily language, songs help students get prepared for the language they will encounter in daily life. Besides, as a part of daily life, they are the tools of informing the students about the culture of the target language. A song is a literary text and literary texts harbor cultural elements belonging to the language in which they are written.

When the relationship between literary texts and life itself is examined, it is seen that the reality of life and human conditions in literary texts are narrated by being processed in the inner world of the author. In this regard, literary texts have a significant role in comprehending human beings and society with their different aspects. In literary texts written in a foreign language, it is possible to find the reflection of the world of that language, a life which is stranger to us (Polat, 1993).

In parallel with these views, songs, as a type of literary texts, reflect culture and transmit cultural values between people, societies and generations. Therefore, while learning a foreign language, a person can learn about a society and its culture through songs.

3. THE CRITERIA FOR SELECTING SONGS IN LANGUAGE TEACHING

As also mentioned above, songs are essential sources to be utilized during language teaching. Besides positive effects, there are of course difficulties encountered while using songs in language teaching. Terhune (1997: 8) lines these difficulties as follows:

1. Pop songs are not scientific. Therefore, some teachers and students do not think that they are effective tools in education.
2. As each student has a different way of learning, some students may have difficulty in studying through music.
3. Inefficient sound systems in schools may cause problems while listening to songs.
4. The types of music favored by students may not be matching with each other.
5. Songs which are not grammatical or those involving complicated sentence structures may confuse students.
6. In some songs, there may be embarrassing parts which cannot be explained to students.
7. Repetition of a limited number of words may cause the song to seem boring or ineffective.

According to Jensen (2000), many teachers do not have sufficient knowledge about music and teacher training programs do not involve anything regarding how to utilize music in language teaching.

Another disadvantage of using songs is the lack of the ability to slow down the tempo of the song when a grammatically difficult part is playing, or to fasten it when there is the repetition of certain parts (Miller, 1999). Moreover, some teachers may think that they cannot sing, but using songs in the classroom for this aim does not necessitate any expertise in this field. Teachers can accompany the song while it is playing or in cases where students do not prefer to sing a song alone.

Despite these disadvantages that songs have, the number of such problems can be reduced if teachers have sufficient knowledge about using songs in the class. According to Terhune (1997), if they are used in classroom wisely and in a balanced way, songs can be perfect sources for teachers. For instance, students may think that songs do not have any educational significance as utilizing them leads students off the syllabus and the course book. For this reason, the teacher should involve certain activities which show that using songs in the lesson has a significant motive. Therefore, in order to avoid the misuse of songs, there are certain criteria to be considered for choosing the song to be utilized in the class.

While utilizing a song in classroom environment, the language of that song, age and language level of the students, areas in which students and the teacher are interested in should be taken into account. In order to utilize songs in the best way, a certain amount of attention is required. Sarıçoban (2000) recommends using songs which harbor frequent repetitions or a story or interpretations on life or cultural elements. Griffe (1992) lists four elements to be considered while choosing a song to be used in the class as follows:

1. Classroom environment (number, age and interests of students; lesson hours)
2. Teacher (teacher's age, interest in music and aim to use the song in the class)
3. Classroom facilities (flexibility in lesson plan, classroom equipment)
4. Music (lesson plan and equipment such as the volume, sources of music, copying machine, board, etc.)

The content of the song chosen to be used in the classroom is also important. Some songs may contain embarrassing elements for students. Sarıçoban (2000) divides songs into two categories as those suitable for adults on advanced level of language and those appropriate for children. Meaningful and popular songs which also harbor cultural elements as well as grammatical patterns should be chosen for adult students on intermediate or advanced level, whereas more familiar or internationally-known songs should be selected for children. Griffe (1992) recommends using short and slow songs for students on beginner level. Crosswords, drawing or picture showing exercises can be conducted with such songs. For the students with a higher language level, long and fast songs which tell a story should be used. The song to be chosen should have a clear sound and it should be comprehensible; there should not be too many instruments played with a high volume in the song.

A song chosen should always contain a grammatical structure or a lingual subject. The diction of the singer should be clear so that the student will understand the lyrics more easily. The song should be chosen form a music genre favored by a major group of listeners. For example, if the teacher makes the students listen to only classical Turkish songs, then the students may feel bored with the lesson.

Applying these four criteria above during a lesson ensures that songs are optimally utilized in the class.

4. ACTIVITIES THAT CAN BE APPLIED THROUGH THE UTILIZATION OF SONGS

Activities that can be carried out with songs in foreign language classes can be classified in three groups as pre-listening, listening and post-listening activities. Here, a teacher should carefully think about what a student will do before, while and after listening. Below are some recommendations regarding these activity stages and what kind of activities a teacher can use in these stages.

4.1. Pre-listening activities

In this stage, the teacher ensures that students are ready for the listening activity to be carried out. According to Davenellos (1999), the aim of this stage is to prepare students to a topic grammatically, educationally and psychologically. Before playing a song to students, it is necessary to introduce the topic, the keywords and the grammatical structure. In this stage, in order to activate students' background information, it may be suitable to ask the students to guess the theme of a song, to brainstorm about it, to present or to discuss the cultural information that the song includes or to state the keywords and the ideas in the song.

Pre-listening activities enable students to be aware of the purpose of listening to the song and to focus on the meaning of the song while listening. Besides, it is also possible to use songs by deliberately removing a part of their lyrics and to conduct activities in which students predict or derive the meaning of a word out of the context (Vandergrift, 1999).

As pre-listening activities, Sarıçoban (2000) recommends discussing the theme, the title or the story of the song if there is one, informing students about the lingual points to be studied and using a picture to introduce the theme of the song.

Moreover, many activities such as predicting the theme of a song out of its title, putting the lyrics of a song in syntactical order, involving posters about the song and the singer and with the aim of raising awareness, asking

students whether they have background knowledge about them and if the song has a video clip, playing it silently and asking students to make predictions about the theme of the song can be utilized in this stage.
An example from an application regarding how to make use of a song of which theme is wedding ceremony, which is a cultural element, in Turkish as a foreign language classes is given below. In this application, the first step consists of pre-listening activities composed with the purpose of familiarizing students with the text.

Activity 1: What do the pictures remind you?
Activity 2: Write down the other words you have in your mind about marriage.

Activity 3: Read the disordered lyrics of a song below. Which of the options below can be the title of the song?
Activity 4: Read the lyrics below and order them for yourself by writing the numbers in the first gap.

3. Aşağıda sözleri karışık olarak verilen şarkıyı okuyunuz. Şarkının başlığı aşağıdakilerden hangisi olabilir?
A) Evlilik B) Gelin ile damat C)Düğün D)Mutluluk

4. Aşağıdaki sözleri okuyunuz ve sözleri kendinize göre birinci boşluğa sıralayınız.

DÖ DS
( ) ( ) Olur yine başka bir gün geliriz oynarız hep birlikte
( ) ( ) Bir düğün, bir tören, yine başladı aynı şölen
( ) ( ) Yenilir, içilir, takılır paralar yakaya
( ) ( ) Bitince bu mutlu düğün gelin ile damat kalır bir köşede
( ) ( ) Analar, babalar otururlar bir masaya
( ) ( ) Geçecek bir ömür, seçecek herkes eşini
( ) ( ) Kınalar yakılır, boyanır gözü yaşlı gelin
( ) ( ) Bitince bu mutlu düğün gelin ile damat kalır bir köşede
( ) ( ) Bir yüzük takarak tutacak ,eşler sözünü
( ) ( ) Olur yine başka bir gün geliriz oynarız hep birlikte
( ) ( ) Olur yine başka bir gün geliriz oynarız hep birlikte
( ) ( ) Bitince bu mutlu düğün gelin ile damat kalır bir köşede

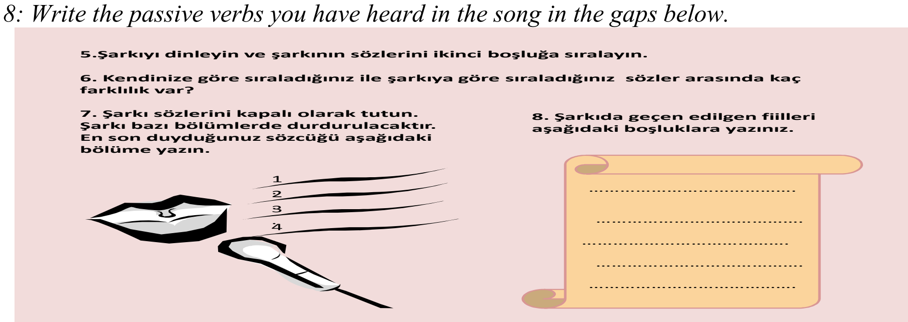
The aims of these activities are to motivate students for the text and the lesson and to have them brainstorm about the text, by providing them with some ideas about the theme of the text before encountering it, since students may fail to focus on or be motivated for the text if they directly face the text without having any preliminary activities.

4.2. Listening Activities
Listening activities are directly related to the text and students are expected to carry out these activities in the course of listening. In this process of listening and by the guidance of the teacher, students control their comprehension skills and focus on listening to the text.

According to Peachey (2003), in order for students to get accustomed to the voice of the singer or the tempo of the song, they need to listen to that song at least for three or four times. Prior to listening, it is also necessary to grant students with a short period of time for reading the questions they are going to answer while listening.

In this stage, activities such as removing certain parts of the text which are related with the grammatical form, word or pronunciation type in question, checking the accuracy of the predictions made about the song before listening, ordering the lyrics of the song, answering multiple-choice or open-ended questions about the song, picking the words that students hear in the song from a long wordlist given before listening, pausing the song and asking students to repeat the last word they have heard or correcting lexical, grammatical or syntactical mistakes deliberately involved in the lyrics.

Activity 5: Listen to the song and put the lyrics in order using the second gap.
Activity 6: How many differences are there between your order of lyrics and the order you have had after listening to the song.
Activity 7: Don't look at the lyrics. The song will be paused at certain parts. Write down the last word you have heard.
Activity 8: Write the passive verbs you have heard in the song in the gaps below.



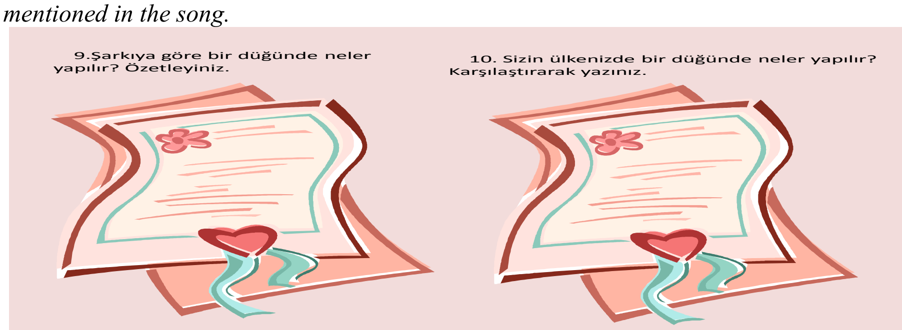
In the activities presented above, the aims are to have students check the predictions they have previously made about the song, develop their listening and comprehension skills and internalize the grammatical structure they have learned. In this process, students are more into production. In this stage, the emphasis is on how and with which elements students should approach texts in order to develop their comprehension skills. It is expected from students to carry out verbal and written tasks by sticking to the text and to progress the way they use the language from dependent to independent by dealing with the text in question with its various aspects.

4.3. Post-listening activities

Various activities for assessing the whole process of listening can be conducted in this stage. According to Davenellos (1999), this stage consists of follow-up activities for developing speaking and writing skills.

In this stage, Sarıçoban (2000) recommends using activities such as reading a text about the singer or the theme of the song, commenting and interpreting the song and dramatizing the plot of the song. These activities may vary in accordance with the language level and the areas of interest of students. The teacher can check the answers of the questions from listening stage. For improving writing skills, students can compose a dialogue out of the words of the people in a song; they can summarize, continue the song, or rewrite the lyrics from the point of view of another person in the song. In order to improve pronunciation, students can sing the song individually, with another student or in groups. For improving speaking skills, students can talk about how they feel after listening to the song. Also, some questions can be directed to students with the aim of initiating discussions.

Activity 9: According to the song, what kinds of activities are there in a wedding ceremony? Summarize them.
Activity 10: What kinds of activities are there in a wedding ceremony in your country? Compare them with the activities mentioned in the song.



With these activities, students are expected to summarize the song, to practice writing by involving his/her culture in the class and using the lingual structure he/she has just learned. Students are more into production in this stage. What is expected from students is to carry out verbal and written tasks by sticking to the text and to progress the way they use the language from dependent to independent by dealing with the text in question with its various aspects. In the activity on the final step, lesson topics are quite flexible. The lesson is drawn away from fictional contexts to daily life. Students are expected to state their thoughts without depending on the text.

5. CONCLUSION AND RECOMMENDATIONS

In order for the student to learn the target language, the using of technology need to be exploited in classroom as much as possible. For this reason, utilizing technology for language teaching is of great importance, and the tendency to integrate technology with lesson content grows each day. Accordingly, utilizing songs through technology in lesson environment attract attention. There are positive and negative views on the utilization of songs in foreign language teaching. It is seen that songs are used for many reasons by methods adopted in foreign language teaching. The facts that music soothes students and that melodies, rhythms and rhymes in a song facilitate language learning improve students' reading, writing, speaking and listening skills. Besides, music and songs are all authentic texts. These authentic texts act as significant sources for students to discover the culture of the target language and to improve their cultural awareness. In this study, which was carried out by taking these effects of songs as basis, activities that can be used with songs in Turkish as a foreign language classes are given and certain sample activities are recommended.

For foreign language teaching, if songs are carefully chosen by taking the audience, objectives, language level of students and song content into consideration and if deliberate activities are carried out, it is possible to make use of songs effectively. Utilizing songs this way provides an enjoyable experience not only for students but also for the teacher. Using songs along with such activities will have many advantages such as saving the lesson from being boring and monotonous and improving student motivation.

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USING THE INTERACTIVE LEARNING ENVIRONMENT APLUSIX FOR TEACHING AND LEARNING SCHOOL ALGEBRA: A RESEARCH EXPERIMENT IN A MIDDLE SCHOOL

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ABSTRACT
Most software tools that have been developed with the aim of helping students to learn school algebra have not yet achieved successful results in classroom. Almost all of them are menu-based systems that provide transformation rules in menus and buttons. Aplusix is a new interactive software tool for learning school algebra. In contrast to existing software tools in mathematics education, Aplusix has been developed to allow students to freely build and transform algebraic expressions as they can do on paper. In addition, Aplusix provides appropriate feedback and interactivity, and as such, it becomes a source of learning. This work reports on a research project on the investigation of students' learning of elementary algebra with Aplusix. The work uses the Theory of Didactical Situations (TDS) to analyze and evaluate the learning potentialities of Aplusix. The paper also reports on implications for the learning of school algebra and the integration of Aplusix into mathematics classroom.
Keywords: Aplusix, learning, mathematics education, school algebra, Theory of Didactical Situations, utility value

INTRODUCTION

The difficulties of learning school algebra in a paper-pencil environment relate to different analyses: The evolution from procedural to structural conception (Sfard, 1991), semantic/syntactic difficulties (Drouhard, 1992), the transition from arithmetic to algebra (Vergnaud, et al, 1988), the status of letters and the notion of variable in algebraic expressions (Kieran, 1992). Another difficulty is that algebra is often seen as a formal, isolated system where manipulations of symbols are often dominating (Kieran, 1991). There has been a great deal of research in teaching and learning school algebra the last 15 years (Kieran, 2007).

However, despite the fact that researchers know relatively more about the learning of algebra, a great deal remains to be researched, in particular the integration of ICT into classroom. Several software tools aiming at helping students to learn algebra, have been developed, but few of them have achieved successful results in classroom yet (Kieran, 2007; Zbiek, Heid, & Blume, 2007). A promising interactive software tool in school algebra is Aplusix (Chaachoua, Nicaud, Bronner, & Bouhineau, 2004; Nicaud, Bouhineau & Chaachoua, 2004). The aim of this research work is to gain theoretical and practical insights into the learning and teaching of school algebra using the interactive learning environment Aplusix.

The work is structured as follows. First, the theoretical framework is outlined. Second, the literature review is reported. Third, the research experiment in a middle school is described. This is followed by the data collection methods. The evaluation results are then outlined. Some implications on the use of Aplusix for the learning and teaching of school algebra conclude the article.

Conceptual Framework

The modes of use of Aplusix depend on the chosen conceptual framework in terms of interactions with the students in classroom. The Theory of Didactical Situations (Brousseau, 1997) is one of the most appropriate frameworks for investigating interactions with Aplusix. According to the Theory of Didactical Situations (TDS), learning occurs by means of interaction between learner and a "milieu". Each action of the student in the "milieu", which consists of a material and non material "milieu", is followed by a feedback of the "milieu" itself, which generates difficulties and contradictions. Learning happens through adaptation of the student to the "milieu" (Figure 1).

Aplusix can be considered as an element of the "milieu", and as such, its feedback becomes a source of learning. Aplusix provides three categories of feedback (Nicaud, Bouhineau & Huget, 2004):

- Feedback about the equivalence of expressions,
- Feedback on the state of the current step provided by indicators in the software, and
- Feedback provided by textual messages.

The role of the teacher is that of setting a situation or experiment in which students interact with Aplusix to achieve a given educational goal (Cerulli, Pedemonte & Robotti, 2005).

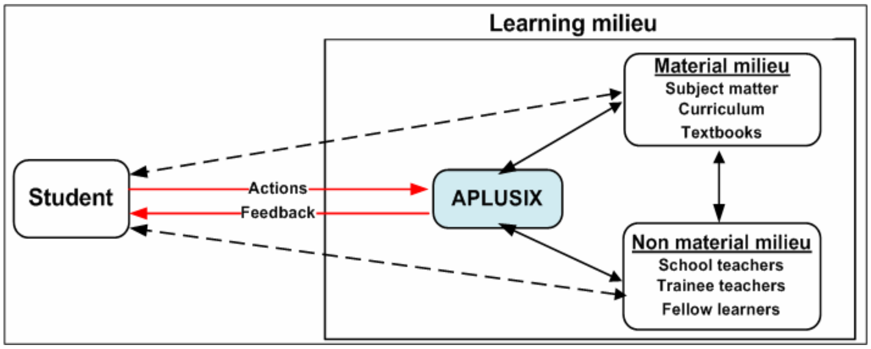

Figure 1: Interactions of the student with the "milieu" according to TDS

LITERATURE REVIEW

Several experiments with Aplusix have been carried out in mathematics education in different countries (Bouhineau et al, 2005; Nicaud et al, 2006; Nicaud, Bouhineau & Huget, 2004): remediation piloted by researchers in Italy; remediation integrated into the regular functioning of classes in Brazil; collaborative learning in India, and regular use during an entire year in France. On the basis of these experiments, researchers (Bouhineau & al, 2005) concluded that Aplusix has been shown to be a usable computer system, favoring the students' learning of school algebra. In addition, the cost of integrating Aplusix into the teaching of algebra is low. Furthermore, the students gained autonomy and improved their knowledge. Finally, Aplusix facilitated the teachers' work because of the students' autonomy and of already-made lists of exercises.

However, despite the promising benefits of Aplusix, research work still remains, among other things develop adapted experiments for many features of the software, collect a large number of protocols and study transformation rules by-hand, use an algorithm to diagnose the transformation made by the students, narrow the domain (in order to get more actions for each student on one domain), determine typical conceptions of students in this domain, use of Aplusix for a very large number of students, exploiting the feedback of Aplusix to mediate the equivalence between algebraic expressions (Maffei, Sabena, & Mariotti, 2009), and understanding the relation between design and usage of Aplusix (Trgalova & Chaachoua, 2009). Finally, there is a need to perform comparative studies between different countries.

Research Experiment in Classes of Grade 10

The research experiment with Aplusix described in this paper took place in two classes of grade 10 having 30 students each and 2 teachers in a middle school. The major goal was to evaluate the student progress in learning school algebra after the training phase with Aplusix. The experiment consisted of a teaching sequence with four major phases. It is similar to the one described in (Nicaud, Bouhineau, & Chaachoua, 2004):

- First, a pre-test of 30 minutes, using paper-pencil techniques, was given to the students.
- Second, before any teaching of algebra, the students were introduced to the functionalities of Aplusix.
- Then, the learning of equation solving with Aplusix began with the training phase, using the feedback of the system. This phase had a two weeks' duration.
- Finally, a post-test of 30 minutes using paper-pencil techniques was organized in order to measure the students' progress in comparison to the pre-test.

Data Collection and Analysis Methods

Both qualitative and quantitative methods were used to collect data. Quantitative data collection consisted of three methods. The first one used pre- and post-test with paper-pencil techniques to measure the students' progress in learning school algebra between the pre- and the post test. The second method relied on statistics that is automatically produced by Aplusix. The data collected statistically can be analyzed and displayed on the screen (Nicaud, 2006). These consisted of students' past activities such as attempted exercises, well-solved exercises, calculation errors, scores and time. The teacher can select the students individually in order to analyze their performances. Finally, a survey questionnaire was used to collect data about the utility value of Aplusix. The questionnaire used a five-point Likert scale from 1 to 5, where 1 is coded as the lowest and 5 as the highest.

Three methods were used to collect qualitative data. The first one used the students' protocols that are produced by Aplusix. Protocols permit the analysis of difficulties encountered by the students, their strategies used in the resolution of problems, the students' acquisition of relational understanding of the equal sign, and the analysis of exercises with bad percentage of success to identify possible didactical variables. The second method used semi-structured interviews with teachers ($N=2$) and students ($N=6$). The third method used observations of students' interactions with Aplusix. There are three types of interactions that can be observed with this method: Student-teacher, student-student, and student-textbooks.

RESULTS

The results are described with regard to the following issues:

- Students' understanding of the equal sign
- Students' performances in solving equations
- Students' algebraic strategies and resolutions, and
- Utility value of Aplusix.

Students' Understanding of the Equal Sign

The exercises in the pre- and posttest contained similar tasks. The goal was to identify students who had a relational understanding of the equal sign both in the pre-and post-test. The results indicate a progression of 23% from the pre-test (11%) to the post-test (34%) with regard to the percentage of students who had a relational understanding of the equal sign (Table 1).

Table 1: Students' progression in their understanding of the equal sign from pre-test to post-test

Pre-test (in %)	Post-test (in %)	Progression (in %)
11	34	23

Students' Performances in Solving Equations

Regarding the students' performances in solving equations the following results were achieved (Table 2):

Table 2: Students' performances in solving equations

	Task	Pre-test (in %)	Post-test (in %)	Progression / regression (in %)
1	ax = b	68	90	22 %
2	–a = -bx	18	42	24 %
3	a/b*x = -c/d	2	0	-2 %
4	–ax+b = 0	21	24	13 %
5	ax+b = -cx-d	11	22	11 %

The results show that tasks using fractions (exercise 3) were very difficult for all students. Exercise 1 and 2, which were more familiar to the students, achieved a progression of 22% and 24% respectively. Most students (90%) solved exercise 1 in the post-test. Exercise 2 was interesting from a pedagogical point of view because it contains a didactical variable (the minus sign). Students had difficulties with this type of exercise in the pre-test (18%). It seems that Aplusix helped some students to solve this exercise (42% achievement in the post-test), a progression of 24%. Exercise 4 and 5 achieved lower results (13% and 11% respectively). This is not surprising since these exercises require the understanding of two didactical variables (the minus sign and the number zero).

Summarizing, the students' performances seem to be dependent on the task type (increase from 0 to 24%). In particular, fraction tasks were a very difficult problem for all students (-2% regression). In addition, problems with the equivalence principle play a role, and it may be well suited to train students with Aplusix.

Students' Algebraic Strategies and Resolutions

The following analysis is about the students who acquired a relational understanding of the equal sign in the post-test, that is to say an understanding of the equivalence principle. The analysis concerned their algebraic strategies they used to acquire such an understanding. The analysis was based on the students' protocols produced by Aplusix. To be able to reason algebraically and develop strategies students need to understand the equivalence principle, manipulate didactical variables, and solve complex equations. The following experiments show the steps the students went through to acquire an appropriate understanding of elementary algebra.

a) Understanding of the Equivalence Principle

The following examples (Figure 3 and 4) show a gradual learning process in three steps. First, the student was not able to use the equivalence principle correctly. In the second step, the student seemed to be able to make progress, before he/she managed in the third step to solve the exercise using the equivalence principle.

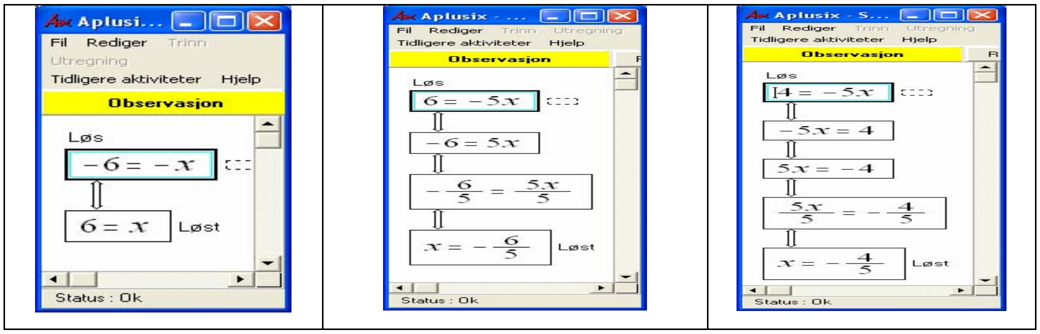

Figure 3: Example showing a gradual understanding of the equivalence principle

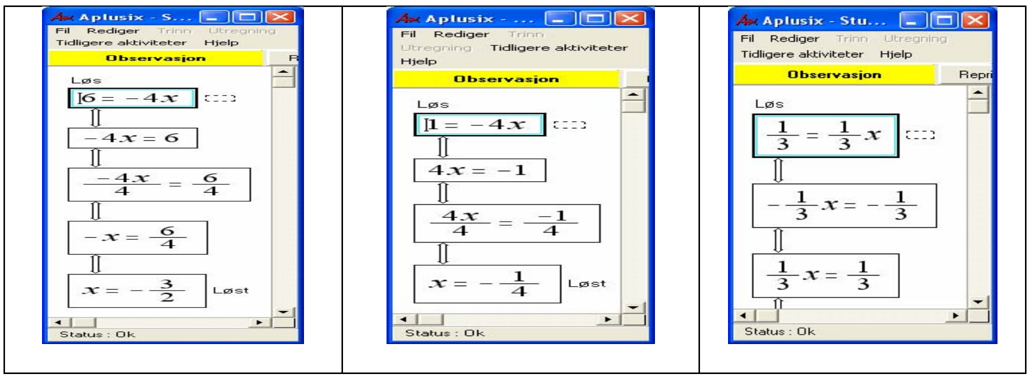

Figure 4: Example showing a gradual understanding of the equivalence principle

b) Use of the Didactical Variable Minus and Arithmetic Knowledge about the Number Zero

This example shows that the student was first not able to understand the role of zero and minus sign in algebraic equations. In the second step, the student improved her/his understanding of the didactical variables considered (Figure 5).

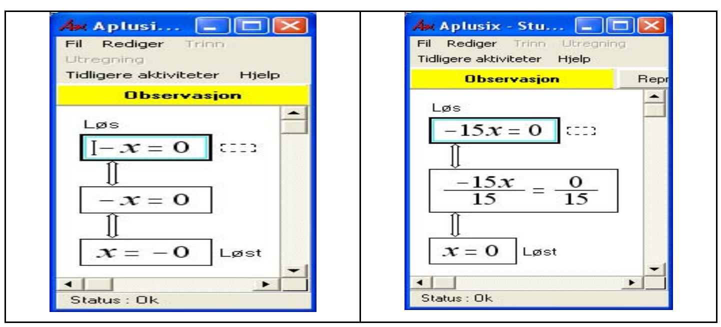

Figure 5: Example showing a gradual understanding of didactical variables

c) Solving Complex Equations

This example shows the students' ability to solve complex equations (Figure 6). It appears that the student made progress in solving complex equations in comparison to his/her performance in the pre-test.

Summarizing, the following conclusions can be drawn:

- The lack of arithmetic skills may have been an obstacle to learning algebra. In particular, problems with the didactic variables fraction, minus, and zero, but also the lack of awareness of arithmetic conventions, such as omitted count characters and calculation priorities, leading to problems when solving equations.
- The performance of many tasks seems to have helped the students' learning.
- One way to help students to acquire an understanding of algebraic equations is to increase the number of equivalent steps in the solution process when using Aplusix.
- Students, who had a relational understanding before they began to use Aplusix, could quickly improve their understanding and performance.

- Several students used algebraic strategies in the post-test than in the pre-test.

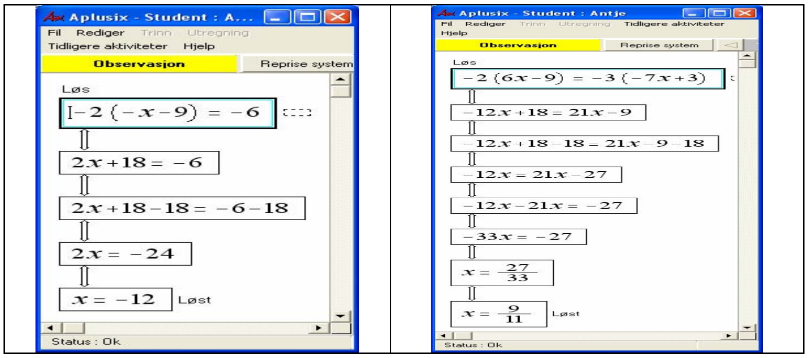

Figure 6: Example showing students' ability to solve complex equations.

Utility Value of Aplusix

The utility value of Aplusix was evaluated on the basis on 5 criteria: Technical usability, pedagogical usability, feedback, differentiation, motivation, and interaction. The evaluation was carried out by means of survey questionnaires. The results achieved are as follows:

- *Technical usability*: There is a relatively large consensus that the Aplusix is easy to learn and to use for most students.
- *Pedagogical usability*: Aplusix seems to be pedagogically suited for both average and strong students, but students at a low level do not appear to have benefited from the software. The reason may be the students' limited prior knowledge, unfamiliar task types, and the mathematical language used in Aplusix. The students' different ways of working (Procedure-oriented, solution-oriented or reflected) seem to affect the pedagogical usefulness of Aplusix. The integration of Aplusix into classroom may have a positive impact on learning, even for students at a lower level.
- *Feedback*: Students from the analysis group (*N=13*), that is to say the group of students who changed their understanding of the equal sign from operational to relational, responded differently to feedback, either unstructured or structured trial and error or with a targeted improvement of the error. All ways of working with Aplusix lead to learning. However, it is difficult to conclude that this applies to all students.
- *Differentiation:* Teachers believed that Aplusix takes into consideration some students' needs. In contrast, students' responses to the questionnaire indicate uncertainty in relation to differentiation opportunities among students.
- *Motivation:* At the beginning of the experiment with Aplusix all students were motivated and task-focused, and some of them were highly motivated. However, the motivation decreased over time, especially for weak students. Lack of prior knowledge may be a plausible reason for decreased motivation.
- *Interaction:* Most students used Aplusix interactively. They needed little teacher help than in normal hours, and there were few interactions between with the "milieu" and the students. However, the interactions with the "milieu" (fellow students, teacher) were difficult to measure due to a number of contextual factors.

CONCLUSIONS AND RECOMMENDATIONS

As with all educational research of this nature, it is difficult to conclude direct causality between the characteristics of the experiment and the learning effect of Aplusix since a number of contextual factors may implicitly affect the learning process. However, by considering the various parameters, both technical and pedagogical, that have been taken into account in this work, it has been possible to make some reasonable interpretations of the results. These indicate that Aplusix shows potential for learning school algebra, although not all types of students benefited equally well. Aplusix may have a positive impact on the students' learning if some conditions are met. Firstly, students need to have a basic knowledge of the relational understanding of the equal sign. Secondly, students should have prerequisites, especially a good arithmetic basis. Third, the design of didactical situations is important, such as choice of task types that are adapted to the students. Then, teachers' ICT expertise, both technical and didactical, is important. Furthermore, the time aspect needs to be considered, both for the learning and use of Aplusix. Finally, the integration of Aplusix into classroom could increase the value and benefit of the program for learning elementary algebra. This may be an important condition for improving student achievement and performance.

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