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Message from the Editor-in-Chief

TOJET welcomes you. It is a great honor for us that you are reader of this journal. Educational technology research, innovation and diffusion in teaching and learning are most important topics for the Turkish Online Journal of Educational Technology.

This journal was initiated in October 2002 to share knowledge with researchers, innovators, practitioners and administrators of education. We are delighted that more than 27000 researchers, practitioners, administrators, educators, teachers, parents, and students from around the world had visited the twentieth issue between July 01 and September 30 2007. It means that TOJET has diffused successfully new developments on educational technology around the world. We hope that this volume six issue four will also successfully accomplish our global educational goal.

I am always honored to be the editor in chief of TOJET. Many persons gave their valuable contributions for this issue. I would like to thank the guest editor and the editorial board of this issue.

The guest editor of this issue is Assist.Prof.Dr. Hüseyin Yaratan. TOJET thanks the guest editor and the editorial board of this issue.

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A FLEXIBLE MOBILE EDUCATION SYSTEM APPROACH

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ABSTRACT
Distance learning is appealing to small business owners, employees, municipalities, state establishments, non-governmental organizations. Distance-learning are ideal for people who have a full-time job or other commitments, who can't take time off to study full time. This might be a professional who needs to update his knowledge or skills, or a mother who wants to refresh her qualifications before re-entering the labor market.

Distance learning platforms have become increasingly popular over the last few years. Typically; the cost is low and flexibility is high for distance learning. In addition to the costs of the courses and training materials, there are the expenses of employee travel, meals, lodging, and transit time. Distance learning removes those expenses from the equation, leaving only the costs of the courses and instructional materials. The rising need for inexpensive, just-in-time training in business and computer technologies has not been lost. This distance learning is any learning that takes place with the instructor and student geographically remote from each other.

Distance learning system should have new ways or solutions because this solution will support smart alternatives. That is, our distance model is named like as flexible and mobility.

In this paper, we propose a large requirements set and some design considerations for distance learning protocols or portal and implementations. Therefore, it is explained that which requirements a useful and easy distance learning should satisfy.

1. LITERATURE SURVEY

Technology has changed the educational landscape in terms of how information is delivered and to whom, the speed of access to information, and in terms of the choice of options for courses, programs, and colleges and universities (Truluck, 2005). Because new technologies different learning styles like distance learning and new education systems like mobile education systems started to become increasingly popular.

It should also be emphasized that is assumed that the Internet students normally will have access to a desktop or laptop computer with Internet connection. This means that the equipment and technologies used when mobile are additions to the students' equipment used when studying at home or at work. It should also be noted that developments were based on the absolute assumption that mobile learners would study in the same group as students not having access to mobile technology. Thus, the design of the learning environment had to cater efficiently for both situations (Rekkedal and et al, 2005).

Distance education is the technology based education alternative which provides easy, fast access to resources; eliminate distance and self-responsibility of learning, home atmosphere environment**.** Distance education environment is the group work without only concentrating gender and receiver communication. It can be done as telecommunicating, audio conferencing or email. It's discussible how effectively receiver or sender do communication, but both of them can be used to deliver information without distance limitation. People who have roles in distance education are students, teacher, designer groups, and directors. Students are main concern which facilitate active role of communication. Teacher has role to guide students. Designer groups are the real establishers of process as technology facilitators. Directors are people who plan and implement education process
(İşman and et al, 2002). To the learner, open and distance learning means more freedom of access, and thereby a wider range of opportunities for learning and qualification For employers, open and distance learning offers the possibility of organizing learning and professional development in the workplace itself, which is often more flexible and saves costs of travel, subsistence etc. These advantages to learners and employers are also important features from the perspective of governments. Traditionally, governments have introduced distance education provision in order to increase access to learning and training opportunity; provide increased opportunities for updating, retraining and personal
enrichment; improve cost-effectiveness of educational resources; support the quality and variety of existing educational structures; enhance and consolidate capacity (Unesco, 2002).

Mobile education is defined as; any service or facility that supplies a learner with general electronic information and educational content that aids in acquisition of knowledge regardless of location and time (Chen and Kinshuk, 2003). Mobile learning or e-learning tools are the result of two converging technologies: computers and mobile phones. Numerous platforms are available, each with its own advantages, technical specifications and cost. A wireless laptop computer offers the greatest capabilities, including maximum storage and a standard PC platform that enables conventional e-learning and web content. A tablet computer has full computer capabilities without the keyboard has been especially successful for teaching and learning visual subjects. A personal digital assistant (PDA) and Pocket PC are portable and can have many add-ons, but might not be compatible and incur high costs (Workshop Report, 2005).

The major advantages of mobile learning include greater access to appropriate and timely information, reduced cognitive load during learning tasks, and increased interaction with other people and systems. It may be argued that networked mobile devices can help shape a culturally sensitive learning experience that can offer additional and, possibly, more powerful means of encoding, recall, and transfer. In addition, it is very important to consider the development of learning objects as well as the recognition of learning styles, cognitive processing, and motivation of learners (Koole and Ally, 2001).

A current disadvantage is that not all data, which are available on the web, are suitable for some beginning courses. Students may not have acquired sufficient knowledge of a particular field necessary to use available data sets, although these data sets are suitable for many advanced undergraduate courses. Too often, data require professional judgments be made or assume a specialist's knowledge. Desirable attributes when specialists use data, may become a handicap, however, when beginners are exposed to them. Perhaps, data sets that are more appropriate will appear to fill these gaps as more educators recognize needs in their particular area of specialty. **[8]** From another perspective, it's inevitable that there are some problems like finance, communication and organization. Especially in organization, it's very important to define the technical, educational personnel that facilitate the education environments.

The growth of distance learning has an international dimension as well, since countries around the world are using distance learning technologies to enlarge their own course, program, and degree offerings and to import and export education programs and services (Terzi and et al, 2004). In reality, distance learning has existed for well over 100 years. Correspondence courses in Europe were the earliest form of distance learning, and correspondence study remained the norm for distance learning until the middle of this century, when instructional radio and television became popular. (Imel, 1998) Countries such as India and South Africa are heavy importers of distance learning programs as they seek to expand educational opportunities for their own citizens. China, Thailand and Japan employ distance learning technologies to develop their own programs and degrees, bolstering their existing higher education systems. The United States, Australia and the United Kingdom are major exporters of higher education through electronic technology (Eaten, 2001)

2. MARKET AND NEED ANALYSIS

Many reasons are discussible about that market actually needs distance learning. Learnable and instructive information is increasing day by day. Education resources or budgets decreasing but education expenses continuously are increasing. Distances are increasing but Flexible Education is doing constant distance in any where. In addition, technology has big constraints so solutions are produced with these constraints (Yarman and et al, 2004)

2.1. Constraints

Main Constraints during learning process are listed as follows;

1. Time: Distance-learning platform is ideal for people who have a full-time job or other commitments, who can't take time off to study full time. Time must be rescued from locations.

2. Qualification: Every companies and establishments want to release high qualification environments. Eight needs should be work concurrently, because these needs are necessary and sufficient for perfect distance learning service.

3. Flexibility: In 21. Century, flexibility or mobility is the most important word for all people. Flexible Mobile Education System answers this need.

4. Low Cost: Certification system does not spread to all points because cost is high. FMED gives two huge advantages. Banks give special solutions that are bonus system, free education and many installments.

5. Certification: Certification must have an international validity. In addition, score system may be worked in system. Score system has an attendance, exam, feedback etc… Standardization must be applied on system in global world.

6. Dynamic Curriculum Vita: Many CV web sites serve to employees but not measurable, not dynamic, do not have many criteria. This situation is most important point, because all educations is getting old day by day and dieing end of two years.

7. Education Method: Every lesson has a different methods, target groups, targets and content.

8. Education Technology: Technology gives many advantages and solutions. However, these solutions have many sub constraints. Every technological solution is not applicable and feasible opportunities.

2.2. Market Segments

Small Business Companies, municipalities, state establishments, non-governmental organizations are main establishments for education sources. These segments of market are briefly analyzed as follows;

- Small Business Companies

Certification training's industry services always small business companies. Approximately, forty or fifty education types are demanded from companies. These companies has a restrict budgets and many time they reduce education budgets because small business companies are improving company's structure. Distance-learning platforms are ideal for people who have a full-time job or other commitments, who can't take time off to study full time. This might be a professional who needs to update his knowledge or skills, or a mother who wants to refresh her qualifications before re-entering the labor market. Distance learning platforms have become increasingly popular over the last few years. Typically; the cost is low and flexibility is high for distance learning. In addition to the costs of the courses and training materials, there are the expenses of employee travel, meals, lodging, and transit time. Distance learning removes those expenses from the equation, leaving only the costs of the courses and instructional materials. The rising need for inexpensive, just-in-time training in business and computer technologies has not been lost. This distance learning is any learning that takes place with the instructor and student geographically remote from each other. In addition; this education may be supported from banks.

- Municipalities

All municipalities must give education service owns people but classical education system has a many restrictions which are time building, budget, instructor, materials. Municipalities may give free education to all people with distance learning. People can take as people wish.

- State Establishments

State establishment's needs are similar small business employees. Specially, all state establishments gives service every location in country so they continuously give in door education for all employees. Of course, like as all people guess, may give education but all education must have standard level and just in time.

- Non-governmental Organizations

Many non-governmental organizations serve education but it is not enough because a few people can use because reel world restrictions have high costs in all areas. they is similar problem like as all municipalities that must give education service own people but classical education system has a many restrictions which are time building, budget, instructor, materials.

Flexible Mobile Education solution may be monitored, concurrently. If an employee has an internet service, an employee can take a lesson with web site, pda, mobile phone. However, all employees take exam during the asynchronies situations.

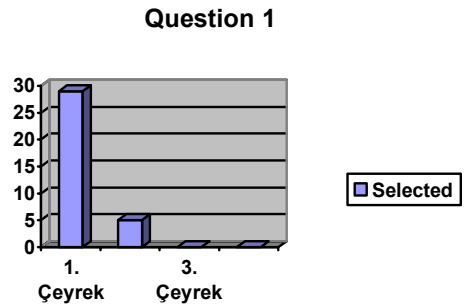
If an employee is not an online, an employee can follow all lessons with computer, mobile phone, pda, smart phone, ipod, mp3 player. However, all employees take exam during the asynchronies situations.

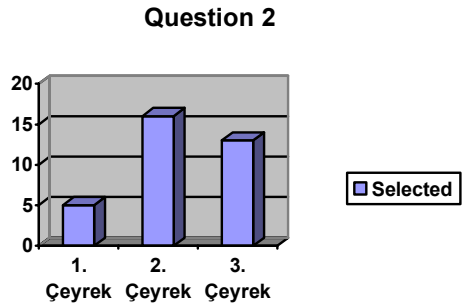
2.3. A Questionnaire Survey

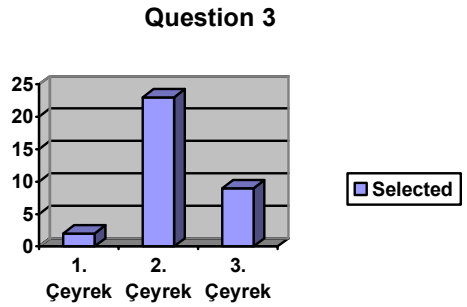
In order to determine of actual market need, a survey hereby was carried out by questionnaire with about 35 participants to determine profile of people who are potential for distance education. They are randomly chosen from different categories such as undergraduate and postgraduate students, with graduated and workers.

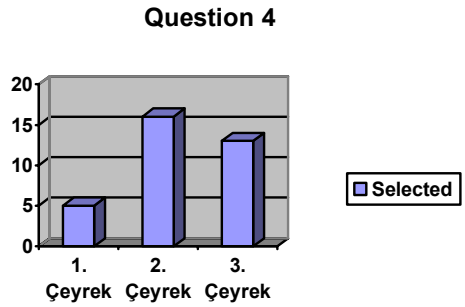
All the participants were asked to learn ideas about normal and distance education, which one is more suitable for their schedule, and which one is more efficient for their education. According to these needs, it has been prepared a questionnaire contained 15 questions. The questionnaire and its results are enclosed on appendix.

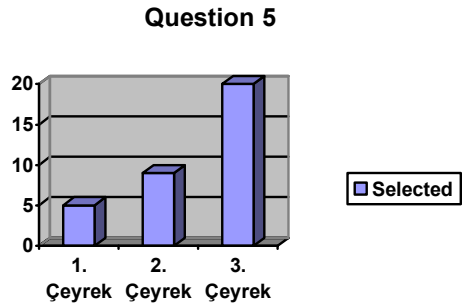
Results:

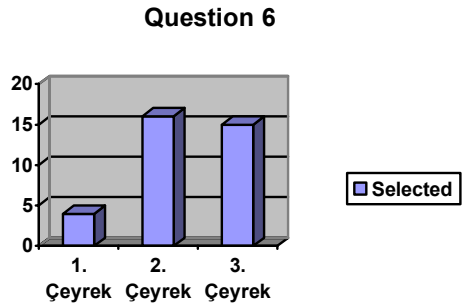


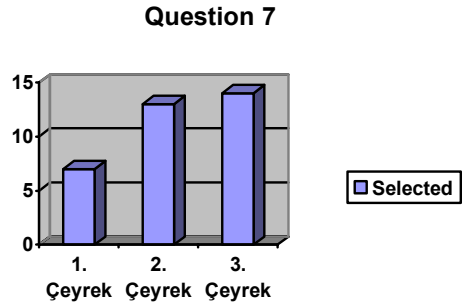


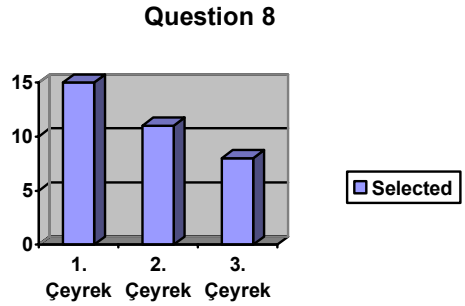


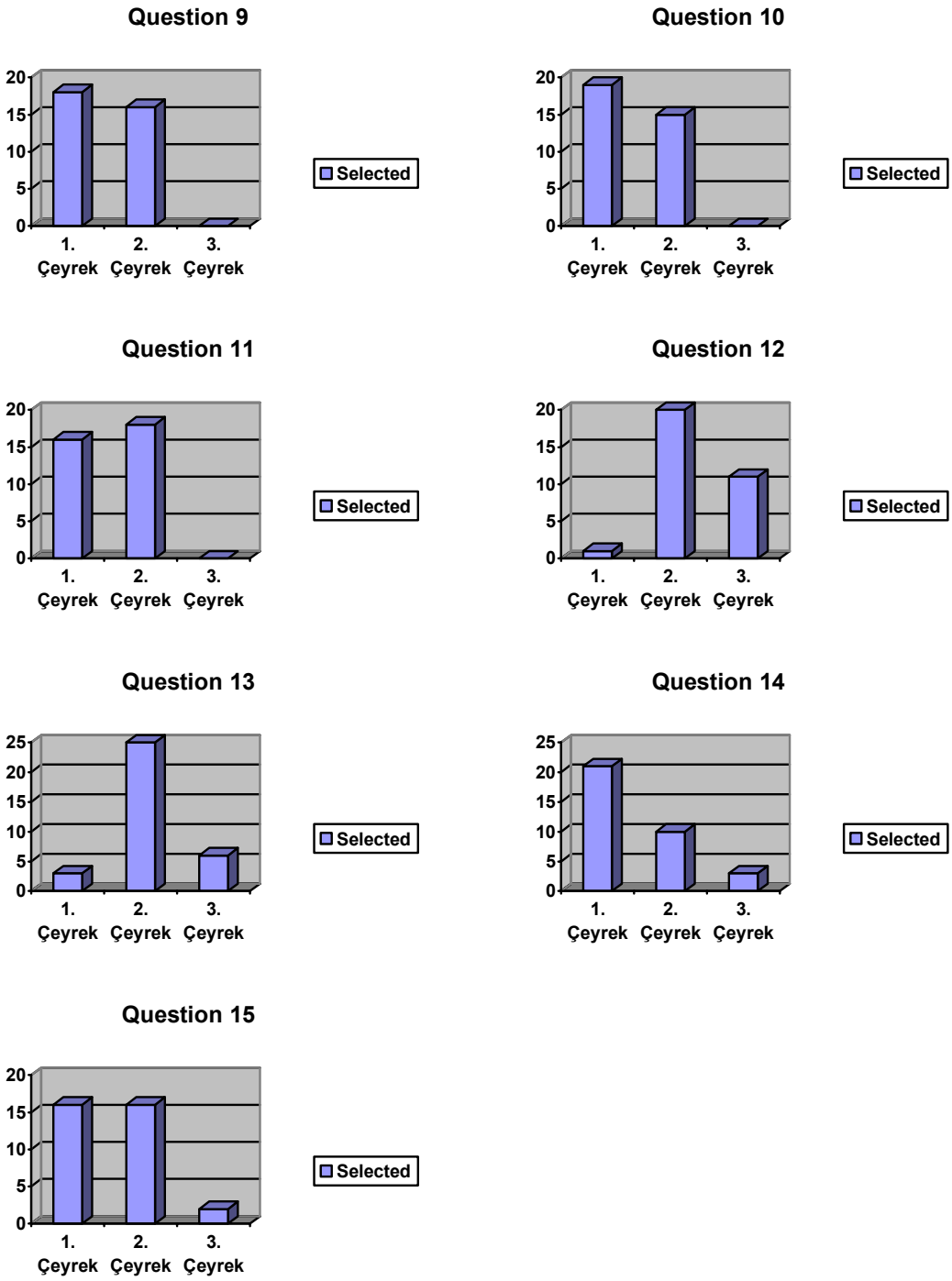












The questionnaire revealed that participants generally think that classroom discussions and having face-to-face interaction with instructions is somewhat important. Because of being accustomed to face-to-face learning they want to feel that they are part of the class. Most of the participants have used some sort of web-based educational system. But they haven't tried mobile education systems before. From this, we safely concluded that use of mobile technology in education was still quite new to most participants. When asked whether they will be willing to use a mobile education service system, most participants agreed that they will but some also disagreed.

When asked about their writing and communication skills we conclude that they have enough background to use mobile education systems. They are self motivated and they sometimes procrastinate works but always get work

done on time. Therefore they can manage to develop themselves effectively by taking distance courses. Moreover some of them hesitate to ask questions in the class and sometimes they have difficulty getting to the campus (especially for on weekends and in the evening). Distance education can be done as telecommunicating, audio conferencing or email. So it will eliminate cost and time and allow learners to ask questions by e-mail.

When asked about predominant learning styles of participants; we realized that they have different learning styles. It is difficult in a classroom to respond all students with different learning styles. Some of them can learn best when they see graphics and read class materials, some learn best when they listen to an explanation of concept and some prefer doing practice (for instance conducting an experiment in a lab). Because distance learning provides visual and vocal education it is a good learning technique for the students having different learning styles.

3. NEED DISCUSSION

Lifelong learning is most important issue for all people in the 21. Century. A computer, a digital TV or coming TV technology that is IP TV, mobility tools that are IPOD, MP3 Player, mobile phone, and smart phone came to many people.

Classical education techniques are an insufficiency. Classical education must need building, expensive investment, time, more materials, and maximum instructors. We may guess, its situation is not feasible and applicable. In addition; professionals or employees has taken classical educations but all information is living maximum for four year then that information goes the information's rubbish heap.

We should find a new solution or equation for optimum solutions that involves minimum time or effective time, low cost, high performance, flexible, standard, just in time. Of course, these conditions are located with measurable system that occurs data analyses, data mining and business intelligence methods, because all companies or states need quantitative information for future years and education policy.

What is the solution? This solution is very easy. We may be carefully this point that is an innovative and puzzle management system. Puzzle management system finds optimum web or network between all pieces which are TV, computer system, IPOD; MP3 Player, Mobile Phone, Smart Phone, life, time, budget, needs, people.

4. MODEL OF THIS APPROACH

Flexible Mobile Learning can be called as Certification Platform Management System (CPMS) (Yurdakul and et al, 1996). Below is practically included the tools of the model to be integrated later.

Computer
Desktop, laptop is used with internet technology in FMED. Video streaming, mp3 format, mail, chat rooms, conferencing is used.

PDA
PDA uses GPRS, WAP, video streaming, and office programs.

IPOD
All lessons are taken from system and offline or online service is open

MP3 PLAYER
If lesson does not have an image, people listens lessons

MOBILE PHONES
Mobile phone uses GPRS, WAP, video streaming, and office programs

IP or DIGITAL PLATFORM TV
All lessons are taken from system and offline or online service is open

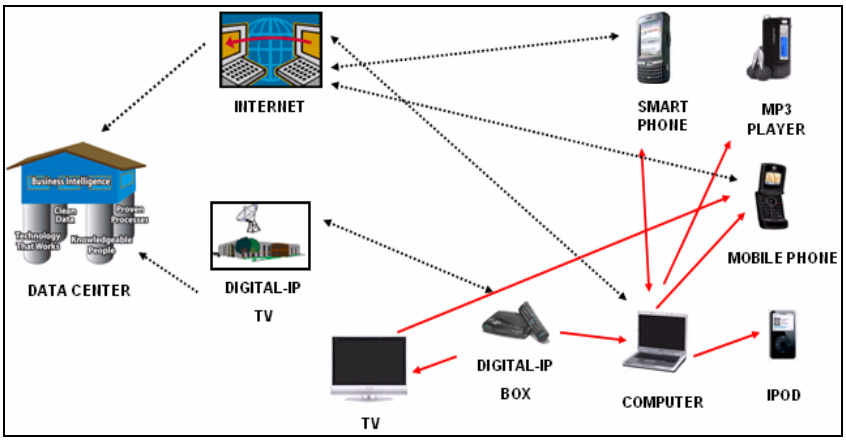


Figure: CMPS Tools

In this approach, the below services should be definitely covered in the design (Sterner and Rigmor, 1998; Varol and Asaf, , 1996).

- One-to-One Education
- Classroom Education
- Web and IP TV Based syncrone or asyncrone education
- Individual Certification
- Test and Analyze just in time on Web, Mobile Phone, IP TV, Mobile Phone, Smart Phone or PDA.
- Education necessity analyze, planning and dynamic curriculum vita
- Analysis, reporting and scoring for person, classroom, companies, region or state
- To Measure and establish so to present new professional development.
- Special education with code on IP TV
- Web cast
- Multicast
- Video on demand
- Electronic publishing
- Online Conservation Clubs and Reel Meeting
- Correspondence tutoring
- Audio conferencing
- Telephone tutoring
- Video conferencing
- Electronic mail
- Computer conferencing
- Audio-graphics
- Video streaming.

Most eLearning situations can use combination of the above techniques

5. ADVANTAGES OF THIS APPROACH

Flexible Mobile Education System (FMED) has many advantages according to other classical and distance learning methods.

- FMED has a synchronize system between Digital TV, Mobile Phone and Web Site.
- FMED measures reel education investment for individual (Miller and Aron, 1991).
- FMED educates all employees with different methods (Miller and Aron, 1991).
- Motivation and retention or loyalty educations are given with FMED on TV, mobile phone and Web Site, concurrently.
- Many education companies may give different educations with in increasing learning Opportunities (Miller and Aron, 1991).

- Same time, Many people may take education in different locations with different ways.
- Specialists give much information at reel time from different locations.
- Every person may take indivudally education method. That is, flexible choosing for method and Environment (Miller and Aron, 1991).
- FMED produces many solutions for all companies with constant resource or low resource so material sharing will be realized maximum.
- FMED gives comfortable and freedom spirit for productivity. That is, any employee or person can be taken in own working area or as you wish location with Digital TV, Mobile Phone, Web Site, MP3 Player, IPOD.
- Education and traveling expenses are decreased with FMED.
- Education environment and reel working environment are coming same with FMED besides living environment or any location.
- Information reaching will be come easy situation.
- In every instant, all people will pull information.
- Easy information winning give advantages for competition with FMED.

6. CONCLUSION

In this paper, main elements and basic properties of flexible mobile education had been explained, its important points had been explained, necessary and sufficient conditions clearly had been determined.

To determine needs and ideas of university students about distance learning it has been applied a questionnaire, and according to the questionnaire results; distance learning is a new area for students. Only a few of them have experience about mobile education but they consider attending distance education courses in order to develop themselves. Since mobile education provides visual and vocal learning it will be helpful with students having different learning styles.

Research comparing distance education to normal education indicates that a well organized distance education can be more effective than normal education. It can eliminate time, geographical boundaries and obstacles for opportunities for people who want to develop themselves. Moreover it can provide learners gain immediate and ongoing access to; peers, dynamically updated information and experts who help students to determine the value of information found on both the internet and real-world environment.

One important fact is that; all students have different learning styles and when using mobile devices they may be in different places. Therefore they may feel disconnected from learning activities so a motivation model is needed including well designed learning materials to cater to different learning styles.

Research showed education is one of the most important issues and education should be mobile. This paper will be pioneer article for distance education system mathematical modeling. The pioneering efforts continue. Fully online programs will be at the core of colleges and universities efforts to expand access to postsecondary education in the world. Utilizing the framework to assess institutional capacity to deliver these critical services and then creating solutions to provide them should better position colleges and universities for success.

As future work of this study it can be designed a prototype system to review how to conduct.

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Appendix:

Questionnaire:

1. What is your current study?
   - ☐ Undergraduate Program (Bachelor)
   - ☐ Postgraduate Program (Master, Degree, etc)
   - ☐ Professional Development (single course)

2. Having face-to-face interaction with my instructors and fellow students is:
   - ☐ Not particularly important to me
   - ☐ Somewhat important to me
   - ☐ Very important to me

3. Classroom discussion is:
   - ☐ Rarely helpful to me
   - ☐ Sometimes helpful to me
   - ☐ Almost always helpful to me

4. My need to take a distance delivered program is:
   - ☐ High -- I need it for a new job, career advancement or other important reason.
   - ☐ Moderate -- I think a regular campus is better, but I want to consider online.
   - ☐ Low -- It's a personal interest that could be postponed.

5. Considering my professional and personal schedule, the amount of time I have to work on an online program is:
   - ☐ Over 15 hours per week.
   - ☐ 12-15 hours per week.
   - ☐ less than 12 hours per week

6. If I had to describe my predominant learning style/preference, I would say it is:
   - ☐ Auditory -- I learn best when I can listen to an explanation of a concept.
   - ☐ Visual -- I learn best when I can read the course materials or view graphics and other visuals.
   - ☐ Tactile -- I learn best by "doing" (for instance conducting an experiment in a lab).

7. Feeling that I am part of a class is:
   - ☐ Not particularly necessary to me.
   - ☐ Somewhat important to me
   - ☐ Very important to me

8. If I have to go to campus to take exams or complete work:
   - ☐ I can go to campus anytime.
   - ☐ I need for campus labs to be open evenings and weekends
   - ☐ I have difficulty getting to the campus, even in the evenings and on weekends.

9. I am able to motivate myself to complete my work:
   - ☐ With little or no help from others
   - ☐ With some degree of help from others
   - ☐ Only with the help of others

10. My skill using the internet is:
    - ☐ Above average
    - ☐ Average
    - ☐ Below average

11. My writing and communication skills are:
    - ☐ Above average
    - ☐ Average
    - ☐ Below average

12. I am considering taking an online course because:
    - ☐ I've taken an online class before and enjoyed the experience.
    - ☐ I'm curious about online classes and have room in my schedule.
    - ☐ I need the class for a graduation requirement or job situation and I can't fit it in to my campus schedule.

13. When it comes to procrastination:
    - ☐ I rarely procrastinate
    - ☐ I sometimes procrastinate, but I always get my work in on time
    - ☐ I always procrastinate - I like to work under pressure
14. I would describe my personal style as:
    - ☐ Self-motivated, self-disciplined and organized
    - ☐ Motivated, but I need help remembering assignments and due dates
    - ☐ Pretty disorganized - I need someone to motivate me and help me stay on top of my coursework
15. When I need help in class:
    - ☐ I feel comfortable asking questions and asking for help when I need it
    - ☐ I hesitate to ask questions of the instructor, but I will ask for help if I need it
    - ☐ I don't like to ask questions or ask for help

EVALUATING AUDIO BOOKS AS SUPPORTED COURSE MATERIALS IN DISTANCE EDUCATION: THE EXPERIENCES OF THE BLIND LEARNERS

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ABSTRACT
Anadolu University has a technical infrastructure, well-qualified faculty, and operates in an innovative and flexible frame. It takes an initiative role to meet the needs of higher education in Turkey by providing equal opportunity not only to satisfy those who value the principle of lifelong education but also seeks new information via distance education with the help of information and communication technologies. Anadolu University Open Education System utilizes all the facilities of contemporary education technology as well as traditional methods in its practices of distance education. Moreover, it provides the learners with the individualized, diversified and enriched services and the opportunities of contemporary education and communication technologies.

The audio-book project is designed and based on individualized learning principles, notablly for the blind students, in the scope of Anadolu University Open Education System. This project enables the blind learners to study on their own, exempting them from the requirement of studying with someone else, and provides them with the opportunity to study any subjects in the book at their suitable convenience. There are approximately 300 blind students involved in this system. There are 14 course books tailored for the blind students needs whereas more than 21 books of the process of recording are still utilized. The Faculty of School of Music and Drama of Anadolu University vocalize these course books in a radiophonic way. Each course book is numbered according to the order of units, the access to the subjects is simplified, the subjects are distinguished from each other by music and the narration is enriched via emphasizing the important sentences in the topic. By the help of these resource materials, the blind learners can be able to study more effectively, and the learning will be long lasting. The audio course books are designed and delivered to the blind students in an MP3 format. In doing so, the goal is to reach the other learners of the Open Education on the Internet. Approximately 70.000 learners have been benefiting from this service so far. Moreover, the audio books can be designed in audio CD formats and/or audiotapes based on the request from the blind learners. The aim of this study is to evaluate these audio course books based on the experiences of the blind learners.

INTRODUCTION

As mentioned by Kurubacak and Yuzer (2004), integrating novel technologies and their new capacities to increase educational productivity by considering individual differences in distance education are a paramount essential phenomena in effective learning. To approach educational problems sensibly, contemporary education uses and integrates new technologies into distance education in many developed or developing countries. Also, it provides diverse opportunities to people from different environments, different ages, all income rates and/or all vocational groups. Therefore, these people can obtain an equal opportunity without losing their productivity and arrange their own pace and capacity for education as well as benefit from communication technology (Özgür and Gürcan 2004).

Developing information and communication technologies offer a variety of opportunities concerning “sound”. Amateur and professional sound recording mediums and materials are made more practical, functional with a high-quality sound recording possible. This provides new opportunities to open education students, that is the to say that the transformation of the printed books as basic education materials into the audio books makes it possible to create new possibilities to study for both the blind and other students. Technology is getting more compact, becoming cheaper, mobile and widespread. As a result of such improvements in technology, the audio books in digital format can be listened to in many different places. Separating the books into different tracks according to units and subject titles enables the students to study faster by going back and forth when covering the subjects of the units. Furthermore, recording on tapes is almost abandoned and analog recording on tapes is replaced by sound recording on materials like CD (Compact Disc), DAT (Digital Audio Tape), MD (Mini disc) or recording directly on computer disc. In addition, the audio books are recorded in MP3 file format to enable students to study via the Internet, CD and MP3 player.

Anadolu University Open Education Faculty produces its course books as "audio books" especially for the blind students but all other students benefit from this project. Audio books offer blind students to study more independently wherever or whenever they want without other people's help.

Using audio-book for distance education

Audio books are educational materials that blind learners can use in every situation and every time without being tied to any place or without other people's help. Audio books produced for blind learners can create an environment to provide, enrich, inform, guide and teach subjects fully by creating an environment to learn and also develop independent learning skill to solve problems and answer questions as well as discuss different course related topics. The benefits of audio books in distance education provide an easy access, low cost and swift alteration of the content when it is necessary. Since audio books are educational tools to support learning, distance programs must be established with simple vocabulary, supported with music and sound effects while the length of program, should ideally last between 45–60 minutes. Additionally, blind students need to listen to audio–cassettes, CDs, MP3 players, etc. and enjoy the experience of being heard on audio book. Learners can achieve some of course objectives only with the help of an audio book:

- Audio book present *raw sounds* for learners to experience; these sounds may be natural (e.g. the call birds or animals), mechanical (e.g. the grinding of gears), musical (e.g. the magic of Mozart), etc. and present foreign language dialogues. Also, it provides a spoken glossary of terms which are difficult to pronounce terms.
- Presenting some conversations can be analyzed, e.g. between doctor and patient, sales staff and criminals talking about their way of life.
- Providing an *expert talking* can engage informal communication styles.

For tutoring, i.e. guiding learners through a task or exercise that requires eyes and hands as well as ears, for example:

- To study a series of diagrams or photographs.
- To operate a machine or piece of equipment.
- To assemble a model.
- To deal with physical or biological specimens.
- To complete a form or questionnaire.
- To set up equipment and/or an experiment.
- To consult tables of statistics, accounts, etc.
- To examine a map, plan, blueprint, etc.
- To provide guidance in fieldwork situations, etc.

Audio books are not so widespread but the inexpensive cost and their potential in open education contexts is easily overlooked. In subject disciplines such as music, where sound is important for blind students, the use of an audio book as an educational medium is already well developed. In multimedia packages, sound and images are often combined to with good effect, yet audio book can sometimes play a similar role at much less cost. The use of audio books to support distance education can be extended to most disciplines. The following suggestions may help support diverse learners by putting audio books in good use (Race 1998: 99–101):

- Have good reasons for using audio-books
- Most learners have access to audio-books
- Label audio-books informatively
- Keep audio-book extracts short and sharp
- Use audio-books where the tone of voice is important
- Sound can help open education learners about the subject-related jargon
- Use audio-books to bring open education to life
- Clarify exactly when a recorded episode must be used
- Turn open education learners' listening into an active process
- When using audio-book to help your learners achieve particular outcomes, explain exactly what they must be getting out of listening to the tape
- Consider using audio-book to give open learners feedback on their tutor-marked assignments, and
- Combine audio and visual learning

Audio book must be clearly support learning objectives. To create attractive audio books not only blind learners but also other learners, the following recommendation given below must be considered (Rowntree, 1994, p. 6):

- An audio-book must be physically available to learners -where and when they need it and convenient for them to use- and to control the timing and pace of their learning,
- An audio-book must be one for which they already have, or can quickly learn, the skills to use effectively and that relates the teacher/ trainer have the skills and know- how to use effectively, and
- An audio book must be one that relates clearly to the other course media- i.e. not solely supplemented as an optional extra and afford to use.

Creating an effective learning environment for blind students
Audio books provide the blind learners with the following criteria listed below (Rowntree, 1994, p. 7-9):

Matching your learning objectives: Audio will be virtually chosen it if the learning objectives require learners to respond to sound. An audio book is one way of presenting the necessary stimulus. It will be the best way for blind students.

Appeal to your learners: Any learner is likely to find some media tools more appealing than others. Older learners may be happier with printed materials or television; younger people liking high-tech ones, will like computer-based learning and multimedia. Audio-book has always been a popular medium among blind students because only this kind book helps them study without other people's assistance.

Physical access: Audio books are easier for blind students to get access to than others. For instance, learners may need to make a journey (and possibly an appointment) and the place and times may be inconvenient for them but more and more people have a tape or CD player at home, or can get access to one if necessary. Most people have their own audiocassette player, some have one in their cars as well as at home.

Convenience in use: Few media can be superior to a book in terms of convenience in use, but audiocassette player is very user-friendly. Indeed, learners can study the material at any time they choose; stop and start the sound whenever they want; replay a passage as many times as they wish; and skip over any material they do not need.

Necessary learning skills: Different media require different learning skills and different attitudes. For example, audio books require blind students to be good listeners. Learners have positive attitudes toward to media. But sence some tools are used to in entertainment situations it often limits their appeal for study purposes. Naturally, most learners can acquire the necessary skills and attitudes, if they wish. However, we have to make sure that it will be worthwhile given the time they have available for course or program they are working on. Clearly, an audio book can provide relief for learners who are not too keen on reading. We may need to support it with printed materials to help this particular group of learners develop the skills for using the audio medium effectively.

Your skills and know-how: As a trainer and/or teacher must have the know-how and skills, they need to use the medium effectively. Moreover, they have to know enough about the teaching capabilities of audio books to design effective materials. Finally, they must have the technical skills needed to produce and also deliver these materials. An audio book is somewhat more demanding than printed materials for blind students. Most teachers and trainers are already familiar with what it can deliver and will rapidly acquire the know-how and skills to design effective teaching methods and even to produce usable cassettes that can be used effectively. Instructors can remain in control of the medium.

Integration with other media: Some of the high-tech media relate uneasily to other media. Either because their producers believe that chosen medium can do everything by itself or because producers of other media sources are unsure of what the high-tech media are doing, so some resources can get sidelined. An audio book can be connected closely to other media. They can be used in class as well as for individual learning, and learners can (and often should) use them to complement the Internet and computer-based learning and their practices.

Can we afford it? Apart from printed material, no medium will cost less to use than an audio book for both the instructor and the learners. Designing effective audio takes no more time than writing a book and producing an audiocassette needs negligible investment in equipment compared with video and/or computer-based packages (an audio package might cost between one sixth and one tenth of a video on a similar topic). Learners are equally

fortunate. They do not have to buy or rent expensive equipment themselves; nor do they incur costs and waste time traveling to a center to use someone else's (Kurubacak and Yuzer, 2004).

An audio book seems to have some special practical advantages. Therefore, audio books are better educational tool than other media resources (Rowntree, 1994, p. 10):

- To provide *aural source material* e.g.: A conversation with a client or colleague for the learner to analyze or react to
- To bring ideas into life presented elsewhere in the course
- To talk with learners through tasks during which it would be disruptive for them to keep consulting by means of written guidance
- To help learners practice skills
- To make teaching more human and personal
- To be expressed very easily
- To encourage or motivate learners
- To influence learners' feelings and attitudes
- To get valuable contributions to teaching from people who would be unlikely to contribute by means of writing
- To let learners hear the voices of experts, users, clients, other learners, etc.
- To present new ideas to learners who are unable or unwilling to read or whose circumstances prevent them from reading
- To provide necessary variety in learners' learning
- To act as a trigger for group sharing of ideas and experience

Some audio books use audio simply to give guidance and reinforcement by leading a tutoring and/or coaching package (Rowntree, 1994, p. 22-23):

- Instructors talk to their learners rather than expressing their teaching points in writing.
- While they are listening, teachers may be getting them to turn the pages of a workbook, which you have laid out with text and pictures (similarly, they may be operating a piece of equipment or handling real objects).
- Anytime the instructors will ask their learners (on the audio book) to answer questions and/or carry out some exercise perhaps writing their answers in the workbook or doing something with equipment they are working with.
- Each time set such for an activity, instructors will say "Stop tape now, and start it again when you have finished…" Instructors may record a tone or a few seconds of music at this point, as another signal for the learner to switch this device off.
- When learners switch this device on again, they hear the teachers' feedback and comments on activities. Instructors will talk about the kind of results they must have come up with. Or, if they're not the kind of results that can easily be described in words (e.g. diagrams or complex calculations), they may direct their learners to a page in the workbook where the instructors' sample answers have been printed.
- Having finished commenting on the previous activity, instructors go on to the next teaching point they want to talk about, as in 1 and 2 above.
- The learner carries on working with the tape guidance, even when the cassette player is switched off: "20 minutes of tape time might provide for an hour or more of learning time."

Audio-books can be used in open and distance education in different ways; for instance (Rowntree, 1994, p. 25):

- Instructors may want to record a commentary or study guidance for many set books or other sources your learners are using.
- Tutors and distance learners may sometimes choose to communicate with one another using cassettes as well as, or instead of, by sending letters or phoning.
- Your learners may be interested in recording their own ideas about certain topics as a way of preparing for the exams.
- Instructors may want to try an evaluation technique and ask distance learners to interview themselves, talking about responses in an evaluation questionnaire into their own tape recorders.

- Audio may also be used for assessment purposes, if instructors get learners to record examples of their work (e.g. foreign language speaking) or their reflections about some other project they have been engaged in.
- Organizers in open or distance education program can consider sending round a regular "audio-newsletter" cassette to keep both learners and their supporters aware of what is going on in the system.

Audio-books formats

In audio books, besides a professional narrator, there must be music and sound effects as well. Structured format elements in audio-books to help blind students are listed below (Ozgur, 1999):

Presenter or Teacher Talking Directly: Subject taught in this format is given in the style of direct talking by a presenter or teacher. In this format, attention should be paid to the fact that there is only one subject to be taught and which is supported by means of music and sound effects. In presenter/teacher format, presenter-teacher is the voice and personality in the program. Teacher-presenter must influence learners/listeners by means of his/her tone of voice, style of talking, reliability, intimacy but not physical properties and (the most important this is flat) s/he must be convincing establishing emotional relations with students.

Dialogues: Radio education programs presented to students are given by using characters' voices with the help of radio playwright who write about the subjects to be taught.

Testimony: Radio is a personal media. In general, students are alone while they are listening to the radio. Sometimes, the point of teaching can be told with those people testimonies related to that subject. In other words, when real people talk about their experiences, students can realize learning.

Story: Radio education programs narroting a story are realized with help of a story, which has a beginning, development and ending; such as radio phonic plays. Drawing listeners' attention to a story's development, educational goals and/or subject is presented to students in a program whom a story is resourced from the teaching subject itself.

Recorded Programs: Recorded programs are prepared in advance, cover certain periods and designed in units and involve music and sound effects. Sometimes, converting TV-based education programs to radio-based education program technology also contributes to support subject taught on TV by radio. The advantages of recorded programs are that they are creative and they can be controlled in each phase of their preparation.

Audio Books and the Condition of Blind Students in the Open Education System of Anadolu University

The Open Education System of Anadolu University has been providing higher education opportunities through distance education for many people not only in Turkey but also in Western Europe and the Turkish Republic of Northern Cyprus with its certificate, associate degree, degree completion and bachelor's degree programs since 1982. Besides, it has an important role in overcoming the educational problems of Turkey and raising the educational level of Turkish people through special projects. Celebrating its 25th year in the 2006-2007 Academic year, Open Education System of Anadolu University today is one of the mega universities in the world with its 7 bachelor's and 20 associate degree programs offered by its three faculties and with approximately 1 million and fifty thousand students and 900 thousand graduates. The number of the students in the Open Education System is 43,2 percent of the total number of students in higher education in Turkey. 633 of these students are handicapped and 283 of these handicapped students are blind. The Open Education System is composed of printed course books, TV programs, academic counseling services, video conference, computer/Internet based educational applications and student support services. All of the students benefit from these resources in the light of the principle of equal opportunity. Unfortunately due to their handicap, the ability of the 283 blind students who study in the Open Education System to benefit from the offered learning opportunities is very limited. Therefore, audio books have been producing since 2004. The audio books liberate the blind students from the necessity of studying with someone else and help them to be more succesful by providing with this unique resource to understand their courses better. The production of the audio books for the students who are blind and will profer to study by listening the course books started in 2004. The audio books which were selected from the courses from which the blind students can benefit most. The audio books of 14 courses in which the student number is maximum and shown in the Table 1 are produced and more than 21 books of the process of recording are still available (Table 2).

COURSES	Audio Books	Overall Students
Introduction to Ecenomics		172
Introduction to Business		153
Introduction to Behavioral Sciences		143
Introduvtion to Law		136
Basic Information Technologies		121
Introduction to Accounting		88
Atatürk's Principles and History of Turkish Revolution		70
Economic Theory		41
Public Finance		39
Management and Organization		30
Financial Management		20
Management Information System		12
Government Budget		11
Turkish Political History		7

Table 1

COURSES	Overall Students
History of Civilization	53
Commercial Law	38
Persuasion and Conversation	20
Applications and Cases in Public Relations	20
Institutional Communication Management	19
Public Relations	18
Public Relations Application Techniques	18
Human Resources Management	18
Public Relations Authorship	16
Marketing Management	12
Strategic Management	12
Auditing and Applications in Economics	11
Capital Markets and Financial Institutions	11
Entrepreneurship	11
World Economy	11
Administrative Law	10
Turkish Economy	7
Local Governments	7
Political Science	7
Organizational Behavior	6
Turkish Language	6

Table 2

These courses are Introduction to Business, Introduction to Behavioral Science, Introduction to Economics, Introduction to Law, Public Finance, Atatürk's Principles and Turkish Revolution History, Government Budgeting, Management Information System, Management and Organization, Introduction to Accounting, Economic Theory, Basic Information Technologies, Financial Management and Turkish Political History. Furthermore, these audio books are converted to MP3 format and delivered on the Internet. This service is beneficial not only for the blind student but also for other students in Distance Education System. They can download the audio books in MP3 format via the Internet to their own computers and use the books to help them

to learn more effectively. That is to say that, in the production of audio books for the blind students access properties of the students to the books, convenience to the needs and expectations, Internet usage, educational aims, CD and MP3 possession, production formats and technical features are considered. The usage of the audio books delivered on the Internet in the years are featured in the Table 3.

	e-Audio Book	
Year	**Number of Students**	**Number of Benefit**
2005	16.789	52.618
2006	68.461	232.100

Table 3

The process of audio book production in the Open Education System of Anadolu University consists of pre-production, production and post-production steps, like any audio, cinema and television program productions.

Pre-Production: In the beginning, to verify courses with audio books, the number of the disabled learners in the Open Education System of Anadolu University was determined. This research was conducted on the demographic, psychological and social backgrounds of the blind students, and the communication tools they have. Research on how audio books support student learning can be carried out in the future as this was seen to be a weakness at the beginning at this project. In the Open Education System of Anadolu University, the books consist of units (chapters). Therefore, every unit can be accepted as an individual module in the process when audio books are produced. The books will be recorded as a direct lecture with the readings from different narrators. Music and sound effects will be mixed in the appropriate parts. The parts in audio books (title of the unit, its number, its objectives, pre-test, introduction, text, summary, self-test, through life, sample events, a self-test key) will get ready one by one individually. No special text will be written for the audio books.

Production: To produce audio books, a professional sound recording studio is needed. In the Open Education Faculty Radio & TV Production Center of Anadolu University, the sound studio that is equipped with professional recording machines with a soundproof technology. While recording audio books, the learners and educators from the State Conservatoire Theatre of Anadolu University will collaborate with the researcher in this study. To avoid waste of time, rehearsal will not be carried out in the studio. They will be recorded as a computer based digital audio recorder workstation system, and they can be changed to every format wanted. It will approximately take one month to record a book. Units are regarded as individual programs while recording audio-books. The audio books in the Open Education Faculty are approximately fifteen units, and these books are around 300-350 pages long. Each unit is about 20-25 pages. It will take seven days to record each unit, and a month to produce an audio book.

Post-Production: This montage step is mixed and matches with musical and natural sounds. Each unit has 20-25 pages long, and a 45-90 minute-program. Each audio book is a approximately 10-16 unit-book, and produced on CD ROMs and adapted to the Internet (Table 4).

Determinig the books which will be converted to Audio book format
Organizing the book-writer team
Determinig the vocalization artists
Test recordings
Determinig the CD Content
Receiving feedback
Organizing the sound recording and montage team
Production
Post-Production (Montage)
Converting the master Audio-CD's to MP3 format
Copy and Broadcast

Table 4

Problem

It has become compulsory to prepare more original educational materials for the learners according to the variety of communication means. Especially, designed course materials cannot be provided to those blind students who register in the Open Education System of Anadolu University. These students particularly cannot benefit from the books without other people's help while they are studying. In fact, the main part of creating an equal learning environment in education is to provide blind students in the Open Education System with audio books, so that these students will become independent individuals.

It is a necessity to evaluate the audio books produced at Anadolu University Open Education Faculty in the 2004-2005 Academic Year with a formative approach considering the student's opinions, re-formulate more effectively considering the educational aims of the program and student's requests and to overcome the problems and deficiencies. Therefore, the purpose of this study is to investigate the opinions related to the audio books specifically designed for the blind students studying at Anadolu University Open Education Faculty to make their self-studying easier.

Purpose

The purpose of this study is to reveal what the blind students think about the audio books which have been used since the beginning 2005 in Open Education Sytem. To achieve that purpose, the opnions of the blind students were gathered and the following issues were questioned:

- the state of making use of any audio books prior to Open Education Faculty
- the types of studying methods prior to the audio books of Open Education Faculty
- the level that students can reach in the learning process of a certain school subject prior to Open Education Faculty audio books
- Determining how the audio books affect the studying and learning performance of the students
- Revealing any advantage and disadvantage of OEF (Open Education Faculty) audio books with regards to the studying environment
- The problems experienced in the availability of the units in the OEF audio books
- The comprehensibility of the verbal explanations of the tables, graphs and formulas in the OEF audio books
- The contribution of the music and audio effects to comprehensibility of the books
- The state of the OEF books' being produced or not in MP3 format
- Gathering the opinions related to whether the audio books should be broadcasted on radio or not

Limitations

This study is limited to 283 students studying at Anadolu University between 2005 and 2006 and also limited to the audio books prepared for only 14 different subjects.

Significance of the Study

This study is very significant as it will help the blind students at Anadolu University, Open Education Faculty benefit from the audio books more effectively and fruitfully, produce books of better quality and serve as reference books for the students and academicians.

METHOD

This study, which is designed to investigate the audio book projects prepared for the blind students at Anadolu University is a descriptive study which aim to describe an existing case. The data in this study was collected through **interviews (derinlemesine görüşme)** method, which is a data gathering technique based on verbal communication, a qualitative measurement. The interviews were carried out through telephone and face to face interviews (Karasar 1991, 166).

Research Model

This study, in which qualitative research model is used, aimed to investigate how and to what extend individuals benefit from the audio books in their natural environments. The qualitative data of the study was gathered through the use of open-ended interview technique which is a toopic centered interview method. In the qualitative study, data was gathered through the use of one or at least two of the following methods; interviews, field notes, observation, personal or official records and investigation of the documents (Bogdan and Biklen, 1998). The standart open-ended interview technique is an interview technique in which participants are available just for once and they are available to participate in the study periodically through the research (Patton, 1990). The interviews which are also a data gathering method in this study were conducted on each participant without reconstructing the questions, following the same order for all participants. No guidence was supplied for the

participants and also it was made possible for the participants interviewed to answer the questions as they wish, without any word limitation (Bogdan and Biklen, 1998).

The Participants

The study was carried out on the blind students at Anadolu University, Open Education System. The scope of the study consists of 283 blind students studying at Anadolu University, Open Education faculty between 2005-2006 education year. Table 5 shows the distribution of the students studying at Anadolu University, Open Education Faculty depending on their departments and faculties. The sampling of the study consists of 30 students randomly chosen out of the 283 students.

		Blind Sudents
OEF	Program in Banking and Insurance	
	Information Management	
	Office Management and Secretarial Training	3
	Office Management	
	Foreign Trade	1
	Home Management	8
	Public Relations	69
	Theology	14
	English Language Teaching (Ankara)	1
	Laboratory Assistants and Veterinary	1
	Accounting	4
	Pre-School Education	5
	Occupational Training Program for the Police Force	1
	Health Related Professions	4
	Social Sciences	19
	Tourism and Hotel Management	
	Local Governments	7
ECONOMICS	Labour Economics and Industrial Relations	5
	Economics	6
	Public Administration	84
	Public Finance	8
BUSINESS ADMINISTRATION	Business Administration	43
	Total	283

Interview Tool

The interview instruments of this study consist of face-to-face interviews and interviews through telephones. The interview was conducted with three participants living in Eskişehir and the other 27 participants were interviewed through telephones. The participants were chosen randomly from different parts of Turkey and one participant was chosen from North Cyprus. The questions asked to gather data were prepared under the supervision of the field experts and in this way the comprehensibility and reliability of the questions were confirmed. After a pilot study, the data of this study was gathered after the interviews conducted September 2006. All of the interviews were taperecorded and then the obtained data was analysed and discussed considering the responses of the participants to the addressed questions. The tables recording of the interviews were carried out with the use of DAT (Digital Audio Tape) recorder and then these recordings were transfered to a computer. The recordings of each individual were seperated from one another in computer and then they were grouped and the main themes were determined according to their responses.

FINDINGS AND DISCUSSION

10 questions in total were prepared for the purpose of determining how the blind students at Anadolu University, Open Education Faculty perceive the audio books. The data was analysed reserving the order of the questions as they are with the use of qualitative analysis method.

The first question that was addressed to the students in the study was "the state of benefiting from any audio books prior to the Open Education Faculty". When the responses taken from the participants were examined, it was found that more than half of the participants stated that they had never benefitted from any audio books prior to the Open Education Faculty audio books. The most basic reason for this is that the number of the materials for the blind students are very limited and the available materials can be said to be printed in Braille alphabet. Students suggested that having no audio books for the blind students prior to the Open Education faculty audio books led students into many problems related to studying. Therefore, the audio books prepared by the Open Education faculty were perceived to be innovative and create a different studying environment by the students.

The second question addressed to the students in the study was "what were your studying strategies prior to the Open Education Faculty audio books?" When we examine the responses to that question, we found that most of the blind students got help from a volunteer reader in their studyings prior to the Open Education Faculty audio books. These volunteer readers are generally relatives of the blind students with insufficient education causes some problems like reading books with an appropriate, comprehensible and fast and adequate pronunciation. Moreever, the blind students have to schedule their studying times to accomodate the volunteers's availablity. The other blind students in the study were found to use computer supported book-scanning method, to listen to visual CDs of Open Education Faculty, to attend private courses. The ones who newly registered to Open Education System stated that they benefit from the audio CDs that were sent to them by OEF. One participant in the study stated that he had no eye problem when he started OEF and lost his seeing ability as a consequence of an accident and as a consequence of that he stated that he benefitted OEF audio books.

The third question in the study is "the degree of learning a certain subject prior to the OEF audio book" The responses to this question vary. Almost all of the blind OEF students participating in the study stated that their learning degree prior to the OEF audio books was worse than now and was also very limited. They also stated that their learning of school subjects improved after OEF sent them these audio books. We can easily say that, in this system, students have the opportunity to schedule their studying as they wish and also have the chance to follow this schedule without any delay. Blind students can improve their learning by scheduling their studying time, their studying periods and their attention, by organizing their studying athmosphere and their motivation to study. Moreever, they can relisten to the units that s/he cannot comprehend or that s/he considers as to be important. These students have the opportunity to listen to the audio books again and again which can help students to store the learned items in the long term memory very easily, and thus, the intended learning takes place. Moreover, these students are aware of the fact that they are taken into consideration through the audio books production by the system, was found to have given extra motivation to the students in their learning.

The fourth question of the interview is "how do the OEF audio books affect their learning". Almost all of the blind students in the study suggested that the OEF audio books affected their learning performance and improved it for the better. Indeed, audio books motivate students for studying and make them more independent and help them learn on their own.

The fifth question in the interview was "what are the advantages and disadvantages of the audio books with regards to studying environment". According to the responses tied with this question, it was found that the method that they used prior to the audio books was to get help from a volunteer reader. With the help of these audio books, they no longer need someone else's help in their studying and they have the opportunity to study wherever and whenever they want, without any time limitation, and also they can listen to the books through headphones without any disturbance from the outer world. Moreever, the students with limited eye problems stated that they could study without tiring their eyes, without using any magnifying glasses, without scanning the books with the use of computer supported instruments. Taking all these comments into account, we can state that audio books offer great contributions to students' success.

The sixth question in the interviews was "what were the problems that they experienced in finding the subject that they want" All of the blind students participating in the study stated that they had no problem in finding the subject that they need in the audio books. Organizing the audio books into many sections (tracks) helped the students find the subject they wanted. However, students experienced some problems with the delivery of the audio books and having no manual specially designed for them can also be counted as being one of the problems. The number of students who have insufficient internet access and the limited number of students who do not have VCD players were found to be some other problems that students experience.

The seventh question in the study was "what is the degree of the comprehensibility of the graphs, tables and formulas in the audio books". As the majority of the participants consider the graphs, tables and formulas as

sufficient in the audio books, they are exempted from such questions and therefore they do not consider these points to be significant. There is a significant difference between those students who are born blind and the students who lost their visual ability later. Those born blind stated that any relief designs and models would be more benefical for them if any physical touch is made available. However, it is compulsory to employ newer practices in the teaching of graph, tables and figures.

The eighth question in the interview was "what is the contribution of music and audio effects to comprehensibility?" All of the blind student participating in the study stated that the audio and music effects in the audio books made it easier for them to comprehend the audio books and also they reinforced some parts that they consider to be important.

The ninth question in the interview was "what is your opinion about whether the audio books are in MP3 format or not". When we examined the responses given to this question very carefully, we found that using MP3 format in the OEF audio books was considered to be appropriate by the blind students. They stated that MP3 format covers less place on CD and also they can benefit from it more easily. It was concluded in the study that there is no need for any other formats but MP3.

The last question of the interview was "what are the opinions of the blind students about the broadcast of the OEF audio books on radios simultaneously". As most of the blind students at OEF stated that broadcasting the audio books on radios might be beneficial. They also added that they were delivered the audio books, they could listen to them whenever they want, they have to spare extra time for radio listening and they may have the risk not to listen to the radio. Another criticism to the broadcast of the audio books on radio is that the units in the audio books are too long. As a result, following the broadcast without any break may cause some perceptioanl difficulties.

CONCLUSION

This study aimed to reveal how audio books at Anadolu University, Open Education Faculty are perceived by the blind students. The data obtained from the participants suggests that audio books were used to study by the blind students for the first time, that they helped them gain their independence when they need to study and continue their learning individually, that they could have the opportunity to study lessons whenever and wherever they wished and that they could improve their learning capacity. We have to be reminded that the audio books are in plain speaking format, therefore, all of the books are monotonous, and that they take too long time (a book takes 4-5 hours to finish), that they have no manuals. All this make it harder for students to benefit. Moreover taking into consideration that access to audio books is available on the Internet for free, but sending these books to students in CD format appear to be problematic. Furthermore the number of the students who have Internet access is limited and that the number of students having CD player at home is also restricted. Hence we should evaluate these difficulties. New regulations should be done for copying the audio books in CD and cassette format to make then available for more students.

It is a well-known fact that the number of audio books is limited when we consider all the subjects covered in the Open Education System. Therefore, more audio books should be produced and some audio books should be produced in different formats. For example, **dramatic expression** format, **an illustration from real life** format may be more interesting and didactic compared to those of flat expression. However, producing books in these formats also brings some difficulties with regards to cost and time. The interaction between student to content, student to student, student to instructor, and student to institution in a Open Education System makes learning easier. However, audio books never give chance to interaction. As the broadcast is available only on the Internet, students may be supplied with interaction which is not synchronic between students and institution. That there exist no interaction opportunity in audio books can be suggested to take blind students away from the learning environment.

Parallelly to updating the books in the Open Education System, the audio books should also be revised, updated and students should be supplied with newer audio books with new information. To achieve all of these require a careful planning. Audio books are one of the best learning tools which can be used as mobile learning environment. Students should be encouraged to listen to the audio books through some portable instruments like MP3 players and cd player whenever and wherever they wish. The audio books are the best learning tools for the blind students with regards to sound quality, the accurateness of the information and accurate pronunciation. In audio books, some sound effects and music effects should be used to get students' attention to some parts. These help students develop concern and wholeness related to particular subjects. The production of audio books means reading the whole audio book. However, students demand shorter materials which include summary parts.

Although students have negative opinions related to the broadcast of the audio book on radio, broadcasting these audio books on radio periodically, carrying out the radio broadcast on the Internet will be perceived as novative by not only Open Education Faculty students but also by all the blind students themselves. It is a well-known fact that some of the students at Open Education System do not benefit from audio books equally. However, the continuous increase in the number of students, the developing technology, the financial inrease for the students to be able to buy the technology and the variety of the subjects and programmes, demonstrate the need for a structural change from own behalf.

In conclusion, each of the communication technology in the field of open education in the world and teaching environment have a positive contribution to teaching-learning process. Therefore, the effect and function of the instruments in the learning process, is to benefit from them in such a way that they complete each another. As long as they supply interaction, the effectiveness and fruitfulness will increase in education. The audio books used in Open Education System provide the blind students with new and different learning environments and opportunities. As they are produced and tailored for the personal differences of the students, it helps Anadolu Univertity increase its positive image in the public eye. The production of audio books helps more blind students benefit from education opportunities. This in itself it is considered to be very significant. After the release of the audio books, the number of the blind students who registered to the system increased. Consequently, audio books are very important for the visually impaired students to benefit from higher education opportunities. New studies should be done to enable not only the blind students but also all the other students to benefit from the audio books and provide more usage of these books by students.

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INTERACTIVE MULTIMEDIA LEARNING: STUDENTS' ATTITUDES AND LEARNING IMPACT IN AN ANIMATION COURSE

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ABSTRACT
Malaysian classrooms are progressively absorbing interactive multimedia as instructional strategies for teaching and learning. Though, till now, interactive multimedia in a Malaysian classroom is often limiting and is confined to the hybrid use of chalk-and-talk method with multimedia assisted materials, where learning is still largely teacher-oriented. Such progress does not realize the full potential of multimedia learning, thus denying the credibility of student-centred learning strategies. The Web provides a wide network of information and interactive simulations necessary for active and independent learning. Hence, this paper describes the development and implementation of student-centred learning through Web-based domain on students in a Film & Animation course. The aim is to determine students' learning impact and attitudes towards independent learning and self-paced discovery. A set of multimedia tools were employed to create the student–centred learning environment and were designed using Gagne's Nine Events of Instructions which provides a proper theoretical framework of a good instructional lesson plan. The essential features were documented, examined and its impact on the student learning process assessed. Students' attitudes toward this Web learning approach were recorded as positive and promising. The use of multimedia in learning proves to be a feasible and viable alternative to traditional classrooms.

INTRODUCTION

The call for learning diversity is all-embracing as society undergoes constant change in the way of living and communication. Thus, this growing need has heralded change and transformation in the learning and teaching arena to shape learners in this knowledge-based society. "Universities today are in transition. Much of the change we see is driven by economic pressures and demands for graduates who will be able to function in a knowledge society" (Franklin & Peat, 2001). Likewise, in Malaysia, institutes of higher learning are currently moving towards a more multimedia-oriented classroom. Neo & Neo (2004) posit, "There is already a move to create multimedia courseware in educational institutions". Meanwhile, Malaysian government has created the Multimedia Super Corridor or MSC Malaysia to assist companies and higher learning institutions to test the limits of technology and to prepare themselves for the future.

The current mode of learning in Malaysia is structured on traditional chalk-and-talk method. For many students, learning has been dependent on time, place and is fundamentally teacher-oriented. The flexibility of such a learning environment is restricted, and the essence of multimedia learning which anchors on student-centred strategy remains a paradigm untouched. Unfortunately, such quandary is a common phenomenon, "technologies are too often used as substitute teachers that deliver information to learners rather than as learning tools that support the active learning process" (Kiili, 2005). This study aims to infuse interactive multimedia and student-centred learning strategies into the classrooms. By utilizing the common interactive learning approach, specifically the Web-based domain, this paper has adapted Gagne's Nine Events of Instructions as guide for a good lesson design. The replication of Gagne's instructional criteria was imperative to ensure the suitability of the multimedia instructions in our quest to reap effective learning outcomes.

Multimedia and student-centred learning

"One way to bring about a change of emphasis in teaching, from the teacher directed approach to a facilitated approach, is to change the medium of instruction" (Kearsley, 2000). Interactive multimedia offers an alternative medium of instruction to the current learning process. The nature of interactivity and discovery in multimedia learning bears a beneficial boost to the monotony of passive learning. Rather than be bounded by the pace of the teacher, learners are individually paced according to his or her own ability. One way, multimedia can give low ability students extensive learning time before moving forward. Alternatively, high ability students can branch out to random sequencing through the module and not be confined by linearity or a much slower pace. This aspect of multimedia learning supports student-centred strategy whereby learners take responsibility in their own

learning process. The liberty to proceed or recede allows self-pacing, an important facet to enable learners to learn according to their individual pace.

Akin to hypermedia, multimedia presents an immeasurable interconnectivity to information in a variety of possible combinations, sequences and mixture of resources which shapes the higher-order thinking in students. "Students learn to sift the relevant from the irrelevant information and can relate new information to real world situations" (Stoney & Oliver, 1999, p.9). With technology, the process of learning germinates interactive and active responses; students will demonstrate both cognitive and emotional intelligences in accordance to the multimedia stimuli.

Multimedia capable features such as the embellishment of graphics, ability to orchestrate sounds, animate moving pictures and present videos are innovations which can enliven the learning experience. The flexibility of multimedia to replace traditional textual instructions allows a wider range of stimuli, both in the verbal and visual, thus increases the state of student engagement in learning. In other words, multimedia is capable to transmit information through its capacity to make it alive, thus helping students to make real-world visualisations otherwise unseen. Kearsley (2002) confirmed that, "Imagery has been shown to facilitate recall in many studies. Recall or recognition is enhanced by presenting information in both visual and verbal form". Studies also show that students who learn from multimedia have greater self-esteem and motivation, consequently the rate of retention in multimedia learning exceeds that of traditional means. When learners are engaged in learning, the likelihood to retain information and sustain the learning process increases. According to Reeves (1998), "Multimedia can stimulate more than one sense at a time, and in doing so, may be more attention-getting and attention-holding."

Researchers indicated that the key distinction between traditional and multimedia instructional strategy is interaction. Interactive multimedia learning cultivates interaction between the learner and the learning content and the content with the learner. Research suggests that when such learning interaction occurs, a learner's attention and comprehension of the learned subject increases. "Interaction is commonly viewed as stimulus response reinforcement encounters action, an integrated form of between the learner and the instruction" as stated by Stemler (1997). Interactivity makes the learning process responsive and active, governing a learning of participation and doing, not passive watching or merely listening.

METHODOLOGY

The treatment spanned across fourteen weeks. The initial course structure contained weekly lectures, one-on-one tutor discussions and critique sessions. However, to achieve the aims of this research project, the Web-based learning were integrated in as a substitute to the weekly traditional lectures. Although the implementations of treatment were over fourteen weeks, there were significant time periods in between allocated for assessments and independent self-learning in both learning domains. Students were exposed to self-regulated learning with the Web domain otherwise not available in the existing method of learning and teaching. The Web module was implemented following that, where students were briefed and informed that their next lecture will be provided online. They were provided with a Web link which connects them to the Web learning module, teacher's e-mail and chat room access. Given one week time frame, students were instructed to access the lecture module independently, on their own effort, time and location. Apart from the flexibility, they were told to engage in online consultations if deemed fit and that the tutors were available for online discussions via Yahoo! Messenger and electronic mail.

Film and Animation (FA) Design Process I is a class for animation students of Gamma (2nd year students) in the Faculty of Creative Multimedia. In this class, the core curriculum is animation precepts which are called "Principles of Animation." The understanding of animation principles is most elementary to the learning of animation. This syllabus is to assist learners on their first attempt to animate independently. There are twelve precepts to animation principles. Among the twelve, one defining principle of action and movement known as "Straight Ahead & Pose to Pose Action" was selected as the lesson design. The title was produced in each of its own whereby "Straight Ahead & Pose to Pose Action" was structured as Web-based. Twenty six students participated in the study (n=26). All of them were students from the second year Film & Animation course of MMF 2013 whereby the researcher was an academic staff of the said course. The general age range was 19-24 years. These students have pre-requisites in design, multimedia and computer authoring subjects obtained from the first year course programme.

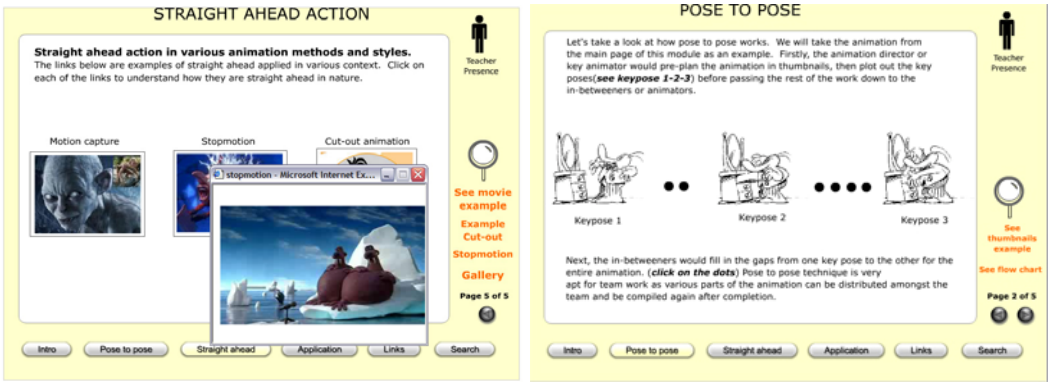
Instructional design of the Web-based learning environment: Gagne's Events

Gagne's theoretical framework was based on the cognitive perspective of learning and emphasized largely on the effectiveness of the instructional design. In his theory, he has correlated the nine events of instruction with the

associated internal mental processes and formulated these events as elements of a good lesson which promote effective learning (Gagne, Briggs, & Wagner, 1992). Hence, the development and creation of the Web-based learning environment in this research incorporated with Gagne's 9 Events of Instruction to be considered a good lesson design (Ellington and Earl, 1999). Based on his findings, the multimedia learning environment can be considered as a "good lesson design" should it acquire the nine events and instructions as put forth by his instructional theory.

Event (1):Gain attention

Learning is a process which requires attention. In order for learning to take place, capturing the attention of the students is therefore critical. Gagne proposed that learning material should provoke learners to be inquisitive and motivated. Thus, in the Web module, images, textual information, sound and contrasting colours as background were used to attract learner's attention. Animation was added as part and parcel of the course as well as to stimulate learners' attention (see Figures 1(a) and 1 (b)).

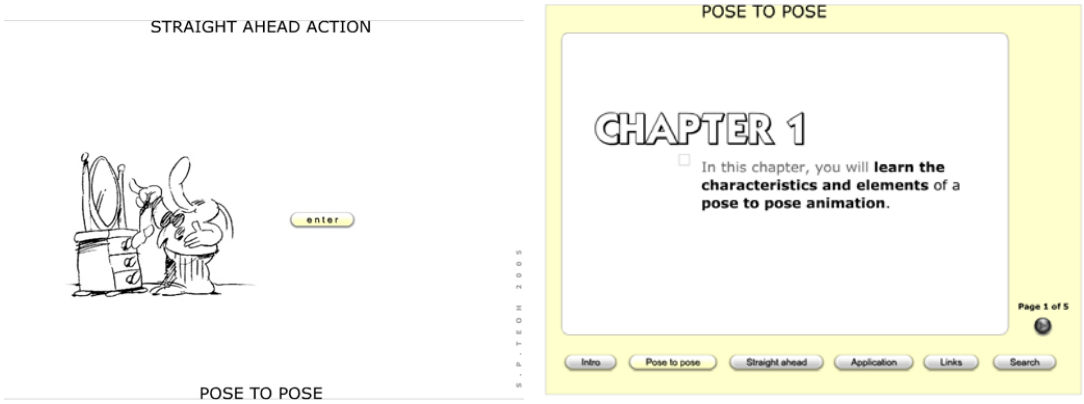


(a) **(b)**

Figure 1 (a) and (b) Multimedia elements were used to gain the students' attention

Event (2): Inform learners of the objectives

Learning objectives should be made clear to the students at the start or early of each given lesson. First, an informed learner will be aware of the gains from which the learning would provide. Second, the objectives would initiate a conscious responsibility towards the learning process; hence this will help assist students to complete the learning programme. As a result, the students were informed of the objectives prior to given the module. The web module contained a page stating and explaining the objectives of the module. The title of the lesson was also stated and provided input to the content that is to be studied, in this case, the topic was "Straight Ahead Action and Pose-to-Pose."(see Figures 2 (a) & (b)) A pre-test was also given to the students prior to using the module.



(a) **(b)**

Figure 2(a) and (b) The title and the objectives of the module

Event (3): Stimulate recall of prerequisite learning

Within this context, prior knowledge and understanding of previously learned concepts are associated to the overall learning experience. The ability to make connections of previous knowledge to newly learned information can facilitate learning development. In order to understand the topics, students had to have prior knowledge in the multimedia and animation in general. In other words, they have to know what multimedia is, what animation is and why it is necessary to understand the topics given in the Web module. In this project, the students have learnt a few principles of animation prior to taking the web module. The content in the web module is one of the 12th animation principles that they have to learn (see Figure 3).

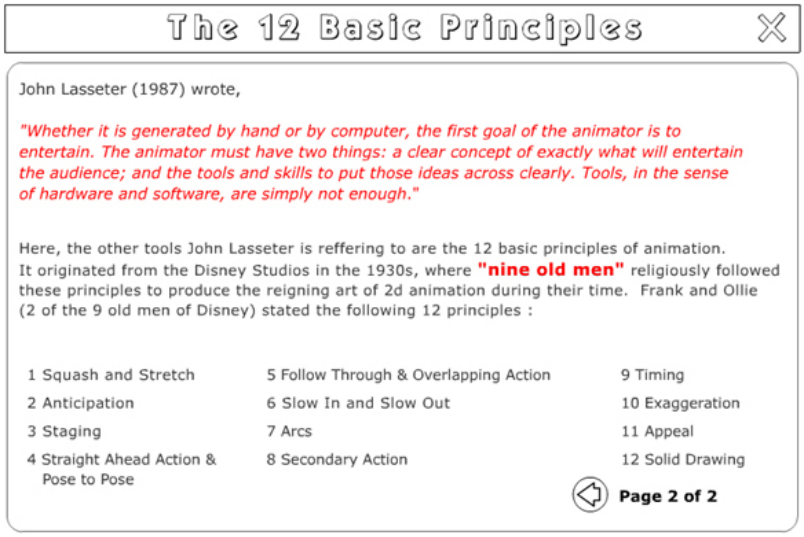
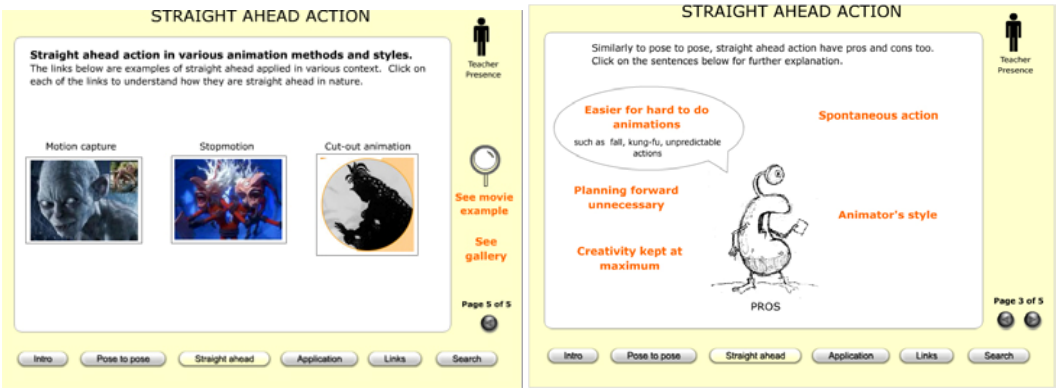


Figure 3The animation principles that the students have to learn

Event (4): Presenting the content

Due to the different learning styles and behaviours, learners have selective perceptions of content based on each individual needs and cognitive awareness. In order to elicit a response from the learner, stimulus in this aspect refers to the presentation or display of the content. Therefore, clear, simple and direct to the point language was used to explain concepts. Images, sound, video and animation elements were used to illustrate ideas, demonstrate and present content. Also contained were navigational tools for the students to explore (see Figures 4(a) & (b)).



(a) **(b)**

Figure 4 (a) and (b) Graphics, Images and navigational tools are provided and presented to the students

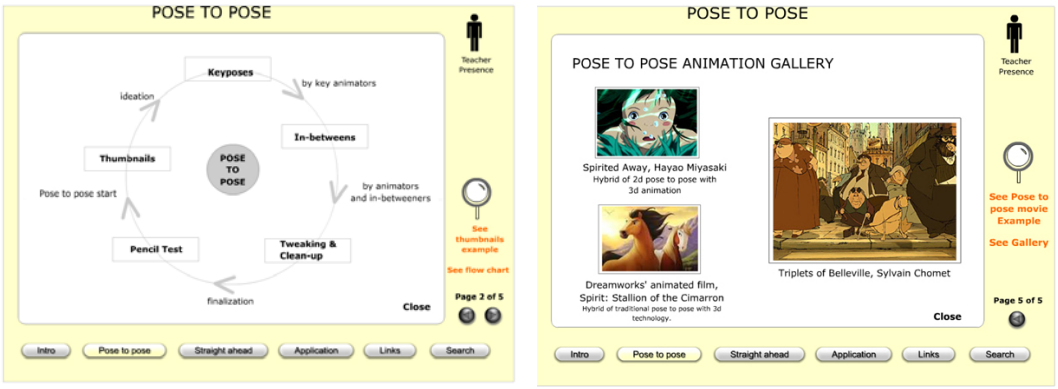
Event (5): Providing learning guidance

Providing examples, guided instructions, concepts, analogies, graphical representations and case studies in the learning programme offer additional guidance to assist learning. Within the Web module, learner's activities were built into the module for the students to interact with. Examples using images, video, sound, and animation were also available for the students to use and understand the content being presented. Examples of the principles were demonstrated and sound was made available to the students to further understand the content

presented. Navigational tools were provided to the students to explore and they were clearly labelled. Clear instructions were given to the students as well as directions to help students to explore and learn on their own (see Figures 5(a) &(b)).

Event (6): Eliciting the performance

Post-tests were given to the students to assess their understanding and their attitude towards learning on the Web method. Also, through the repetitive exploration of the learner's activity built into the modules, the students will be required to demonstrate their understanding.



(a) **(b)**

Figure 5 (a) and (b) Examples were provided to enhance their understanding of the content and instructions allowed them to navigate within the module

Event (7): Providing feedback

Providing informative feedback on learner's performance is an important reinforcement process. Students in this learning environment had access to the teacher in person or via email or chat. For the Web, instant messaging feature was added to the module to allow the students to ask the teacher for help or clarification and for teacher to provide feedback to the students. Students could also obtain feedback from one another (see Figures 6(a) & (b)). Instructions on how to use the modules were also included to provide feedback.

(a) **(b)**

Figure 6 (a) and (b) Show the icon that the students can assess the teacher through instant messaging and email for feedback and help.

Event (8): Assessing performance

In order to determine the effectiveness of the learning process, assessment was required to evaluate students' comprehension and knowledge of the learned content. They were also given post-tests to see if they understood the content that was presented to them. Projects required critique sessions to demonstrate students understanding of the animation principles by creating an animation movie reflecting the principles learnt

Event (9): Enhancing retention and transfer
Learning is complete when knowledge can be transferred into a new situation. The need to have varied practice tools and aids can facilitate transfer and enhance retention process (see Figure 7). The students have to apply what they have learnt in the module in doing a final independent project for the Animation course. Students must exhibit the principles learnt to the actions in their animation.

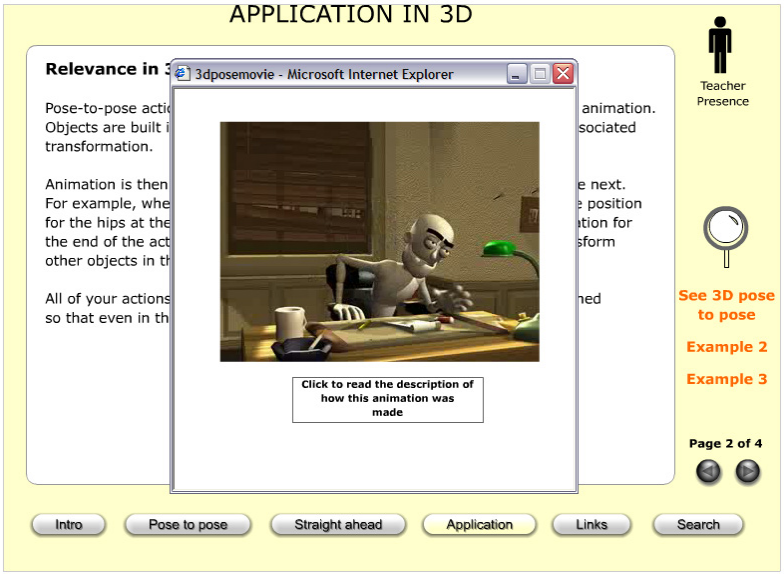


Figure 7 Application on how the principle is applied in 3D form

Surveys and Questionnaires
The Web-based survey yielded twenty one student respondants. Five point likert-type scales and closed-ended questions were used as a tool for survey assessment. The survey was adapted from *CAL Evaluation, Gregor Kennedy, University Of Melbourne (1998).* A set of questions were constructed for Web-based learning environment. This variety inclusive of the open-ended questions enabled students to express their views in fuller statements and at the same time add comments which were not pre-ordained by the researcher. The following are the results of the Likert-scale questionnaire (see Table 1).

The student survey was structured in the following priorities:

1. Learning motivation
2. Content Organisation
3. Navigation and GUI
4. Multimedia and Interactivity
5. Web Features

The table states the mean (m) of result of the statement as well a the percentage of students who agree and strongly agree with the statements (p). The items in the results were divided in the constructs as stated above. As for reliability of the survey, according to Lim, Khine, Hew, Wong, Shanti, and Lim (2003), a reliability of above 0.6 is deemed to have satisfied the reliability of the survey. The reliability of the survey questionnaire or the Cronbach's Alpha was 0.908. Thus, this survey is deemed reliable.

Table 1 The results of the survey given to the students

No.		Mean (m)	% (p)
	MOTIVATION		
1	I find learning interesting and engaging.	4.00	92.3
2	I found the module useful for learning.	4.23	92.3

3	From the start it was clear what I was going to do in the module	4.00	88.4
4	From the start it was clear what the objectives of the module were	4.19	96.2
5	I know better about the subject after using the module.	4.15	92.3
	CONTENT		
6	Generally there was just the right amount of information on each screen.	3.88	80.0
7	Important information or key concepts were easy to identify	4.31	88.5
8	Generally the content was clear and logically organised	4.27	92.3
	NAVIGATION & GUI		
9	I found it easy to locate pieces of information I had previously used.	4.19	96.2
10	I found the interface clear, structured and appealing.	4.23	96.1
11	I always knew where to go next.	4.38	100
12	I found it easy to navigate my way around the module.	4.35	92.3
13	The buttons and links were easy to understand.	4.42	92.3
14	I found it easy to return to the module from an outside link.	3.88	80.8
	MULTIMEDIA & INTERACTIVITY		
15	I found the graphics and multimedia useful in visualising the concepts.	4.35	96.2
16	The module provided responses that were meaningful to me.	3.92	80.7
17	Multimedia increases my motivation to learn.	4.46	100
18	Interactivity helps me learn better.	4.46	96.2
	WEB FEATURES		
19	I found the chat access to my teacher helpful whenever I needed assistance.	4.08	73.1
20	I found the e-mails and chats effective and convenient for teaching.	3.96	69.2
21	The information from outside links reinforced my knowledge of the subject.	4.19	84.6

Student Feedback

In addition, based on the five constructs stated above, interviews were conducted via the chat room, as means to engage in one-on-one dialogue in the least formal flair. This approach was effective as it encouraged students to elaborate their thoughts in the least intimidating manner. Table 2 presents the list of feedback (unedited) the students had written in response to the open-ended questions posed to them.

Table 2 Student feedback of the web-based environment

		WEB
1	**Learning Motivation**	• I can access it wherever I wanted to. • Web method more easier way, able to access anytime, anywhere. • I prefer to use Web method because I am very bad in communication and quite blurry. • I love to get tutorials from the internet. Easy to catch up. • I always browse website for learning tutorials. • I have not used the web much except for referencing and reading of certain topics. • Web method is most of the time behind some monitor. • Not motivated because I am always by my pc so when I come to university and have to sit at a pc again…it sort of bugs me out. • I tried to open it when the connection is bad and it takes a very long time • It is way more interesting than bloody boring power point slides. • It is helpful cause it is boring just hear the lecturer talking in front. • I have more time to read the information. • Yes I enjoy the module because I am not alone anymore with the module. • (Web) It makes the learning process non-linear. • It enhanced my interest factor. • It makes me want to know more.
2	**Content**	• Clear and organised I was able to learn. • Language is simple and easy to understand • Info is clear and easy to understand. • It was presented nicely and really organised. • Yes, it is summarized. The point is already highlighted. • I was able to understand the content because we can see a lot of examples

		there. • Visuals help me understand more cause I can understand and visualise the related topic. • I have enjoyed the web because it is more fun than reading long notes or going through 5 slides just to explain 1 thing. • Though brief, I found out that whatever topics to be covered are there. • Good enough to remember • Sorted out by points. Therefore easier to find keywords. • Very useful and enough for basic understanding of the subject.
3	**Navigation & GUI**	• The GUI was nice, clean, simple and to the point. • The GUI has clear direction and clear links. • It was clear in its direction and purpose in directing our attention further on the module. • The navigation helps me to go back and forth whenever I want. • The web module allows me to learn because I am a slow leaner. So I might take longer time than others to learn something. • Web allows learning in my own pace. Since I am quite lazy, the pace is slower. • It makes learning process non-linear. • Easy to understand and user friendly. • Suitable, no hard to understand icon. • Suitable, easy to see where to go next. • Learning in my own pace.
4	**Multimedia & Interactivity**	• There's not much text to bore me and many visuals to interact with which is fun. • Allows us to learn more and the multimedia element really helps a lot. • Am motivated as my eyes are interacted with something fun. • The interactive features will lock the information that I just read in my mind longer. • The interactive features give a deep image in my mind after study. • Interactive features are useful as it helps me understand the topics. • I can not only see, I can hear and I can feel in a way. • Want to click on it (curiosity) because of the illustrations. • Videos takes long time to load. • I try to open it with the connection and it takes a very long time. Motivation depends on the connection. • The Web module is fun and enjoy the study but the interactive is very heavy to load for those who using low speed internet. • I was able to understand the content because we can see a lot of examples there. • Best features - animated graphics. • The MM elements manage to make me think further ahead than visual. • The Interactive features act as a sidekick wherever you are in trouble. • There are pictures for easy understanding. • It was more interesting to learn where there's interactivity involved. • The Web makes me want to click (on curiosity) because of the illustrations. • MM helps me visualize the content better. • The use of graphics and animation samples really helps. • The external links and animations are helpful.
5	**Web Features (chat access, email and links)**	• The best features of a web module are the external links. The external links and animations are helpful. • Yes I enjoy the Web module because I am not learning alone anymore. • Worst web features-downloading

DISCUSSION

1. Learning Motivation
The students' perceptions on the use of multimedia and interactivity were very positive. Students agreed that learning with interactivity and multimedia was interesting and engaging; at the same time they found this method of learning useful and favourable. The motivation in the Web was high with m=4.00, p=92.3 (see Table 1 line 1). Some of favourable comments were "*Web method more easier way, able to access anytime, anywhere*" and "*It is way more interesting than bloody boring power point slides*" (see Table 2, under Learning Motivation).

While the overall implementation of the Web-based learning garnered positive numbers in learning motivation, there were some reluctance as pointed out in the students' feedback. *"Web method is most of the time behind some monitor"* and *"I tried to open it when the connection is bad and it takes a very long time"* (see Table 2 on Learning Motivation under Web) were some examples.

2. Content Presentation
Screen information was appropriate as the following data suggest; Web m= 3.88, p=80.0 (see Table 1, Line 6). Acquiring preference for conciseness, students noted brevity of content as very influential to their learning; *"It was presented nicely and really organised"*. Another said, *"Language is simple and easy to understand"* (for more student comments on this area see Table 2 under Content).

3. Navigation and GUI
In Table 1 (Line 12, m=4.35, p=92.3), the results show that the students found it easy to navigate in the module which was also supported by their comments such as "*Easy to understand and user friendly"* and "*The GUI has clear direction and clear links*" (see Table 2, under Navigation and GUI).

As a techno-savvy generation, these students suggested that they were comfortable with the characteristics of non-linear learning and are adaptable to more complex structures. Such was reflected in a respondent's feedback, *"it makes the learning process non-linear"* (for more student comments on this area see Table 2 under Navigation & GUI). The students also commented that they enjoying learning at their own pace, especially those who consider themselves slow learners. One student commented "*The navigation helps me to go back and forth whenever I want*" while another stated very clearly "*Learning in my own pace"* (see Table 2 under Navigation & GUI).

There has been confidence in self-paced learning among the respondents. Students have shared fondness for liberty of time and control over their learning tasks and that they are able choose to proceed, pause or retrace anytime they wish or feel ready to. For some, this feature was exceptionally helpful as they do not have to catch up with other students or the lecturer in order to sustain personal learning and understanding. Hence the students' feedbacks include *"Web allows learning in my own pace"* and "*The web module allows me to learn because I am a slow leaner. So I might take longer time than others to learn something*" *(*see Table 2 under Navigation & GUI for more student responses).

4. Multimedia & Interactivity
The use of graphic visualisations and multimedia for presentation of information received encouraging responses. 96.2%, of the respondents agreed to the notion "*I found the graphics and multimedia useful in visualising the concepts*" (see Table 1, Item 15, Web m=4.35, p=96.2). One commented, *"The interactive features give a deep image in my mind after study" ."* (see Table 2 under Multimedia & Interactivity). The effectiveness of multimedia and interactivty as a learning medium clearly supports knowledge transfer and at the same time promotes engagement in learning which surpasses its status quo of a mere tool of delivery. Many students had reported high interests resulting from enriching multimedia experience hence harnessing ownership in self-learning. This was reflected in some responses such as *"It was more interesting to learn where there's interactivity involved" , "Want to click on it (curiosity) because of the illustrations"* and *"The interactive features will lock the information that I just read in my mind longer."* (see Table 2 under Multimedia & Interactivity for more student responses).

5. Web Features
Whether it was online chats, web links or the variety of resources made available, students felt that the Web features were helpful for learning. *"External resources via the web links reinforce knowledge of the subject",* said the respondents. The following data confirmed the comment; m=4.19, p=84.6 (see Table 1, Item 21). A student said, *"The best features of a web module are the external links. The external links and animations are helpful"* (see Table 2 under Web features). A very interesting insight from a student had revealed how the Web can help him to participate in a communal learning experience. In his response, *"Yes I enjoy the Web module because I am not learning alone anymore."*

CONCLUSION

In general, this study have found that interactive learning using this Web-based environment is feasible and is a viable alternative to the traditional classroom which has proved to be limited in achieving the necessary needs of the students in the modern learning context. Students were positive towards active learning and were confident in enforcing self-paced strategy. This is a viable learning strategy and should be encouraged by educationists.

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ORIGINAL RESEARCH AND PEER REVIEW USING WEB-BASED COLLABORATIVE TOOLS BY COLLEGE STUDENTS

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ABSTRACT
The Environmental Inquiry program supports inquiry based, student-centered science teaching on selected topics in the environmental sciences. Many teachers are unfamiliar with both the underlying science of toxicology, and the process and importance of peer review in scientific method. The protocol and peer review process was tested with college students at 11 universities around the United States. The overall goal was to promote science education by engaging students in a sociologically authentic scientific research including anonymous peer review. Students were provided with the methods and knowledge to conduct a toxicology experiment and the technology needed for communication. They conducted a bioassay experiment, posted their results on a web, and completed anonymous peer reviews. Data consisted of peer reviews, anonymous online questionnaire, and another questionnaire about students' experiences and their evaluation of the project. There were statistically significant differences among schools in scores received for the quality of the argument and quality of technical writing. However, the only statistically significant difference concerned the average score received was the quality of technical writing. The findings suggested that the research and peer review protocols could be adapted for use by introductory level college science students, including prospective science teachers.

Keywords: Peer Evaluation; Environmental Inquiry; Science Teacher Education; Computer Uses in Education

INTRODUCTION

The Environmental Inquiry program supports inquiry based, student-centered science teaching on selected topics in the environmental sciences. Texts to support high school student research are published by The National Science Teachers Association (NSTA) in the domains of environmental toxicology, watershed dynamics, biodegradation, and the ecology of invasive species. The first of these publications, What's the Risk?, was published in 2001 and includes bioassay protocols for assessing the toxicity of substances. Secondary school science students can post the results of their bioassays on a web server and participate in a process of anonymous peer review and "publication" of their research. Teachers and secondary students who have participated in the process reported finding it interesting and useful; however, we recognized that many teachers are unfamiliar with both the underlying science (toxicology) and the process and importance of peer review in scientific method. We tested the protocol and peer review process with prospective science teachers in a secondary science methods course at Penn State, using a companion website set up specifically for college-level students. The College Peer Review project is a multi-university project that has been implemented every academic semester since fall 2001 (Trautmann, Carlsen, Yalvac, Cakir, & Kohl, 2003). The results of that test suggested that research and peer review protocols could be adapted for use by introductory level college science students, including prospective science teachers. This paper reports the results of a multi-site expansion and test of that work.

Participants and Purpose of the Study

This research involved college students in science courses, pre-service science education courses, and science studies courses at 11 colleges and universities around the United States. The overall goal of the project was to promote science education by engaging students in a sociologically authentic scientific research project including anonymous peer review. The project was designed to enable students to experience science as a mode of inquiry rather than a static collection of facts.

The aim of quantitative analysis was to identify the aspects of the project that are working and the aspects that need to be improved or omitted. This paper presents some quantitative data from the 11-campus project. Data are

included from 10 campuses (the eleventh yielded only one student's data and is omitted from the analysis). This research intended to be used as a resource for discussion of the project and the development of plans for "next steps" and to understand the participants' initial engagements and attitudes toward the project by answering the following questions:

- What do students perceive as the strengths and weaknesses of the model, rating the protocol specifications and written materials, the online systems, the quality of the reviews they received, and the extent to which they perceived that their experiences were scientifically "authentic?"
- How are the final drafts of students' research reports affected by peer reviews?
- Do reports improve significantly when authors receive detailed, consistent reviews?

METHODS AND PROCEDURES

In the project, students were engaged in open-ended scientific investigations (Trautmann, Carlsen, Krasny, & Cunningham, 2001). Participants were provided with the methods and knowledge of science to conduct a toxicology experiment and they used the necessary tools (e.g., the chemicals, the organisms, Petri dishes) and methods (e.g., counting the number of germinated seeds, measuring the root length in mm) to finish their investigations. All activities were organized to provide an opportunity for students to learn how to frame research questions, design and carry out experiments, critically analyze their results, write a report, and defend their conclusions to their peers. Participating students engaged in original research, computer-mediated collaboration, peer review, and online publishing. They conducted a bioassay experiment, posted their results on a web server, and completed anonymous peer reviews. Peer reviews were submitted using an online form. A questionnaire with both fixed-format and open-response questions was administered anonymously at the end of the semester. Participants were asked to help us evaluate the College Peer Review project by completing a questionnaire about their experiences. Evaluation of the questionnaires helped us to determine the value of the project and to guide the project's future development.

Students worked in pairs to conduct the bioassay experiment and tally their results, but posted individual reports and completed individual peer reviews. The reports followed a common, question-driven format, and quantitative data were entered using a table tool. After completing their own lab reports, students had about a week to complete online peer reviews of two other students' projects. Students composed their peer reviews using a structured data entry screen with two quantitative items and three essay items.

Peer reviews were anonymous; only report authors and instructors were given access to their contents. The matching of reports and reviewers was nonrandom but anonymous across institutions.[1] User data, reports, and peer reviews were stored in the database in related tables. The final common stage of the project was "publication" of reports after students made revisions using peer review feedback. Since many of the major activities of the project occurred online (report writing, peer review, publication) most of the data were collected automatically.

Data Analysis and Discussion

Analysis began by reorganizing data tables that had been collected by our server using Microsoft Access. The first task was data cleaning and the creation of one inclusive table by combining a user table, reports table, written reviews table, received reviews table, and final questionnaire table. Once a comprehensive clean data table was created in Access, it was exported to statistical software (SPSS) for quantitative analysis. There were 411 participants. 341 (83%) gave permission for us to use their responses in research. A number of checks of participant-response bias were done and no meaningful differences between permission-granters and others were detected. The following analyses are limited to the 341 individuals who gave consent. However, the peer review scores assigned to consenters by non-consenters are included, without any identifying information about the latter. In the following pages, data are presented as were gathered by the automated system. Discussion to address related issues and their relevance are provided where necessary.

Are you in a teacher education program?

[1] Students at the different universities completed the experiment at different times within an approximately two-month time frame. Instructions to students about how to select reports to review were left to the instructors' discretion. At Penn State, for example, we had our students complete the experiment first, then asked them to hold off on completing reviews until the results had been posted from two other institutions. At least one instructor encouraged his students to try to review another report that assessed the toxicity of the same chemical they had assessed. In most cases, however, students chose reports to review based only on the title of the report, which included the name of the chemical being assessed and an author-determined 5-digit code. Lab partners shared their 5-digit codes with each other so they could avoid reviewing their partner's report, which would have presented a conflict of interest.

Although there were teacher education students at most of the participating colleges, they were outnumbered by science majors. 44 participants' major could not be identified (this information was provided in the final questionnaire, which not all consenters completed); therefore out of 341 participants, 297 are reported. Out of 297 participants 94 (%31.6) were in teacher education program and 203 (%68.4) were not. The following table reports the number of students and whether they are in a teacher education program, by school.

Table 1: Number of Students and Whether They are in a Teacher Education Program, by School

University											
School code	1	3	4	5	6	7	8	10	11	12	Total
Number of students											
Not a teacher ed student		20			1	123		1	9	49	203
Teacher ed student	16		28	12	2	5	11		20		94
Total teacher ed status known	16	20	28	12	3	128	11	1	29	49	297
Teacher ed status unknown	0	0	0	0	3	0	0	9	31	0	43

Missing values = 44, 12.9% of the total N of 341 consenters. One non-consenting participant is omitted, the only student from an 11th university.

What are your gender and minority group affiliations?
74 participants (21.7%) were male. Analyses did not yield significant differences on any variables between male and female students. Differences among schools in gender distribution were not statistically significant. With the exception of one school, universities with more than six participants all had female participants outnumbering male participants by at least three to one. This was true among science courses as well as science education courses. 17.6% of the students who completed the final questionnaire identified themselves as members of underrepresented minority groups (African-American, Hispanic, and Native American). There were no statistically significant differences associated with this response on any measure.

Basic descriptive statistics for the final student questionnaire
Of the 341 students who submitted reports and gave consent for research, 192 (57% of consenters) completed the final questionnaire. Summary statistics from the questionnaire are reported below. We used Likert-scale items, where 1= "strongly disagree," 2="disagree somewhat," 3 = "Neutral," 4 = "Agree somewhat," and 5 = "Strongly agree."

Table 2: Items and Summary Statistics from the Questionnaire

	Descriptive Statistics	N	Mean for all students	Mean for teacher ed.	Mean for other students
1	I learned something by writing peer review comments	192	3.96	3.82	4.05
2	I felt qualified to provide meaningful peer review of other students' reports	192	3.73	3.65	3.78
3	I believe that the peer reviews I wrote should be helpful to the students that received them	192	3.98	3.97	3.99
4	Peer reviewing other students has helped me to think more critically	193	4.10	4.08	4.11

5	Peer reviewing other students has helped me to improve my own scientific writing	193	4.02	3.90	4.08
6	I received useful peer review comments about my own report	192	3.53	3.36	3.63
7	The quantitative scores I received from peer reviewers were fair	192	3.60	3.51	3.66
8	I changed my mind about something in my report because of comments I received through peer review	192	2.99	2.94	3.02
9	It is easier to say what I really think when I don't have to sign my name or meet in person with the students	192	3.71	3.69	3.72
10	I think that meaningful peer review is a reasonable expectation for college students	190	4.23	4.21	4.24
11	I think that meaningful peer review would be a reasonable expectation for high school students	190	3.88	3.96	3.84

None of the above differences is statistically significant at $p < .05$.
Although teacher education student means were lower for all items except item 11, these differences are not statistically significantly (ANOVA with correction for multiple t-tests). However, it is worth noting that item 11 evaluates high school students' ability to provide sound feedback to each other. Table 3 and Table 4 provide brief individual descriptive statistics for each final questionnaire item below.

Table 3: Frequencies and percentages for item 1 through item 5

	Item 1		Item 2		Item 3		Item 4		Item 5	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Strongly disagree	2	1.0	7	3.6	3	1.6	6	3.1	2	1.0
Disagree	7	3.6	18	9.4	2	1.0	1	.5	8	4.1
Neutral	32	16.7	34	17.7	29	15.1	29	15.0	37	19.2
Agree	106	55.2	94	49.0	119	62.0	89	46.1	84	43.5
Strongly agree	45	23.4	39	20.3	39	20.3	68	35.2	62	32.1
Total	192	100	192	100	192	100	193	100	193	100

A majority of the respondents (79%) agreed that they learned something by writing peer review comments. 79% of the students reported that they felt qualified to provide meaningful reviews of other students' reports. 82% of the students thought they provided helpful reviews, and less than 3% anticipated that their review would not be helpful. 82% of the students agreed that peer reviewing enabled them to reflect and think about their own and others' research more critically. Providing feedback on other students' research reports was perceived beneficial by students. 75% of the respondents agreed that their technical writing improved because of the peer reviewing process.

Table 4: Frequencies and percentages for item 6 through item 11

	Item 6		Item 7		Item 8		Item 9		Item 10		Item 11	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Strongly disagree	10	5.2	7	3.6	30	15.6	13	6.8	4	2.1	5	3
Disagree	22	11.5	14	7.3	38	19.8	20	10.4	2	1.1	9	5
Neutral	51	26.6	69	35.9	49	25.5	36	18.8	17	8.9	33	17

Agree	74	38.5	60	31.3	54	28.1	63	32.8	91	47.9	87	45
Strongly agree	35	18.2	42	21.9	21	10.9	60	31.3	76	40.0	58	30
Total	192	100	192	100	192	100	192	100	190	100	192	100

Although 82% of the students thought they provided helpful reviews, only 57% reported that they received helpful reviews. 18% of students reported that peer reviews did not help them to improve their reports. Most of the students thought their peers were fair when they rated the quality of the reports. Previous research has shown that marks given by students can be as reliable as those given by instructors (Orpen, 1982). 11% of the participants reported that their score were "unfair." 39% of the students agreed that they changed their minds about some aspect of their report because of feedback they received via peer review. This might be attributed in part to the implications of peer evaluation, which involve a different relationship that that between instructors and students. It may contribute to a collaborative role rather than an adversarial one (Billington, 1997).
A majority of students felt positive about the anonymity of peer review. This is consistent with what actually happens in scientific community. According to Arnold Relman, the chief editor of the New England Journal of Medicine, about 85% of their reviewers have preferred to remain anonymous, and report that they are more candid and rigorous when they are not required to sign their reviews. 87% thought college students could provide meaningful and helpful peer reviews. Previous research has suggested that students appreciate the opportunity to comment on each other's work in a constructive manner, and that peer review can instill a sense of community within a class (Hay & Miller, 1992). When students were asked if it was realistic to expect meaningful reviews from high school students, 75% responded positively. There is no significant difference between teacher education students and other students on this measure. However as noted earlier, this item was the sole item on which teacher education students felt more positive than other students.

School Differences in Quantitative Review Scores
In their peer reviews, students rated the quality of the argument and the quality of authors' technical writing by assigning a score to each. We found some statistically significant differences between schools. An ANOVA procedure was used to detect these differences and then post hoc analyses were done to identify pair wise differences between schools.

The first measure, which was QScore1, asked reviewers to answer the question, "Did the author address each question fully and provide good support for his or her conclusions?" Responses were reported on a five-point scale ranging from 5 = "Excellent. Exceptionally well done" to 1 = "Failure. Unacceptable responses; report should be restarted from scratch." This was called the "quality of argument" score. Students at School 6 received significantly higher scores on this measure than students at Schools 3, 10, and 12. Because School 6 had a small number of participants (n=6), this result should be carefully interpreted. There were no other pairwise differences. Table 5 gives the ANOVA results for the quality of argument.

Table 5: One-Way ANOVA results for QSCO1 by SCHOOL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
SCHOOL	9	11.9	1.32	2.53	0.0082
Error	309	161.1	0.52		
Total	318	173			

Post hoc tests

Duncan Grouping	Mean	N	SCHOOL
A	3.80	5	6
B	2.69	49	12

B	2.58	19	3
B	2.50	9	10

Significant differences at p<.05, means with the same letter are not significantly different

There were significant differences among schools in scores received for quality of technical writing (QScore2received). One-way ANOVA was performed, followed up with Duncan grouping post hoc analysis for pairwise comparisons, Table 6. Three groups of schools were identified, as seen in the table below, with statistically different average received mean scores. Schools 6 and 5 comprised two discrete "groups," A and B. Table 6 presents one-way analysis of variance results for quality of technical writing across schools. Schools 1, 3, 7, and 12 comprise a third group with a significantly different mean score, when compared to Groups A & B. There were no other differences.

Table 6: One-Way ANOVA results for QSCO2 received by SCHOOL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
SCHOOL	9	15	1.67	3.53	0.0003
Error	309	145	0.47		
Total	318	160			

Post hoc tests

Duncan Grouping	Mean	N	SCHOOL
A	3.90	5	6
B	3.20	12	5
C	2.59	49	12
C	2.57	126	7
C	2.53	16	1
C	2.49	19	3

Significant differences at p<.05, means with the same letter are not significantly different

Students in each participating college reviewed and scored other students' reports. Scores on technical quality of reviewed reports were labeled as variable QSCO2Written. ANOVA results in Table 7 shows that students at School 6 awarded significantly higher scores to others concerning the technical quality of reviewed reports, an interesting phenomenon given that they also received the highest scores. Students School 5 awarded significantly lower scores; however, they received the second highest scores for their reports. (Please note that these are only preliminary analyses; we still need to look at issues like which schools tended to review which other schools. Again, the matching of reports to reviewers was anonymous but not random, and it is likely that students were most likely to review reports by other students from their own campus, because their reports were most likely to be available for review at the time each campus's reviews were required by the relevant instructor).

Table 7: One-Way ANOVA results for QSCO2 Written by SCHOOL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
SCHOOL	10	13.85	1.39	2.91	0.0017
Error	298	141.86	0.48		
Total	308	155.70			

Post hoc tests

Duncan Grouping	Mean	N	SCHOOL
A	3.5	4	6
B	2.6	122	7
B	2.5	5	10
B	2.2	12	5

Significant differences at p<.05. Means with the same letter are not significantly different

Differences in Quantitative Review Scores for Teacher Education Students

Students in teacher education programs generally received and assigned higher mean scores than non-teacher education students. However, among the differences in mean scores for all four measures, the only statistically significant difference concerned the average score received for the quality of technical writing. Table 8 reports that teacher education students were able to articulate their research and communicate results in a more effective way than the students who are majored in sciences or science studies. Analysis of variance results for quality of technical writing received score by major is reported in Table 9.

Table 8: Written and Received Score Differences in Reviews for Teacher Education Majors

Teacher Education	QScore1 Received	QScore2 Received *	QScore1 Written	QScore2 Written
No	2.7508	2.60017	2.7362	2.6503
Yes	2.9147	2.84425	2.8653	2.7991

*Only the received quality of technical writing received score (QScore2) is statistically significant at p<.05.

Table 9: One-Way ANOVA results for QSCO2Received by Teacher Ed.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Teacher Educ.	1	3.51	3.51	7.08	0.0082
Error	280	138.9	0.5		
Total	281	142.41			

CONCLUSION

Findings suggested that participants found the peer review and the original research aspects of the project engaging, unique and interesting. They enjoyed their experiences with the project activities, working in groups and the online collaboration. Through its original research, peer review, and online collaboration aspects,

College Peer Review project led students to appreciate the social characteristics of science. As noted at the beginning of this paper, these are findings from a research study which is intended as background information to stimulate subsequent discussion and analysis by participating faculty and other interested researchers.

In looking for differences by school and other factors, our primary interest was in developing questions to guide formative evaluation of this project. For example, what are the advantages and disadvantages of restricting participation in a project like this to prospective science teachers? Do between-school differences lead to differences in review-related outcomes? Do positive experiences as a reviewer and as a review-receiver favorably incline pre-service teacher participants to consider using peer review with their own students some day?

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THE COMPETENCE OF PHYSICAL EDUCATION TEACHERS IN COMPUTER USE

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ABSTRACT
Computer-based and web-based applications are primary educational tools that are used in order to motivate students in today's schools. In the physical education field, educational applications related with the computer and the internet became more prevalent in order to present visual and interactive learning processes. On the other hand, some difficulties are encountered in the integration of computers to physical education and in the use of these tools by teachers. Physical education teachers have to develop their knowledge and skills in order to use computers as teaching tools and support and guide students to use these technologies for learning. The aim of this study is to find out how often physical education teachers use computers and related software for educational purposes. Based on the findings of the research, suggestions towards effective use of computers in physical education classes are made.

INTRODUCTION

Technology has turned out to be a necessity more than a luxury in the schools. The schools are built according to the technological needs and equipped with the necessary network for internet access. Now computer hardware in many schools is completed and the developing process of the required educational software is still being carried out.

The directors of the schools who are willing to improve the quality of the education served for the students are supplying more financial and human resources for the hardware, software and other technological facilities (Zhu, 2003). The cost of new computers are low enough for most of the schools to be covered. Computers and information technologies are rapidly developing and children are growing up with the technology. The researches on the effects of the technology on education have proved that under the ideal conditions educational technology contributes very much in all subjects to all students (Winn, 2002).

The abilities on information technologies have turned out to be vital elements which effect individual economic success, political participation and social interaction (Ono and Zavodny, 2004).

As far as the information technology becomes more widespread, the importance of computer and technology use increases and turns out to be an important element in human resources (Ono and Zavodny, 2004). Both the educators and the public accepts the necessity for the students to be competent in computer use. In order to benefit from technology in education, both the teachers and students should have enough knowledge about computers. However the discussions about the limits of computer use in educational activities are still continuing. In 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). Physical education teachers can also teach a subject in their curriculum by first analyzing it technically in computer labaratory. By that way they can teach the biomechanics visually and then move on to the application of those techics which will help for a more productive course.

Computers and Technology in Education Field

Today one of the most important problems in educational field is the didactic way of teaching. Another leading problem is the lack of communication and dialogue between teachers and students, students and students. Besides lack of evaluation methods to measure the very complexed learning targets and the difficulty for the students to adopt their theoritical knowledge to practical use in daily life forces for new approaches in education field (Knapper, 2001).

Educational technology will contribute seriously to the solution of these problems if it is used truely. During the last few years educators have begun to use computer supported teaching methods more often to increase the participation of students to the learning activities and to promote access to learning materials. Computer supported teaching which is defined as the use of computer by the students in teaching is an interactive process which makes learning easier (Azarmsa, 1991).

Researchers point out that computers have contributed a lot to the educators about adopting some 'structuralist methods' which they can not success themselves (Jonassen and others, 1998). The education programs in our country have been designed according to the 'structuralist method' since the beginning of 2005-2006 educational year which can be announced as the most important reform movement in education field. Therefore the use of computer in and out of classroom activities have gained more importance in this new education curriculum.

Computers and Technology in Physical Education

Although computers and technology seems to be contradictory with the aims of physical education, technology have a wide range of use in physical education. Heart beat monitors are perfect tools for cardiovascular speed and can provide more concrete information to the students and teachers about their development (Mohnsen, 2001; Wood and Lynn, 2000).

Using the true technological devices the teacher can record video clips of some physical skills and movements or can download such clips to his computer and then let the students access these videos through a web site. Physical education teachers can introduce the best players of a sport through technological devices. Moreover he can record one of the best students' serve or tourniquet and then explain these technics to the classroom showing their videos. In this way the students will participate to the subject easier and the excitement of learning will be increased.

Besides various problems may occur during the integration of technology with physical education. The primary problem is that the procodure and the preperation of computer takes very long time. Another problem is that enough financial resources can not be supplied for the new technological hardware. Finding suitable software is also an important problem (Bird, 1998). Such kinds of problems forces the physical education teachers avoid using computers in their classrooms.

Computer Using Behaviours of Teachers

The use of computers in learning processes can help to develop cognitive skills of students during thinking, solving problems and learning. Besides it is necessary for the teachers to apprehend technology very well and put the focus on the students. Due to various factors many of the teachers are still reluctant about integration of technological facilities to their classses. They need to develop their personal knowledge and ability of technology in order to help and guide their students (Maor, 1999).

The teachers have defined some obstacles in integrating technology to their classes; 1) time, 2) education, 3) technological support and 4) hardware problems (Cuban, 2001; Sheingold and Hadley, 1993).

On the other hand academic references point out that there is a positive relation between computer related experience and attitude towards computers (Necessary and Parish, 1996). Having more experience with the computers lead to a more positive attitude towards computers (Chen, 1986; Hunt and Bohlin, 1993; Arnez and Lee, 1990; Levine and Donitsa-Schmidt, 1998).

The anxiety of computer use turns out to be a barrier for the teachers to integrate technological facilities to their classes. The teachers' positive thoughts about benefiting from computers in the classes motivate them for the use of computers in education (Marcinkiewicz, 1994). According to these information we can say that teachers should always be encouraged to use computers and their experience with computers should be increased. So that they can easily and more often use computers and other technological devices in their classes.

Teachers should not only use the computers themselves but also should encourage their students to use computers for educational purposes and remind them that computers are not only used for playing games. They should encourage the students by asking them to send their homeworks via e-mails and use web sites in order to reach a specific subject (Hall, 1999).

In order to find out many subjects related to physical education and sports, the students shoud visit the web sites of General Directorate of Sports and Youth (www.gsgm.gov.tr), National Education Ministry (www.meb.gov.tr) and some other popular web sites like www.sporbilim.com, www.eurosport.com and www.sportengland.org. The students have to be informed that most of the actual information can be achieved through internet and the teachers first need to know these resources themselves in order to inform their students. Physical education teachers teach practical, technical and theoretical aspects of the subjects. They should actualize and enrich their information not only using the books but also the internet facilities. Asking their students to return their homeworks via internet and find subjects on web sites, they can have the computers as the means of communication with the students.

THE PURPOSE OF THE RESEARCH

The purpose of this study is to find out computer -the most important technological device of today- using ability of teachers, their owning personal computers, the presence of computer laboratories in the schools and the possibilities of benefiting from the computer laboratories.

The Universe of the Research

The universe of this research includes all the physical education teachers who had participated to in-service training courses held by National Education Ministry in 2005. The sample group of the research is chosen through the physical education teachers from 81 different cities who had participated to in-service training courses held in Çanakkale and Mersin.

The Survey Used in the Research

For the research, a survey of 43 questions measuring different abilities of computer use is developed. The teachers had to choose one of four alternatives in each question; No Experience, Little Experience, Some Experience and High Experience.

In the analysis No Experience is graded with 1 point, Little Experience with 2, Some Experience with 3 and High Experience with 4 points.

The survey has 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 are asked. In the second part Windows abilities, in the third part Word abilities, in the fourth part Excel abilities, in the fifth part Power Point abilities and in the last part Multimedia abilities are questioned.

There are 9 questions about Windows, 9 about Word, 9 about Excel, 8 about Power Point and 8 about multimedia.

Data of the Survey

The data in this research is derived from the application of the survey called “The Survey of Educational Technology Use” to the physical education teachers. The survey was applied to 192 physical education teachers from 81 different cities who had participated to in-service training courses held in Çanakkale and Mersin and 186 of these surveys were taken into evaluation.

In the research validity is defined according to the specialist’s view. On the other hand cronbach alfa = ,9853 is found out as the reliability value.

Statistical Method Used in the Research

In the research both quantitative and qualitative methods are used. For each variable t-test is applied through SPSS statistical software.

Demographical Characteristics of the Sample Group

Table-1 Ownership of personal computer

1.	67.7 %	(130)	yes	
2	24.5 %	(47)		no

According to Table-1 67,7 % of the teachers (130) has personal computers at home but 24,5 % (47) of them do not own computers.

Table-2 Presence of computers at schools

1.	76 %	(146)	yes
2.	17,7 %	(34)	no

According to Table-2 76 % of the teachers (146) have computer laboratories in their schools but 17,7 % (34) of them do not have laboratories at their schools.

Table-3 Computer use of the families

1.	67,7 %	(130)	yes
2.	25,5 %	(49)	no

67,7 % of the teachers (130) have stated that their families use computers at home but 25,5 % of them (49).

Table-4 The use of computer laboratories by physical education teachers

1.	57,3 %	(110)	yes
2.	34.4 %	(66)	no

%57,3 of the teachers (110) have stated that they can always benefit from the computer laboratories of their schools but 34,4 % of them (66).

The Ability to Use Windows Start Menu: 10,6 % of the physical education teachers (19) do not have any experience to use Windows start menu, 4,5 % of them (8) have little experience, 40,2 % of them (72) have experience and 44,7 % of them (80) have high experience.

The Ability to Use Windows Programs Menu: 12,2 % of the physical education teachers (22) do not have any experience to use Windows programs menu, 5,5 % of them (10) have little experience, 43,6 % of them (79) have experience and 38,7 % of them (70) have high experience.

The Ability to Use Windows Files Menu: 12,8 % of the physical education teachers (23) do not have any experience to use Windows files menu, 6,1 % of them (11) have little experience, 44,4 % of them (80) have experience and 36,7 % of them (66) have high experience.

The Ability to Use Windows Settings Menu: 14,8 % of the physical education teachers (27) do not have any experience to use Windows settings menu, 12,6 % of them (23) have little experience, 41,8 % of them (76) have experience and 30,8 % of them (56) have high experience.

The Ability to Use Windows Control Menu: 15,9 % of the physical education teachers (29) do not have any experience to use Windows control menu, 15,9 % of them (29) have little experience, 38,5 % of them (70) have experience and 29,7 % of them (54) have high experience.

The Ability to Use Windows Search Menu: 17,7 % of the physical education teachers (32) do not have any experience to use Windows search menu, 19,9 % of them (36) have little experience, 34,3 % of them (62) have experience and 28,2 % of them (51) have high experience.

The Ability to Use Windows Help Menu: 17,0 % of the physical education teachers (31) do not have any experience to use Windows help menu, 18,1 % of them (33) have little experience, 38,5 % of them (70) have experience and 26,4 % of them (48) have high experience.

The Ability to Use Windows Run Menu: 14,8 % of the physical education teachers (27) do not have any experience to use Windows run menu, 14,8 % of them (27) have little experience, 37,2 % of them (68) have experience and 33,6 % of them (61) have high experience.

The Ability to Play Games: 17,5 % of the physical education teachers (32) do not have the ability to play games, 13,1 % of them (24) have little ability, 39,9 % of them (73) have ability and 29,5 % of them (61) have high ability.

The Ability to Use Word File Menu: 16,4 % of the physical education teachers (30) do not have any experience to use Word file menu, 15,3 % of them (28) have little experience, 35,5 % of them (65) have experience and 32,8 % of them (60) have high experience.

The Ability to Use Word Edit Menu: 27,1 % of the physical education teachers (49) do not have any experience to use Word edit menu, 22,1 % of them (40) have little experience, 28,7 % of them (52) have experience and 22,1 % of them (40) have high experience.

The Ability to Use Word Insert Menu: 30,0 % of the physical education teachers (54) do not have any experience to use Word insert menu, 23,9 % of them (43) have little experience, 25,0 % of them (45) have experience and 21,1 % of them (38) have high experience.

The Ability to Use Word View Menu: 39,1 % of the physical education teachers (70) do not have any experience to use Word view menu, 24,0 % of them (43) have little experience, 20,1 % of them (36) have experience and 16,8 % of them (30) have high experience.

The Ability to Use Word Format Menu: 32,4 % of the physical education teachers (59) do not have any experience to use Word format menu, 25,8 % of them (47) have little experience, 20,9 % of them (38) have experience and 20,9 % of them (38) have high experience.

The Ability to Use Word Tools Menu: 42,8 % of the physical education teachers (77) do not have any experience to use Word tools menu, 18,3 % of them (33) have experience and 15,6 % of them (28) have high experience.

The Ability to Use Word Table Menu: 35,8 % of the physical education teachers (64) do not have any experience to use Word table menu, 22,3 % of them (40) have little experience, 25,1 % of them (45) have experience and 16,8 % of them (30) have high experience.

The Ability to Use Word Window Menu: 25,8 % of the physical education teachers (47) do not have any experience to use Word window menu, 14,3 % of them (26) have little experience, 36,8 % of them (67) have experience and 23,1 % of them (42) have high experience.

The Ability to Use Word Help Menu: 25,3 % of the physical education teachers (43) do not have any experience to use Word help menu, 31,1 % of them (57) have little experience and 28,4 % of them (52) have high experience.

The Ability to Use Excel File Menu: 21,9 % of the physical education teachers (40) do not have any experience to use Excel file menu, 27,3 % of them (50) have little experience, 28,4 % of them (52) have experience and 22,4 % of them (41) have high experience.

The Ability to Use Excel Edit Menu: 27,6 % of the physical education teachers (50) do not have any experience to use Excel edit menu, 32,0 % of them (58) have little experience, 24,9 % of them (45) have experience and 15,5 % of them (28) have high experience.

The Ability to Use Excel Insert Menu: 36,1 % of the physical education teachers (65) do not have any experience to use Excel insert menu, 29,4 % of them (53) have little experience, 18,9 % of them (34) have experience and 15,6 % of them (28) have high experience.

The Ability to Use Excel View Menu: 41,1 % of the physical education teachers (74) do not have any experience to use Excel view menu, 27,8 % of them (50) have little experience, 17,8 % of them (32) have experience and 13,3 % of them (24) have high experience.

The Ability to Use Excel Format Menu: 38,7 % of the physical education teachers (70) do not have any experience to use Excel format menu, 29,3 % of them (53) have little experience, 14,9 % of them (27) have experience and 17,1 % of them (31) have high experience.

The Ability to Use Excel Tools Menu: 42,8 % of the physical education teachers (77) do not have any experience to use Excel tools menu, 29,4 % of them (53) have little experience, 15,0 % of them (27) have experience and 12,8 % of them (23) have high experience.

The Ability to Use Excel Table Menu: 37,0 % of the physical education teachers (67) do not have any experience to use Excel table menu, 29,8 % of them (54) have little experience, 19,3 % of them (35) have experience and 13,8 % of them (25) have high experience.

The Ability to Use Excel Window Menu: 29,1 % of the physical education teachers (53) do not have any experience to use Excel window menu, 27,5 % of them (50) have little experience, 25,8 % of them (47) have experience and 17,6 % of them (32) have high experience.

The Ability to Use Excel Help Menu: 29,1 % of the physical education teachers (53) do not have any experience to use Excel help menu, 30,2 % of them (55) have little experience, 24,2 % of them (44) have experience and 16,5 % of them (30) have high experience.

The Ability to Use Power Point File Menu: 28,0 % of the physical education teachers (52) do not have any experience to use Power Point file menu, 26,9 % of them (50) have little experience, 25,8 % of them (48) have experience and 19,4 % of them (36) have high experience.

The Ability to Use Power Point Edit Menu: 37,8 % of the physical education teachers (70) do not have any experience to use Power Point edit menu, 27,6 % of them (51) have little experience, 20,0 % of them (37) have experience and 14,6 % of them (27) have high experience.

The Ability to Use Power Point Insert Menu: 46,2 % of the physical education teachers (85) do not have any experience to use Power Point insert menu, 25,5 % of them (47) have little experience, 16,8 % of them (31) have experience and 11,4 % of them (21) have high experience.

The Ability to Use Power Point View Menu: 47,0 % of the physical education teachers (87) do not have any experience to use Power Point view menu, 24,9 % of them (46) have little experience, 16,8 % of them (31) have experience and 11,4 % of them (21) have high experience.

The Ability to Use Power Point Format Menu: 44,3 % of the physical education teachers (81) do not have any experience to use Power Point format menu, 25,1 % of them (46) have little experience, 18,0 % of them (33) have experience and 12,6 % of them (23) have high experience.

The Ability to Use Power Point Tools Menu: 50,0 % of the physical education teachers (92) do not have any experience to use Power Point tools menu, 22,3 % of them (41) have little experience, 16,3 % of them (30) have experience and 11,4 % of them (21) have high experience.

The Ability to Use Power Point Table Menu: 45,4 % of the physical education teachers (83) do not have any experience to use Power Point table menu, 25,1 % of them (46) have little experience, 16,4 % of them (30) have experience and 13,1 % of them (24) have high experience.

The Ability to Use Power Point Window Menu: 37,8 % of the physical education teachers (70) do not have any experience to use Power Point window menu, 22,2 % of them (41) have little experience, 21,6 % of them (40) have experience and 18,4 % of them (34) have high experience.

The Ability to Use File Menu of Multimedia Program: 46,8 % of the physical education teachers (87) do not have any experience to use file menu of multimedia program, 23,7 % of them (44) have little experience, 17,2 % of them (32) have experience and 12,4 % of them (23) have high experience.

The Ability to Use Edit Menu of Multimedia Program: 54,9 % of the physical education teachers (100) do not have any experience to use edit menu of multimedia program, 23,1 % of them (42) have little experience, 12,6 % of them (23) have experience and 9,3 % of them (17) have high experience.

The Ability to Use Insert Menu of Multimedia Program: 56,3 % of the physical education teachers (103) do not have any experience to use insert menu of multimedia program, 22,4 % of them (41) have little experience, 14,2 % of them (26) have experience and 7,1 % of them (13) have high experience.

The Ability to Use View Menu of Multimedia Program: 57,5 % of the physical education teachers (104) do not have any experience to use view menu of multimedia program, 21,4 % of them (39) have little experience, 14,8 % of them (27) have experience and 6,6 % of them (12) have high experience.

The Ability to Use Format Menu of Multimedia Program: 56,6 % of the physical education teachers (103) do not have any experience to use format menu of multimedia program, 20,9 % of them (38) have little experience, 13,7 % of them (25) have experience and 8,8 % of them (16) have high experience.

The Ability to Use Tools Menu of Multimedia Program: 57,5 % of the physical education teachers (104) do not have any experience to use tools menu of multimedia program, 22,1 % of them (40) have little experience, 12,7 % of them (23) have experience and 7,7 % of them (14) have high experience.

The Ability to Use Table Menu of Multimedia Program: 56,0 % of the physical education teachers (102) do not have any experience to use table menu of multimedia program, 21,4 % of them (39) have little experience, 14,3 % of them (26) have experience and 8,2 % of them (15) have high experience.

The Ability to Use Window Menu of Multimedia Program: 49,5 % of the physical education teachers (92) do not have any experience to use window menu of multimedia program, 19,9 % of them (37) have little experience, 17,7 % of them (33) have experience and 12,9 % of them (24) have high experience.

t- test for Ownership of Computer at Home
The results according to t-test are as the following:

Word

- The ability to use file menu 0,044
- The ability to use edit menu 0,003
- The ability to use insert menu 0,003
- The ability to use view menu 0,003
- The ability to use format menu 0,000
- The ability to use tools menu 0,012
- The ability to use table menu 0,012
- The ability to use window menu 0,021
- The ability to use help menu 0,018

As a result of t-test; the teachers owning personal computers use Word program menus better than others who do not have personal computers at a meaningfulness level $p<0,05$. Therefore it can easily be stated that teachers owning personal computers use Word better than the others.

Excel

- The ability to use file menu 0,004
- The ability to use edit menu 0,004
- The ability to use insert menu 0,012
- The ability to use view menu 0,004
- The ability to use format menu 0,003
- The ability to use tools menu 0,005
- The ability to use table menu 0,006
- The ability to use window menu 0,005
- The ability to use help menu 0,032

As a result of t-test; the teachers owning personal computers use Excel program menus better than others who do not have personal computers at a meaningfulness level of $p<0,05$. Therefore it can easily be stated that teachers owning personal computers use Excel better than the others.

Power Point

- The ability to use file menu 0,000
- The ability to use edit menu 0,006
- The ability to use insert menu 0,005
- The ability to use view menu 0,008
- The ability to use format menu 0,001
- The ability to use tools menu 0,004
- The ability to use table menu 0,002
- The ability to use window menu 0,001

As a result of t-test; the teachers owning personal computers use Power Point program menus better than others who do not have personal computers at a meaningfulness level of p<0,05.

Multimedia

- The ability to use file menu 0,003
- The ability to use edit menu 0,004
- The ability to use insert menu 0,002
- The ability to use view menu 0,003
- The ability to use format menu 0,006
- The ability to use tools menu 0,003
- The ability to use table menu 0,001
- The ability to use window menu 0,003

As a result of t-test; the teachers owning personal computers use Power Point program menus better than others who do not have personal computers at a meaningfulness level of p<0,05.

t- test for the Presence of Computer Laboratory at School

According to this variable, there is no difference at a meaningfulness level of p<0,05.

t-test for the Use of Computers by Family Members

The results according to t-test are as the following:

Word

- The ability to use file menu 0,054
- The ability to use insert menu 0,003
- The ability to use view menu 0,024
- The ability to use format menu 0,043
- The ability to use window menu 0,031

As a result of t-test; the teachers whose families use computers have the ability to use Word program menus better than the rest at a meaningfulness level of p<0,05.

Excel

- The ability to use insert menu 0,049
- The ability to use view menu 0,023
- The ability to use tools menu 0,030

As a result of t-test; the teachers whose families use computers have the ability to use Excel menus listed above better than the rest at a meaningfulness level of p<0,05.

Power Point

- The ability to use view menu 0,019
- The ability to use tools menu 0,037
- The ability to use table menu 0,028

As a result of t-test; the teachers whose families use computers have the ability to use Power Point menus listed above better than the rest at a meaningfulness level of p<0,05.

Multimedia

- The ability to use table menu 0,037

As a result of t-test; the teachers whose families use computers have the ability to use table menu of Multimedia program better than the rest at a meaningfulness level of p<0,05.

t-test for Benefiting from Computer Laboratories

Power Point

- The ability to use insert menu 0,028
- The ability to use view menu 0,032

As a result of t-test; the teachers who benefit from computer laboratories have the ability to use insert and view menu of Power Point better than the rest at a meaningfulness level of p<0,05.

COMPARISON OF THE AVERAGES

In order to measure the level of program usages of the teachers, the averages of all the subtitles of each program are compared with t-test analysis.

t-test Results for Ownership of Personal Computers at Home

(Windows)

Computer	N	X	S	sd	t	p
Yes	130	2,9658	,96950	,08503	,210	,008
No	47	2,9338	,63307			

(Office)

Computer	N	X	S	sd	t	p
Yes	130	2,3725	,95242	,08353	3,440	,000
No	47	1,8617	,59268			

(Multimedia)

Computer	N	X	S	sd	t	p
Yes	130	1,9172	,98566	,08645	3,263	,000
No	47	1,4175	,59591			

As a result of this analysis it is obvious that the teachers who have personal computers at home can use Windows, Office and Multimedia programs more efficiently than the rest at a meaningfulness level of p<0,05.

t-test Results for Presence of Computer Laboratory at Schools

There is no meaningful difference for this variable at a meaningfulness level of p<0,05.

t-test Results for Use of Computers by Family Members

(Windows)

Sex	N	X	S	sd	t	p
Yes	130	2,9514	,98128	,08606	,394	,024
No	49	2,8912	,69147			

(Office)

Sex	N	X	S	sd	t	p
Yes	130	2,3105	,93783	,08225	1,964	0,025
No	49	2,0181	,73883			

As a result of this analysis it is found out that the teachers whose families use computers can use Windows and Office programs more efficiently than the rest at a meaningfulness level of p<0,05.

t-test Results for Benefiting from Computer Laboratories

(Windows)

Sex	N	X	S	sd	t	p
Yes	110	2,9374	1,02462	,09769	,004	,002
No	66	2,9368	,7382			

As a result of this analysis it is found out that the teachers who benefit from computer laboratories at schools can use Windows more efficiently than the rest at a meaningfulness level of p<0,05.

CONCLUSION

Three main question areas are defined for the research and analyzed statistically. As a result of the research the competence of physical education teachers in computer use is examined.

In the research first the relation between ownership of personal computers and competence in Windows is researched. As a result of the analysis it is found out that the teachers who have personal computers at home are more competent in using office and multimedia programs when compared to the others.

There is no relation between presence of computers at school and competence in computer skills. It is also found out that the teachers whose families are familiar with computers use 'Edit, Insert, View, Format and Window' menus of "Word"; 'Edit, View, Tools' menus of "Excel"; 'View, Tools and Table' menus of "Multimedia" programs more efficiently than the rest at a meaningfulness level of p<0,05. Another result is that the teachers who benefit from computer laboratories at their schools can use 'Insert and View' menus of "Power Point" more efficiently than the rest at a meaningfulness level of p<0,05.

Therefore it is possible to state that if the physical education teachers are given technological facilities and the chance to use them, they will take the advantage of using these facilities successfully and carry out new researches to share the results with their students.

According to these findings some suggestions should be listed:
Presenting CDs which include physical education and sports techniques should become a habitual part of classes.
The analysis of physical education and sports 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 students should be encouraged to receive and send their homework by e-mails.

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THE OPINIONS OF TURKISH HIGHSCHOOL PUPILS ON INQUIRY BASED LABORATORY ACTIVITIES

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ABSTRACT
The purpose of this study is to prepare inquiry based experimental activities on the photosynthesis, thought to be a very difficult subject by pupils, and to determine the pupil's ideas towards this method. This study was made with 24 pupils from Grade 3 at Atatürk Anatolian High school in Turkey. As data gathering material; seven inquiry experimental study sheets, the pupils' opinions survey consisting of six open-ended question, and two-lesson-hour video records were used. According to the result of study, the pupils declared that the inquiry based laboratory activities were more permanent, more enjoyable, and more pupil centered than the traditional methods, that thanks to this method, they studied cooperatively and benefit from different aspects by discussing, that they were be satisfied with the teacher's guide position in the implementations, and that their attitudes related to biology increased positively.

Key words: Inquiry, laboratory, experiment, opinion, photosynthesis

INTRODUCTION

Inquiry Based Learning

The idea of teaching science by inquiry methods is not a new one. In Dewey's Democracy and Education (1916), he states that is not advisable to present the learner with just the conclusions from scientific experimentation. Instead he proposed that students be allowed / encouraged to explore and experiment to come up with their own conclusions about science concepts, as well as the process and nature of science. If students are to learn by more expository instruction, then the students tend to see science as just another content area instead of learning that science is a process that can be applied to ordinary experiences. In addition, Dewey proposes that if the learner applies more discovery methods of learning, he will "…gain independent power to deal with material within his range, and avoid mental confusion and distaste" (Dewey, 1916; Thomas, 2005)

Dewey's philosophy on education was widely accepted, and was used as an integral concept during the curricular reform the 60's and 70's. Inquiry based learning installed by Dewey is a type of problem solving approach and based on the students' research and analysis.

Scientific inquiry refers to diverse ways in which scientists study the natural world and propose explanations based on evidence derived from their work. Inquiry also refers to the activities of students in which the develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world (NRC, 1996).

However, inquiry does not consist of a single facet, in fact, there are varying degrees ranging from a more traditional approach, to a more open inductive approach where students are generating their own experiments. The National Science Standards (1996) determined that inquiry contains five essential characteristics:

- Learners are engaged by scientifically oriented questions

- Learners have the ability to determine what data allows them to develop and evaluate scientific explanations
- The students will have the ability to formulate their own explanations from the evidence they have obtained
- Students can expand upon their findings and relate those findings to similar situations
- The learner will then be able to communicate their experimental findings to others in class via small group work, presentations to the entire class, or written laboratory reports.

The studies showed that this strategy which was used in natural sciences such as mathematics and science may also be used in all areas. This is an effective strategy when the subject comprises of a problem to be solved (Ornstein & Thomas, 2004).

The inquiry process starts with presentation of a complicated event to the students. Suchman suggested that individuals encountered with such a condition would desire to solve this problem naturally (Joyce et al., 1992).

- The students when encounter with a problem/ a complicated condition they naturally question and analysis.
- They might become curious to learn about their own idea strategies and analysis them
- New strategies can be learned directly and added to the others
- The inquiry based on cooperation enriches the way of thinking and helps the students to learn that knowledge has a transient and developing nature. In addition it helps them to evaluate alternative explanations (Joyce et al., 1992).

Inquiry-based learning is a process where students are involved in their learning, formulate questions, investigate widely and then build new understandings, meanings and knowledge. That knowledge is new to the students and may be used to answer a question, to develop a solution or to support a position or point of view. The knowledge is usually presented to others and may result in some sort of action.
Research suggests that using inquiry-based learning with students can help them become more creative, more positive and more independent (Kühne, 1995). This is true for all students, including those with special needs who require more individual attention during the process.

Building a culture of inquiry also means recognizing, supporting and teaching the role of metacognition. Metacognitive skills are part of the "learning to learn" skills that are transferable to new learning situations, in school and out of school. Through reflecting on the process during inquiry-based learning activities, students are given opportunities to explore and understand both the cognitive and affective domains of "learning to learn" (Hacker, 1999; Kuhlthau, 1988). Understanding and dealing with thoughts and feelings makes inquiry-based learning a powerful learning experience for students and teachers.

Inquiry-based learning provides opportunities for students to:

- develop skills they will need all their lives
- learn to cope with problems that may not have clear solutions
- deal with changes and challenges to understandings
- shape their search for solutions, now and in the future.

A systematic approach to the development of these skills is essential to prepare students for problem solving and lifelong learning. A systematic approach ensures that students have the opportunity to engage in inquiry, to learn an overall process and to understand that this general inquiry process can be transferred to other inquiry situations.

Using these same process skills as they proceed from primary grades through senior high school will enable students to:

- become familiar with the inquiry process
- understand a framework that supports searching for and using information
- internalize a variety of inquiry skills and strategies for independent and group use
- adapt procedures to various inquiry situations (Alberta Education, 1990).

Success with inquiry-based learning often requires a change in school culture. Some schools, individually or as part of a district-wide initiative, have made inquiry-based learning their instructional priority. Studies investigating the implementation of inquiry-based science education, inquiry-based information literacy programs and other inquiry-based educational innovations have resulted in guidelines for building a culture of inquiry (Falk & Drayton, 2001; Fullan, 1991; Kuhlthau, 2001):

- Administrators in the school or district have a clearly articulated vision for inquiry.
- The vision for inquiry is carried forward despite competing pressures.
- Two or more champions promote the vision for inquiry.
- Resources and space for inquiry are readily accessible.
- Teachers collaborate and support each other.
- Teachers, students and parents trust each other.
- Small, interdisciplinary teams of teachers work together.
- Problem-solving and investigative skills are valued throughout the school/school system.

For the last several years, there has again been a call for curriculum reform in science classes and laboratories in particular. The National Science Foundation (NSF) has put out a call for instructors to educate students in the ability to formulate useable questions, plans, appropriate experiments, conduct observations, interpret, and analyze data, draw conclusions, communicate their results, as well as being able to coordinate and implement a full investigation (NRC, 2000; Thomas, 2005). Toward this end, there has been a resurgence of interest and research in the inquiry approach to science. Inquiry in general obtaining and constructing his or her own knowledge rather than receiving the information from a didactic lecture or a "cookbook" laboratory (Thomas, 2005).

Teachers play varied roles in supporting students' development of inquiry skills. These roles include modeler, guide, diagnostician, facilitator, mentor, and collaborator, which indicate a varied amount of structure and scaffolding teachers build into an activity (Wu & Hsieh, 2006; Crawford, 2000). For example, as a guide, a teacher provides specific directions for developing students' skills and strategies. When a teacher plays a role of collaborator, he or she does not provide scaffold but allows students to take a role of teacher.
Classrooms where teachers emphasize inquiry-based learning have the following characteristics (Drayton & Falk, 2001):

- Inquiry is in the form of authentic (real-life) problems within the context of the curriculum and/or community.
- The inquiry capitalizes on student curiosity.
- Data and information are actively used, interpreted, refined, digested and discussed.
- Teachers, students and teacher-librarian collaborate.
- Community and society are connected with the inquiry.
- The teacher models the behaviors of inquirer.
- The teacher uses the language of inquiry on an ongoing basis.
- Students take ownership of their learning.
- The teacher facilitates the process of gathering and presenting information.
- The teacher and students use technology to advance inquiry.
- The teacher embraces inquiry as both content and pedagogy.
- The teacher and students interact more frequently and more actively than during traditional teaching.
- There is an identifiable time for inquiry-based learning.

Scientific inquiry is a "multifaceted" activity (NRC, 1996) and can take many forms. Inquiry learning moving away from the traditional approach of a universal and procedural scientific method is to encourage students to participate in a range of activities in which students construct and evaluate scientific knowledge (McGinn & Roth, 1999). What types of activities might be involved in inquiry learning? What are the important aspects of inquiry that ought to be supported in a learning environment? Following NRC (2000) and Krajcik et al. (1998), it can be identified seven phases in an inquiry process: asking and deciding questions, searching for information, designing investigations, carrying out investigations, analyzing data and making conclusions, creating artifacts, and sharing and communicating findings. These phases are not steps to take in a linear fashion and students can go through the phases in complex ways. For example, students can reframe their research question and redesign their investigation after recognizing that their data can not answer their questions. Additionally, due to the nature of inquiry some scientific investigations do not involve all seven phases. For example, analyzing data from a weather database and constructing explanations of phenomena such global warming and climate change could be an interesting project for inquiry, although students do not collect empirical data by themselves nor do they carry out hands-on experiments. Students should be provided with opportunities to appreciate and understand various forms of scientific inquiry (Wu & Hsieh, 2006).

From the constructivist point of view, inquiry-based science learning charges students to take the responsibility of their own learning and "doing" science to perceive 'science as a process of seeking knowledge' that requires students to possess process skills. Contemporary cognitive learning theories and information processing strategies discussed and reviewed above recognize that meaningful learning of science is reflective, constructive, and self regulated (Saha C.G., 2001).

Recognizing constructivism as the basis of current reforms in science education, NSTA (1992) called for "hands-on" experimentation and learner-generated questions, investigations, hypotheses, and models. Students need to have opportunity to learn process-based science in the schools to construct a robust backround of previous knowledge so that they can pose testable question, design and conduct an experiment to answer their research question, collect, analyze, infer communicate their findings. (Saha C.G., 2001).

In response to the 1957 launch of the Soviet satellite "sputnik" concerns in quality of math and science education. As a result, organizations such as National Science Teacher's Association put together organizations whose purpose was to investigate scientific literacy and reiterated the need for less memorization and more hands-on learning. During this "progressive movement" organizations such as the biological sciences curriculum study were formed to implement more inquiry based learning into the classroom (Thomas, 2005)

Inquiry Based Laboratory

Interest in using inquiry-based teaching strategies has increased in recent years as science teachers have become more critical about the efficacy of cookbook-type laboratory activities and indeed the purposes, practices, and learning outcomes of laboratory in general.

It is gradually being recognized that whereas cookbook labs can teach some laboratory technique sand skills (Wu & Hsieh, 2006) or serve as visual aids for concepts already studied, they are largely ineffective as a tool for teaching science concepts. As stated by one teacher-researcher, ''In the same way as any scientist, students will see what their prior theories lead them to expect. More significantly, they will not make the meaning that we as teachers expect them to make of experimental evidence until they have already grasped the theoretical framework that allows them to 'see' the evidence.'' (Wu & Hsieh, 2006) Therefore, cookbook laboratories may work well as illustrations of concepts already studied and understood but it is unlikely they will lead to new conceptual learning.

In science instruction, laboratory practicals have been a popular vehicle for activity/performance-based science tasks for a long time. However, in many school science programs these laboratories are used in a cookbook fashion to verify scientific facts and not promote laboratory or science process skills to investigate the natural phenomena. On the other hand, inquiry based (requiring students to explore in order to figure out how the world works) laboratory practicals that incorporate direct, holistic and complex performances are potent IPAs alternative to traditional paper-and-pencil multiple-choice test (Saha C.G., 2001).

Many definitions of inquiry-based laboratories and inquiry pedagogical models may be adapted to fit the local context. The authors of this report consider inquiry to be any combination of the following activities described as inquiry by the National Science Education Standards (National Research Council, 1996): observing objects and events, posing questions, designing investigations, proposing explanations, collecting data, analyzing data, and comparing proposed explanations with new data. As inquiry-based laboratories gain popularity, one important question facing science education researchers is whether inquiry-based laboratories have the potential to teach science concepts. Do the problem-solving components of inquiry promote conceptual growth in science? The purposes of this study were to explore, using interpretive research methodology, potential change in the conceptual ecologies of college students enrolled in an inquiry-based laboratory for non majors and to relate this change to the students' learning beliefs and science epistemologies.

The National Research Council (1996) recommended that students learn science through scientific inquiry. Inquiry-based classes are preferred over traditional classes because students are engaged in learning science through an active process (NSTA, 1996). While there are many variations, in an open-ended inquiry-based laboratory, students formulate their own hypotheses, design a unique experiment, and conduct an investigation. Courses that include open-ended scientific investigations enhance students' skills of observation and discovery, hypothesis formation, testing, and evaluating (Division of Undergraduate Science, Engineering, and Mathematics Education, 1990). To optimize learning, students must have the opportunity to design their own experiments and test their own hypotheses, especially in the laboratory (Lunsford, 2002).

National Based Education Standards (NRC, 1996) considers science by "doing" as a valid way to attain scientific literacy. Inquiry-oriented performance–based science learning process (where students require to conduct some

activities in order to investigate a question on a natural event) means learning by experience in which students encounter science via a process of inquiry and problem solving. Thus doing science rather than just learning about science provides students an opportunity for viewing scientific evidence objectively and help make sense of the natural events meaningfully. "Even Aristotle once said that what we have to learn to do, we learn by doing."(School of Ocean and Earth Science&Technology-SOEST, 2000)

In other words, inquiry-based laboratory tasks have the promise to help understand the processes that underlie student performances-not only in diagnosis but also in suggesting remediation (Siegler, 1989). Tamir and Frankl (1991) observed inquiry based biology courses help students achieve high standard of functional knowledge, process skills, cognitive and intellectual development. Lawson and Wornsnop (1992) recommended that biology lessons be planned to promote hypothetico-deductive reasoning that itself calls for hands-on activities requiring students to explore in much the same way as scientists do. In addition, constructed response formats encourage deeper understanding and higher-order, critical-thinking process and thus promote learning and instruction aimed at achieving scientific literacy for all. Realizing the potentials of IPA in implementing standards-based reform, science educators are seeking ways to use these assessments to measure student science learning outcomes (Saha C.G., 2001).

PURPOSE

When the studies (Crawford,2000, Deckert et al.,1998, Drayton & Falk,2000, Gentry, 2002, Herron, 1971, Howard & Boone, 1997, Krajcik et al, 1998, Lawson et al.,1990, Laipply, 2004, Lunsford, 2002, Mcginn & Roth,1999, Russell & Donald, 2001, Saha, 2001, Staer et al., 1998, Thomas, 2005, Wu & Hsieh, 2006, Wu & Krajcik,2006) related to inquiry based laboratory activities examined, It was determined that there was no study is based on pupils' opinions. Besides, in this study, photosynthesis subject was chosen to be able to implement inquiry based laboratories activities. Photosynthesis is an important biochemical process by which energy-rich organic nutrients, for both the photosynthetic organisms and the heterotrophs, are produced from simple inorganic molecules found in the environment. According to Arnon, "Photosynthesis eminently merits its distinction as the most important biochemical process on earth" (Barker & Carr, 1989). As a consequence of its scientific importance, photosynthesis is considered one of the main topics in school biology and it is included in almost every middle school syllabus. This is based on its importance for a basic understanding of how the world functions as an ecosystem (Eisen & Stavy, 1988) and of how it acts as a bridge between the non-living and the living world (Waheed & Lucas, 1992). Photosynthesis has been rated as one of the most difficult topics for students (Waheed & Lucas, 1992). Its difficulty lies mainly in the fact that it is a complex biological topic, with a number of conceptual aspects (ecological, physiological, biochemical, energetic, autotrophic feeding) whose connection cannot be easily understood by the students (Waheed & Lucas,1992).

The purpose of this study to determine the effect of inquiry based laboratory activities on photosynthesis subject which was rated as one of the most difficult topics for students by using pupils' opinions.

METHODOLOGY

This study was made with 24 pupils at Atatürk Anatolian High school in 2006-2007 academic period. As data gathering material; seven inquiry experimental study sheets, the pupils' opinions survey consisting of six open-ended question, and two-lesson-hour video records were used.

The process steps followed in the study are below:

1. Preparing the lesson plan: In this step, the lesson books on the photosynthesis were examined, the concept misunderstandings about this subject were determined, the lesson plan including purposes and timing of study was prepared by making a literature research.

2. Preparing the laboratory hand-outs: The experiment mechanisms about photosynthesis, prepared before, were adapted to inquiry based learning, and six experiment hand-outs were prepared. There are the general information, blanks to draw the mechanism, and the questions about the experiment in the hand-outs (Figure 1). The information about the materials in the experiment wasn't given intentionally, and the pupils were asked to find it in "general information" part by themselves.

Hand-out

General information:

Mechanism:

Questions:

Figure 1. A simple inquiry based hand-out

3. Preparing groups: The pupils were divided in to six groups of four before the experiments, and the information about all the experiments was given to each pupil by copying the hand-outs. Then, six experiments were distributed as one to each group. Meanwhile, after the groups read the general information about the experiments, they chose the experiment they would do.

4. Answering the introduction questions: The introduction questions about photosynthesis prepared before were answered by pupils before the mechanisms were set up. Introduction questions were given below;

1. What is the aim of photosynthesis?
2. Were photosynthesis observed on only plants?
3. Why couldn't the colors seen in darkness?
4. What are the differences which may happen on the matter when a matter is illuminated?
5. Why is the leaf of plant green?
6. Why aren't the roots of plant green?
7. Why can't a green penny perform photosynthesis under the sunshine?
8. There are 7 colors in the sunshine. How can we understand whether these colors exist or not.
9. Were photosynthesis observed on aquatic plants?
10. Why is the lime juice used in the experiments of photosynthesis or respiration?
11. Sleeping in the same room with house plants at night is said to be harmful. What is the reason of this situation?
12. Why is the frothing observed when a bottle of soda shakes?
13. The plants don't take oxygen from atmosphere in the afternoon. What is the reason of this situation?

5. Preparing mechanisms: After the pupils read the part of "general information", they discussed the mechanisms they will prepare. After they decided essential materials, they took materials from laboratory boards. In this step, the teacher didn't participate in study, he only answered the pupil's questions related to materials. Besides, the pupils interested not only in their experiment but also in the different group's experiments, and they took information from their friends.

6. Demonstrating experiments: The group members recorded the data related to experiment, and discussed the results of experiment. When the experiments completed, one of the group members demonstrated their mechanisms, aims of the experiment, what hypothesis was used in the experiment, and also the answers of the questions related to the experiment. Meanwhile, the other group members asked the part they couldn't understand and an discussion atmosphere occurred. During each demonstration, the other group members filled in the blanks in the hand-outs.

7. Repeating information: The data obtained from mechanisms and scientific information was repeated by the teacher.

8. Implementing Pupils' Opinions Survey: Pupils' opinions survey, consists of six open-ended questions, developed by researcher implemented final of study and pupils' opinions related to inquiry based laboratory were tried to determine.

FINDINGS

The questions in the pupils' opinions survey and some of the pupils' answers are given below:

a) How do you like the experiments? Were you able to understand all the experiments?

Pupil A: *We were. They were selective and nice. I have taken biology lessons for 8 years in my twelve-year educational background, and I have done an experiment for the first time.*
Pupil B*: Yes, I was. The experiments were quite nice. We have done a biology experiment for the first time for a long time. The application of the experiments was easy and teaching. Also, It was very useful that we did the experiments.*
Pupil C: *The experiments were applicable. We justified the information which we learned. We understood all the experiments.*
Pupil D: *Our own experiment was easier to understand. Because we watched only the presentations of the others, they weren't very useful. The one we did was quite better.*

Almost all of the pupils determined that the experiments to be teaching, applicable and easy. Two of the pupils expressed that they couldn't understand all the experiments, but that they comprehended at least some of the information in the experiments they couldn't understand.

b) Thanks to the inquiry based laboratory activities, did your negative attitudes towards biology lesson change? Could you explain your answer?

Pupil E: *There was not my any negative attitude. But I can say that the teaching was better.*
Pupil F: *There was not my any negative attitude. Thanks to these experiments, we learned about new things in the mysterious world of biology, and the lesson was more enjoyable.*
Pupil G: *I have already liked biology. These experiments increased my interest towards lesson, and made the lesson unforgettable easily.*
Pupil H*: No, there was no change. There is no thing I can explain, I didn't like it before and don't like it now.*

Most of the pupils (87,5 %) expressed that they had no negative attitudes towards biology and they liked this lesson before. Also, they point out that their positive attitudes about biology increased thanks to this study. Remaining three pupils (12,5 %) expressed that they had negative attitudes related to biology, and that they didn't like this lesson because It was based on memorization, but two of these pupils expressed that their attitudes changed a bit positively, and the other pupil expressed that his negative attitudes continued.

c. Were the discussions in the lesson useful? Could you explain your answer?

Pupil I: *Yes, for example, I didn't used to know what acetone is used for .We discussed this with my friend, and realized that neither of us know it.*
Pupil J*: Yes, my interactions with my friends improved. The coordination and getting along with my friends supported our friendship and connection.*
Pupil K*: It was useful. We helped each other with understanding the experiments.*
Pupil L: *It was not very useful. It was a little noisy.*

Most of the pupils (91,7 %) pointed out that these discussions were more useful. Also, they expressed that they benefit from different aspects, that their communication skills improved, and that they corrected their mistakes thanks to this method. Remaining two pupils (8,3 %) expressed that there was noise in the classroom.

d. Has learning with your own thoughts been useful in this pupil based study? Have you been satisfied with the guide position of the teacher?

Pupil M: *Yes, It has. My self-confidence has improved, also, our teacher was very good.*
Pupil N: *It has. Our teacher has made a quality and highly successful study.*
Pupil O: *The guide position of the teacher was good.*
Pupil P: *It was useful that learning with our own thoughts, and that the pupil was responsible for and interest in the experiments at first level.*

All the pupils expressed that learning with their own thoughts was very useful, that they were satisfied with the guide position of the teacher, and that the guidance of the teacher was necessary. Also, some of the pupils

expressed that the experimental studies in which the teacher makes alone and the pupils do nothing except for watching him are not educational and enjoyable.

e. Could you compare this study with traditional learning

Pupil R: *It was more effective than traditional learning. Because the visual materials were used more effectively. The concrete results of the things told in theory were observed.*
Pupil S: *I realized that the didactic method was infertile and I was more active in the inquiry based activities. I found out that the learning by seeing and thinking was more permanent.*
Pupil T*: The laboratory was very cold. We were cold but had fun. We had been cold and hadn't had fun during the traditional method.*
Pupil U: *I think that answering the questions in a test book is the best teaching method. We could have had more information in the same period of time. But It was very useful in that It made the information permanent.*

The pupils expressed that the inquiry based laboratory activities were more enjoyable, educational, permanent, scientific, and pupil centered than the traditional methods.

f. What are the missing parts in the study and your negative critics?

Pupil V: *Because the laboratory was insufficient, there were a few missing parts. We had trouble providing the plant with darkness. But this situation didn't prevent us from performing the experiment.*
Pupil W: *We couldn't observe the expected results in some of the experiments. One or two-day-waiting period was necessary in these experiments. We couldn't observe some of the results because we were in the laboratory only two hours. The lack of material in the laboratory was a bit problem.*
Pupil X: *There was a serious timing problem. We had to complete the experiment in a shorter time than necessary time. Moreover, there was a serious heating problem in the laboratory.*
Pupil Z: *There is no missing part I saw. I think that this kind of experiments are useful after every subject. The lack of material may cause trouble. But finding solutions to this problems increases creativity (For example, using water instead of prism).*

The pupils generally criticised the lack of materials and finding some experiments whose results could be observed in a longer time.

RESULTS

The laboratory activities are very important in the subjects in which metabolic events, such as photosynthesis, could be explained experimentally. But the laboratory lessons should be done more inquiry based, not with the guidences in which all the process is given one by one. Only in this way could the traditionality in this lesson be through taken over.

According to the results of this study, the pupils expressed that the inquiry based laboratory activities are more permanent, enjoyable, and pupil centered than the traditional methods, that they studied cooperatively thanks to this study, that they utilized different aspects, that they were satisfied the guide position of the teacher during the application, and that attitudes towards biology lesson increased positively.

DISCUSSION

Wu and Hsieh (2006) identified four inquiry skills that are critical for students to develop scientific explanations in their study: to identify causal relationships, to describe the reasoning process, to use data as evidence, and to evaluate explanations. The purpose of this study was to understand how sixth graders develop inquiry skills to construct scientific explanations throughout a series of inquiry-based learning activities. Inquiry has been viewed as an approach to learning science that involves a process of exploring the natural or material world (NRC, 1996; Tamir, 1989). This study defined inquiry as a question-driven learning process involving conducting scientific investigations, documenting and interpreting narrative or numerical data, and summarizing and communicating findings. To help students learn science through inquiry, they developed a framework for inquiry learning that involves three dimensions: phases in an inquiry process, features of inquiry learning, and intellectual skills required for inquiry learning. Explanatory activities play a particular important role in the latter two dimensions. The results of my study get along with Wu and Hsieh's results. The pupils constructed causal correlations with introduction questions, then collected data by using their mechanisms, shared their data with their friends, and

evaluated the results of the experiment. Therefore, the four inquiry skills, defined by Wu and Hsieh, were observed in this study.

David Ausubel developed the meaningful learning model as an alternative to the memorizational learning. In the theory of Ausubel, an "advanced organizer" is needed to get the pupil to construct a connection between pupil's previous information and new ones. In the meaningful learning, the new concepts can be learned by collecting more detailed concepts. The advanced organizers can be a caricature, a graphic, an audial material or questions. In each condition, the advanced organizers should be designed to set a mental model iin the pupil's mind to learn the new information. In my study, the introduction questions were used as the advanced organizer. Thanks to these questions, the pupils interests were attracted and they were made to discover the information which they will use in the mechanisms.

The seminal work of Ausubel, interpreted for science education by Novak (Novak & Gowin, 1984), on the construction of conceptual knowledge networks through meaningful learning has provided a foundation for many contemporary studies, including this one. Ausubel's theory of meaningful learning posits that learners increase their conceptual knowledge bases when they choose to relate new information to prior knowledge. Ausubel named three cognitive functions involved in meaningful learning: (a) subsumption—the attachment of the concept to a network of other meaningful concepts; (b) progressive differentiation—categories for concepts become increasingly branched; and (c) integrative reconciliation—two or more concepts are seen as related in new ways. Thus, science learning consists of increasing levels of classification, clarifying hierarchical relationships, adding exemplars, and forming new links between concepts. In my study, the pupils were observed to make use of their information about light and reflect which they learned in Physics lessons, their information about catalyst and chemical reactions which they learned in Chemistry lessons, and also the pre-information about the plant metabolism and the general structure of a plant cell.

Garnett, Garnett and Hackling (1995) have suggested that the aims of laboratory work can be grouped into four main categories: conceptual learning; techniques and manipulative skills; investigation and problem solving skills; and affective outcomes. The Mayer Report (Mayer, 1992), the National Statement on Science for Australian Schools and the Science Profile have placed a particular emphasis on the development of inquiry and problem solving skills, as have similar national curriculum frameworks in North America, Canada, the United Kingdom and New Zealand. For example, the National Science Education Standards of the United States of America (National Academy of Sciences & National Research Council, 1996) outlines a national goal that all students should become scientifically literate, which means that a person can "ask, find or determine answers to questions derived from curiosity about everyday experiences" and can "evaluate the quality of scientific information on the basis of its sources and the methods used to generate it." Similarly the UK Science National Curriculum Orders include Experimental and Investigative Science as one of four attainment targets (School Curriculum and Assessment Authority, 1994). Tamir and Lunetta (1978) have argued that to achieve such aims there is a need for teachers to match appropriate types of laboratory work to those aims (Staer et all., 1998)

The Working Scientifically strand of the Australian Science Profile describes the development of science investigation skills through eight levels. The Western Australian Monitoring Standards in Education project revealed that typical Year 10 students have only attained Level 3 and some of the simpler Level 4 science investigation skills (Education Department of Western Australia, 1994). Hackling and Garnett's research (1991) indicates that Western Australian secondary students "had poorly developed skills of problem analysis, planning and carrying out controlled experiments, basing conclusions only on obtained data, and recognizing limitations in the methodology of their investigations". The low levels of investigation skills reported for Western Australian secondary students are likely to be related to the opportunity given through laboratory work to practice these skills; that is, the extent to which laboratory work is open to inquiry (Staer et al., 1998).

Laboratory activities can be classified by level of openness to inquiry according to whether the teacher prescribes the problem, the apparatus to be used, the procedure to be followed and the expected answer, or the students are required to make these decisions for themselves. A scale of openness to inquiry has been developed (Hegarty-Hazel, 1986; Tamir, 1989) to classify laboratory activities (Table 1). A scale was first devised by Schwab in 1962 and elaborated to include level zero, the lowest level of inquiry, by Herron in 1971 (Tamir, 1989). Hegarty-Hazel (1986) further elaborated the scale to divide level 2 into levels 2a and 2b to increase discrimination between levels of openness.

Table 1. ***Levels of Openness of Inquiry in Laboratory Activities (after Hegarty-Hazel, 1986)***

Level	Problem	Apparatus	Procedure	Answer	Common name
0	*Given*	*Given*	*Given*	*Given*	*Verification*
1	*Given*	*Given*	*Given*	*Open*	*Guided inquiry*
2a	*Given*	*Given*	*Open*	*Open*	*Open guided inquiry*
2b	*Given*	*Open*	*Open*	*Open*	*Open guided inquiry*
3	*Open*	*Open*	*Open*	*Open*	*Open inquiry*

At the lowest level of inquiry (level 0), the problem to be investigated, the apparatus to be used, the procedure and the answer to the problem are all given to the students by the teacher or by a worksheet. At the highest level of inquiry (level 3), the students are required to determine all of these for themselves (Staer et al., 1998).

Analysis of laboratory manuals from North American inquiry based curricula such as BSCS and PSSC by Herron (1971) and Tamir and Lunetta (1978) revealed limited opportunities for open investigation work. Similarly, Friedler and Tamir's (1986) analysis of Israeli high school science laboratory manuals and classroom observations revealed that one third of activities were at level 0 and one half were at level 1 on Herron's (197I) scale, and "only rarely were students required to identify and formulate problems, to formulate hypotheses, to design experiments, and to work according to their own design". In my study, the prepared inquiry based laboratory activities could be said to be “2b” level in the classification which is described by Tamir. Because the problem was given in the experiments, the pupils were made to determine the materials and to use the mechanisms, the details were not given in the general information part, the process ranking in the experiment was determined by the pupil, they were asked to answer the questions at the end of the experiment and also to discuss among themselves.

Russell et all (2001) found that students in these labs spent more time on task and had higher levels of active participation than students in more traditional, or “cookbook”, laboratories. In my study, the cook book based on the laboratory implementation was not used, instead a more creative atmosphere was prepared. Most of the pupils expressed that they designed many mechanisms themselves and dealed with the questions individually were highly useful and interesting.

Gentry (2002) found that most students enjoyed working in groups and agreed that their group members explained lab procedures if they did not understand. Some studies have also found that students enjoy working in groups in the laboratory (Pratt, 2003, Travis and Thomas, 2004). Other research has studied the benefits of group work in the science laboratory. Howard and Boone (1997) reported that students rated working in groups as the most enjoyable aspect of their laboratory course. Because their students were assigned seats alphabetically (similar to our seating arrangements), they concluded the positive response was not a reflection of friends helping each other. Instead, working in groups provides the opportunity for cooperative learning. Travis and Thomas (2004) demonstrated that group interaction increased the level of student involvement in the laboratory. They showed that students working in groups were able to recall and apply the information learned in laboratory better than students that did not participate in a group. In my study, the pupils were divided the groups of four people randomly. The pupils expressed that small groups were useful, that a task was given to every member, and also that there was a constant information exchange among members.

Inquiry based laboratories include open-ended scientific investigations that require students to observe, form hypotheses, test, and evaluate (Division of Undergraduate Science, Engineering, and Mathematics Education, 1990). In my study, the pupils determined the hypothesis of every experiment, recorded the data during experiment, and evaluated the results with their friends.

Much of the research looking at inquiry in a college setting, is implemented in non-majors biology courses. In 1990, Lawson, Rissing and Faeth created a Biology 100 course for the explicit purpose of teaching non-majors how to do science. They propose that through inquiry based laboratories, students gained an understanding of modern biological theories and concepts and were able to use them in application in their everyday lives (Lawson, Rissing and Faeth, 1990). Sundberg & Moncada (1984) also implemented an investigative laboratory approach in non-majors biology class. They presented their investigative laboratory approach as one with a level of inquiry similar to that found in an open inductive inquiry approach rather than a open-ended more traditional approach. When comparing their students with those registered in a concurrent major biology class, they found some interesting things. Although the non-majors received less course content (though more inquiry), the non-majors consistently demonstrated more in depth understanding of major biological concepts than the majors did.

A group of twenty-four-pupils attended to my study. Some of them expressed that the reason why the experiments were more enjoyable and effective was the number of pupils in the classroom was few.

Little to no research has investigated relationships attitude towards science and biology self-efficacy. The most recent, and the most applicable research to date was published as a case study investigating relationships between self-efficacy and attitudes toward science in an inquiry based biology laboratory. Research showed that inquiry based instruction had a positive effect on both student's attitudes toward science and their biology self-efficacy (Laipply, 2004).The result of this study get along with my study. In my study, thanks to inquiry based laboratory activities, some of the pupils expressed that their interests in science increased and that their negative attitudes about biology changed positively.

Recent studies has looked into implementing and designing inquiry laboratories that are effective in promoting students' development of formulating and implementing their own investigations (Deckert, Nestor, Dilullo,1998; Sundberg&Moncada,1984) In my study, the pupils expressed that self-directed learning and the mechanisms which were designed by themselves were very useful, and that their self-confidence increased.

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TABLES

Table 1. ***Levels of Openness of Inquiry in Laboratory Activities (after Hegarty-Hazel, 1986) (PAGE 11)***

Level	Problem	Apparatus	Procedure	Answer	Common name
0	*Given*	*Given*	*Given*	*Given*	*Verification*
1	*Given*	*Given*	*Given*	*Open*	*Guided inquiry*
2a	*Given*	*Given*	*Open*	*Open*	*Open guided inquiry*
2b	*Given*	*Open*	*Open*	*Open*	*Open guided inquiry*
3	*Open*	*Open*	*Open*	*Open*	*Open inquiry*

FIGURES

Hand-out

General information:

Mechanism:

Questions:

Figure 1. A simple inquiry based hand-out (PAGE7)

APPENDIX

Some Inquiry Based Laboratory Hand-outs (The mechanisms were drawn by pupils)

Experiment 1

An Elodea (aquatic plant) and a little tap water are put in a per. The light source is placed on 4x distance to the per, and after waiting for "t" time, the number of the bubbles released by Elodea is counted. Then, the same process is done again for 3x, 2x, and x distance.

Mechanism

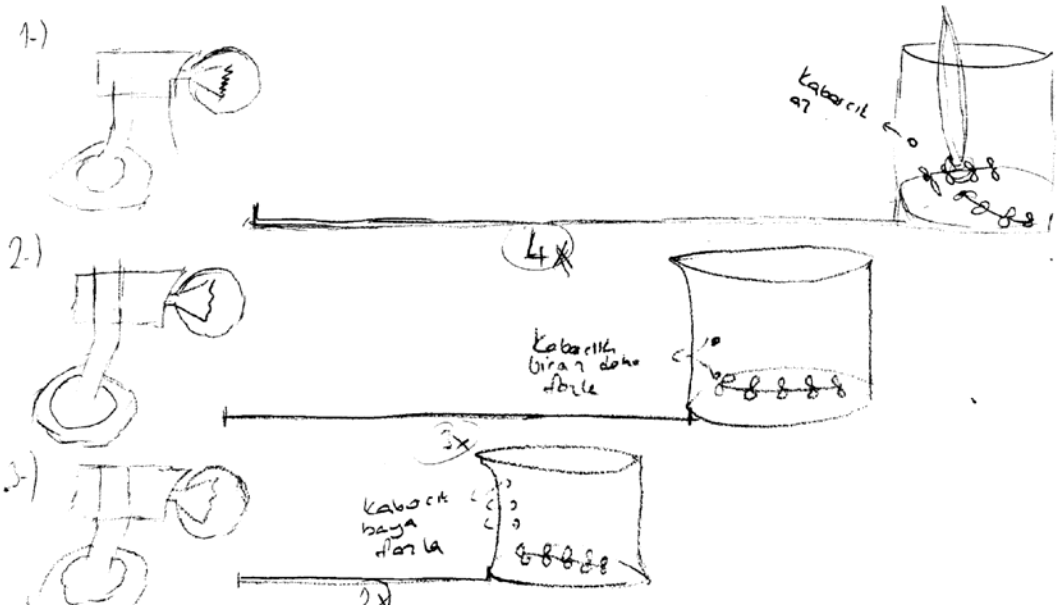

Figure 2. Mechanism 1

Questions:

1. **What gas the reason of the bubbles released by Elodea?**
2. **What factor plays a role in the photosynthesis velocity in this experiment?**
3. **What are the results of the experiment?**

Experiment 2

Three pers are used in this experiment. Only tap water is put in one of them, the tap water and a little lime water are put in the second, and the tap water and soda are put in the third. After the same length Elodea plants are added in each of the pers, the mechanisms are placed in front of the light source. The number of bubbles in each of the pers is counted.

Mechanism

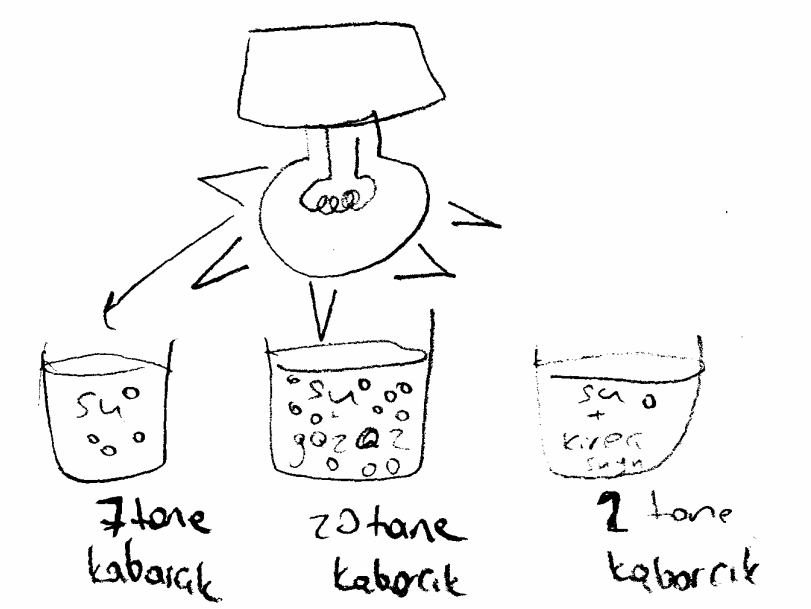

Figure 3. Mechanism 2

Questions:

1. **What is the reason of adding the lime water and soda?**
2. **What factor plays a role in the photosynthesis velocity in this experiment?**
3. **Which per is the control group?**
4. **What are the results of the experiment?**

Experiment 3

The geranium plant and lime water are put in a per. The per is attached to glass pipe including an oil drop by using a plastic pipe. The prepared mechanism is kept in darkness and the movement of the oil drop is observed with a meter.

Mechanism

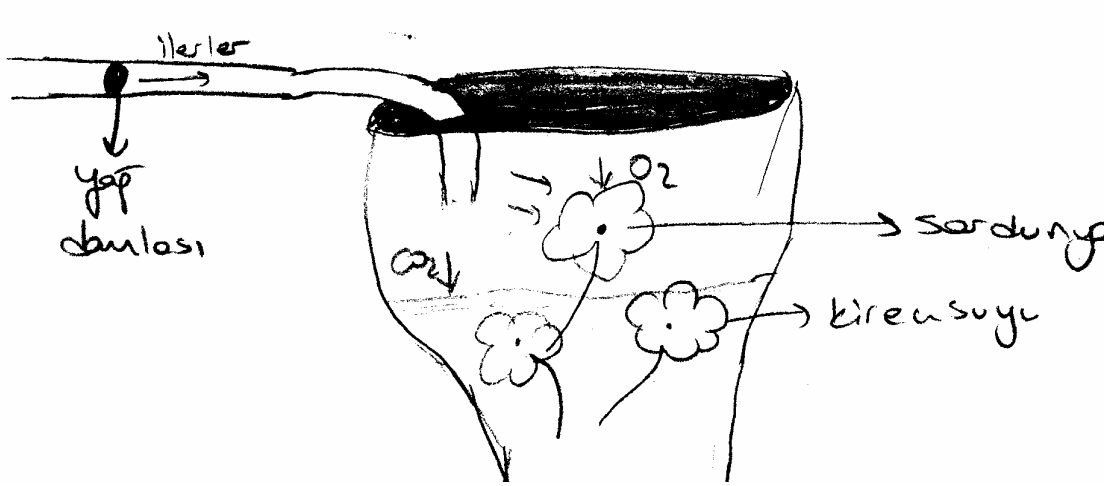

Figure 4. Mechanism 3

Questions:

1. **What is the reason of adding the lime water?**
2. **What is the role of the oil drop in the experiment?**
3. **If the experiment performed under sunshine, how do the results change?**
4. **What are the results of the experiment?**

THE RELATIONSHIP BETWEEN TEACHER IMMEDIACY BEHAVIORS AND LEARNERS' PERCEPTIONS OF SOCIAL PRESENCE AND SATISFACTION IN OPEN AND DISTANCE EDUCATION: THE CASE OF ANADOLU UNIVERSITY OPEN EDUCATION FACULTY

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ABSTRACT
A significant number of studies in the literature stress the important role of teacher immediacy behaviors on learners' perceptions of social presence and satisfaction in open and distance learning environments. Yet, those studies were conducted in different open and distance education institutions than the current example of which unique characteristics and applications are commonly recognized in the field. Unlike others, the current study examined the effects of both verbal and nonverbal instructor immediacy behaviors on learners' perceptions of social presence and satisfaction in face-to-face academic tutoring services provided in open and distance learning environments. Results indicated a moderate and positive relationship between the control variable and outcome variables

1. INTRODUCTION

Open and Distance Education (ODE), in general, is defined as an educational model in which the learner is in a remote location from the instructor's and in which the interaction between them is achieved through communication environments and technologies. Comparable to other institutions, the system at Anadolu University (AU) Open Education Faculty (OEF) utilizes various information and communication technologies (ICT) to provide academic services. Unique needs of different learner groups require a well organized

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integration of a range of ICTs. These environments may play both a "fundamental" and a "supportive" role in different services. Although Anadolu University's traditional ODE programs employ latest information technologies, textbooks still remain the core of the ODE system as the primary learning material.

In addition to textbooks, many other support services are offered to learners including TV programs, e-exam, digital versions of TV programs, e-book, synchronized virtual classroom, tutorial services through video conference, and face-to-face academic tutoring services. With the exception of face-to-face academic tutoring, all fundamental and support services are carried out with an approach that places the individual needs of learners at the center. Intrinsically motivated, learners study the content and the materials on their own pace.

One of the most significant factors affecting learner motivation is teacher-learner interaction (Picciano, 2001). Academic tutoring service of Anadolu University OEF is a face-to-face initiative that promotes greater teacher-learner interaction. Courses covered in the academic tutoring service provide the only opportunity for a face-to-face communication. Distance learners evaluate and utilize this service for better understanding the content in a physical environment where they feel responsible, interact with other learners, and assure their level of achievement.

The feeling of responsibility for one's own learning is reported to ensure active participation and to decrease the feeling of isolation felt by the distance learner (Saba & Shaerer, 1994). Learners must interact with teachers and others as a social entity, "real person", to avoid the feeling of isolation. The concept of social presence was introduced and defined by Short and colleagues (1976) as the "the salience of the other in a mediated communication and the consequent salience of their interpersonal interactions" (p.65). There are growing numbers of studies that focus on improving social presence in distance education because distance learning environments lack many communicative advantages contemporary face-to-face environments carry. Research has reported that teacher immediacy behaviors have an important role on shaping learners' perceptions of social presence (Christophel, 1990; Gorham, 1988; Hackman & Walker, 1990).

Derived from Mehrabian's (1969) work, immediacy is conceptualized as those nonverbal behaviors that reduce physical and/or psychological distance in interpersonal communication. Similarly, Thweatt and McCroskey (1996) defined immediacy as communicative behaviors that reduce perceived distance by individuals. Therefore, teacher immediacy can be portrayed as verbal and nonverbal behaviors that reduce physical and psychological distance between teachers and learners. Immediacy perceived by the learner in a learning environment can be viewed as an indicator of reduced feeling of isolation. Immediacy is categorized and investigated under two sub-factors as verbal and nonverbal.

Nonverbal immediacy is recognized more as a psychological trait because it involves behaviors like eye contact, body posture, gestures, physical proximity, touching, and smiling. Mehrabian's (1971) research suggested that such nonverbal cues increase the sensory stimulation of interlocutors which in turn lead to more intense, more affective, more immediate interactions. He suggested that nonverbal behaviors such as facing toward someone, standing close to someone, and touching form the immediacy among individuals. In the same vein, nodding to approve, smiling, and intentionally using gestures and stressing some words, as well, are acknowledged as nonverbal immediacy behaviors (Andersen, Andersen & Jensen, 1979; Newliep, 1997).

Studies on the teacher immediacy included behaviors such as talking about experiences that have occurred outside class, communicating with learners before and after classes, using humor to attract attention, encouraging learners to actively participate and ask questions, addressing learners by name, praising learners' work or comments, and providing feedback on learners' work. Her results suggest that these types of behavior also contributed significantly to students' affective learning. Depending on the words selected, verbal immediacy serves to improve psychological feeling of closeness among individuals. For example, instead of word like "you" and "me", using the word "us" enhances feelings of closeness and association (Gorham, 1988). Learners in such a teacher's class are expected to possess positive attitudes toward learning and display more interaction with others. Increased interaction among learners, in return, positively affect their perceptions of social presence, acknowledging others as real individuals (Hackman & Walker, 1990).

In addition, teachers' verbal and nonverbal immediacy behaviors have significant effects on learners' feeling of satisfaction regarding the teacher and the environment (Andersen 1979). Research (Andersen 1979; Biner, 1993; Gunawardena & Zittle, 1997) indicated a positive relationship between social presence and learners' level of satisfaction. Neill (1991) also stated that verbal and nonverbal immediacy behaviors reduce the psychological distance and improve learners' performance. According to Knapp (1980), higher levels of social presence and learner performance result in elevated learner motivation.

The current study, conducted in OEF at Anadolu University, investigated the effects of verbal and nonverbal teacher immediacy behaviors on learners' perceptions of social presence and their level of satisfaction regarding the teacher and the learning environment in Academic Tutoring services offered for distance "Introduction to Economics" class. Satisfaction reflects the students' overall attitude toward the components of a distance education course. Biner, Dean, and Mellinger (1994) identified seven distinct dimensions of course satisfaction: Teacher/content, technology, classroom management, personnel, timely delivery of materials to students, support services, and interaction with the teacher out of the classroom. However, within the scope of this study, only environment and teacher dimensions are included for analyses.

2. METHOD

2.1. Framework of the Research

This piece of research is an experimental study. The population of the study consisted of learners enrolled to the "Introduction to Economics" class who are also receiving face-to-face Academic Tutoring service in OEF at Anadolu University. From that population, the sample included 213 learners attending Academic Tutoring service in Eskisehir, Turkey. Academic Tutoring Services was first launched in 16 cities with 390 faculty members in 1999 (Serter ve Çekerol, 2002). By the year 2007, face-to-face tutoring services are offered in 73 centers with 861 faculty members on local cooperating universities' campuses at evenings and weekends. The service starts at the first week of January and continues through the end of May and includes 10 most challenging courses over a variety of fields.

Two scales were used to assess perceptions of Academic Tutoring instructors regarding verbal and nonverbal communication behaviors. A 5-point Likert type scale developed by Richmond and colleagues (2003) was employed to assess nonverbal immediacy behaviors. This scale included 19 items that covered behaviors such as gestures, eye contact, and body language. The reliability coefficient for the scale was found to be .70.

To assess verbal immediacy behaviors, a 5-point Likert type scale developed by Hackman and Walker (1990) was utilized. Items in this scale reflected behaviors such as providing feedback, attracting students' attention, and addressing learners by their name. The reliability coefficient for the scale was found to be .90.

To assess the effects of learners' attendance to Academic Tutoring service on their social presence, a scale with 19 items was developed by the researchers. The scale reliability was found to be .93. Of those 19 items, 13 were designed to assess the effects of the learning environment and 6 were designed to assess the effects of teacher interaction.

Another 5-point Likert type scale with 25 items was used to assess learners' satisfaction regarding the instructor and the environment in Academic Tutoring. First part of the scale included statements regarding instructors' encouragement of learners to cooperate, communicating with learners out side the classroom, using visuals, providing support out side the classroom, and designing the content. The second part used to investigate learners' purposes to attend, whether the environment was helpful to learners, and whether being in the same space with the instructor influenced their perceptions of social presence. The reliability coefficient for the scale was found to be .91.

500 copies of each scale was printed out and administered to learners who were enrolled to "Introduction to Economics" class. Administration of scales were completed one week before the semester ended on May 16th, 26 under the supervision of the researchers. After eliminating forms that were incomplete or missing many items, the sample of the study consisted of 213 learners.

The primary aim of the current study was to examine the effects of verbal and nonverbal teacher immediacy behaviors on learners' perceptions of social presence and their level of satisfaction regarding the teacher and the learning environment in Academic Tutoring services offered as a supporting aspect in a distance education class, "Introduction to Economics", in OEF at Anadolu University. Hypotheses of the study are listed below:

- There is a relationship between verbal and nonverbal teacher immediacy behaviors and learners' perceptions of social presence.
- There is a relationship between verbal and nonverbal teacher immediacy behaviors and learners' level of satisfaction regarding the learning environment.
- There is a relationship between verbal and nonverbal teacher immediacy behaviors and learners' level of satisfaction regarding the instructor.

Based on the hypotheses above, objectives of the study are defined as below:

1. In what direction and to what extent verbal and nonverbal teacher immediacy behaviors affect learners' perceptions of social presence?
2. In what direction and to what extent verbal and nonverbal teacher immediacy behaviors affect learners' level of satisfaction regarding the learning environment?
3. In what direction and to what extent verbal and nonverbal teacher immediacy behaviors affect learners' level of satisfaction regarding the instructor?

2.2. Data Analysis

Various statistical procedures were utilized in the study with the *p* value of .05 accepted as the level of meaningfulness. In addition to investigating means, correlation coefficients were analyzed to inspect the relationship between the teacher immediacy behaviors and two dependent variables of learners' social presence and level of satisfaction

Statistical procedures were handled by using SPSS 10.0 and the result are presented at the end of the paper

3. RESULTS

This section presents the results depending on the statistical analyses. Scales consisted of a total of 84 items in a five-point Likert type format ranging from 1=Strongly agree to 5=Strongly disagree. Boundaries of each response (from 1 to 5) was calculated by dividing the serial width (4) by the number of responses (5) and found to be 0.8. Depending on this calculation, boundaries for each response are accepted as below:

1	= 1+ 0.8	= 1.8
2	= 1.8 + 0.8	= 2.6
3	= 2.6 + 0.8	= **3.4**
4	= 3.4 + 0.8	= 4.2
5	= 4.2 + 0.8	= 5

The value of 3.41 was accepted as accept the threshold and values equal and over that number are acknowledged as positive

Table 1
Means of Verbal, Nonverbal Immediacy Behavior, Social Presence and Satisfaction Scales

Scales	Mean Scores
Verbal Immediacy	2,86
Nonverbal Immediacy	3,50
Social Presence	3,40
Satisfaction	3,37

According to the results, it is recognized that nonverbal immediacy behavior had the highest mean (M=3.50) among all variables. Means of learners' social presence (M=3.40) and satisfaction level (M=3.37) were close to each other. Teacher verbal immediacy behavior received the lowest mean with a value of 2.86. After inspecting the items in the verbal teacher immediacy scale, it is observed that the lowest means were associated with these three items: Teacher addressing learners by their name (M=1.70); allowing learners to address the instructor by his/her name (M=1.79); and communicating with learners out side the classroom (M=1.83). Investigating the level of learner satisfaction, it is observed that these two items received lower ratings from other items: "I attend to Academic Tutoring hours to gather with other distance education learners" (M=2.39) and "I attend to Academic Tutoring hours to meet new people" (M=2.41). On the other end, learners reported that this service helped them to better perform in exams (M=4.00), revealing that learners utilize this service primarily for exams. In the social presence scale, items of "I feel at ease in joining discussions in the class" (M=3.12) and "I feel comfortable in expressing my thought to my peers in the class" (M=3.21) were rated lowest. However, learners reported that attending the Academic Tutoring service helped them feel like a part of the community (M=3.60). In the nonverbal teacher immediacy scale, while the lowest mean was given to the item stating the instructor depended heavily on personal notes or notes on the board (M=2.5), highest ratings were given for items stating that the instructor was acting naturally (M=4.3), the instructor was joyous and smiling(M=4.1), and the instructor achieved eye contact with learners (M=4.1),

Table 2
Correlations between Verbal Immediacy Behavior, Nonverbal Immediacy Behavior, Social Presence, and Satisfaction

		Nonverbal	Verbal	Social Presence	Satisfaction
Nonverbal	Pearson Correlation	1.000	.524**	.312**	.400**
	Sig.(2-tailed)		.000	.000	.000
	N	211	211	206	207
Verbal	Pearson Correlation	.524**	1.000	.412**	.476**
	Sig. (2-tailed)	.000		.000	.000
	N	211	211	206	207
Social Presence	Pearson Correlation	.312**	.412**	1.000	.768**
	Sig.(2-tailed)	.000	.000		.000
	N	206	206	207	203
Satisfaction	Pearson Correlation	.400**	.476**	.768**	1.000
	Sig. (2-tailed)	.000	.000	.000	
	N	207	207	203	208

** Correlation is significant at the .001 level (2-tailed).

As it can bee seen in Table 2, the highest correlation was observed between social presence and level of satisfaction. Regarding this finding, it can be concluded that when learners feel like a part of a community, they feel more satisfied regarding both the instructor and the environment. In addition, correlations of both social presence and level of satisfaction with verbal immediacy behaviors were higher than those with nonverbal immediacy behavior. That is, learners perceive verbal messages and behavior more positively thatn nonverbal messages or behaviors.

Table 3
Correlation between Verbal Immediacy Behavior, Nonverbal Immediacy Behavior, and Satisfaction Subfactors

		Satisfaction with environment	Satisfaction with teacher	Nonverbal	Verbal
Satisfaction with environment	Pearson Correlation	1,000	.738**	.260**	.288**
	Sig.(2-tailed)		.000	.000	.000
	N	208	208	207	207
Satisfaction with teacher	Pearson Correlation	.738**	1.000	.459**	.562**
	Sig. (2-tailed)	.000		.000	.000
	N	208	208	207	207
Nonverbal	Pearson Correlation	.260**	.459**	1.000	.524**
	Sig.(2-tailed)	.000	.000		.000
	N	207	207	212	211
Verbal	Pearson Correlation	.288**	.562**	.524**	1.000
	Sig. (2-tailed)	,000	.000	.000	.
	N	207	207	211	211

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

Investigating the table above, it is observed that level of satisfaction with the environment did not have strong correlations with verbal and nonverbal teacher immediacy behavior. Level of satisfaction with the teacher has moderate correlations with verbal and nonverbal teacher immediacy behavior, although correlations with verbal behaviors were higher than those for nonverbal behaviors.

4. CONCLUSION AND IMPLICATIONS

Academic Tutoring services carried out in OEF at Anadolu University are known as an environment in which the learners see themselves, their teachers and other learners as real individuals. In this study, the effects of this service forming learners' perceptions of social presence are discussed.

The relationship between the teacher's verbal and non-verbal immediacy behaviors and the learners' perceptions of social presence and levels of satisfaction is investigated in this study. The primary aim of the study was to determine the direction of the relationship between the teacher's immediacy behaviors and learners' perceptions of social presence. It was found that there is a moderate and positive correlation between them. Studies in the literature, similarly, report that teachers' verbal and nonverbal immediacy behaviors have a positive influence on the learners' perceptions of social presence (Anderson& Anderson 1982; Gunawerdana & Zittle, 1997). On the other hand, it can be said that creating the feeling of social presence in the learner is a significant determinant of the efficiency of learning. Findings of the study parallel the findings of previous research in the literature. The results indicated that learners see themselves as a part of the community and learn better when they attend Academic Tutoring services. They emphasized that they use this service especially for being successful in the exam and that they will encourage their friends to take advantage of this service.

Regarding the dimensions that create the feeling of social presence in the learner, Williams and Ware (1976) emphasized that encouraging learners to participate in the lesson, providing individual feedback, and communicating with learners outside the classroom may be effective. In this study, learners' perception of social presence has been found close to the critical value of 3.41. This finding indicates that learners cannot benefit from the teacher's verbal immediacy behaviors to the desired extent. A plausible explanation for this can be the abundance of the learners participating in Academic Tutoring services. Therefore, as opposed to what the literature suggests, in this study, learners couldn't evaluate the teacher positively about giving individual feedback, and communicating with learners outside the classroom.

The second and third aims of the study targeted determining the direction of the relationship between teachers' verbal and nonverbal immediacy behaviors and learners' satisfaction levels concerning the environment and the teacher. As a result of the analyses carried out, a moderate relationship has been found between those variables. When the level of satisfaction concerning the environment is associated with the teacher's verbal (.288) and nonverbal (.260) immediacy behaviors, it is indicated that neither immediacy behavior has a significant influence on determining the satisfaction level of the learners concerning the environment. This finding can be explained by the learners' desire to make use of this environment just for being successful in the exams (M=3.99). Although learners wanted to utilize Academic Tutoring services for each course (M=4.1), they perceives this environment as an opportunity that will help them having a degree. In the ARCS (**A**ttention **R**elevance **C**onfidence **S**atisfaction) Model proposed by Keller (1987), learners' desire to have a degree as a result of learning is seen as one of the most significant external factors in determining learners' level of satisfaction concerning learning. Similarly, in this study, it can be said that learners' desire to make use of this service to pass their exams has a significant influence on determining the level of satisfaction concerning the environment.

When learners' level of satisfaction concerning the teacher is associated with the teacher's verbal (.562) and non-verbal (.459) immediacy behaviors, it is observed that verbal immediacy behaviors increase the satisfaction levels of learners. Presenting the content as respecting different points of views (M=3.57), asking questions related to the content (M=3.48), and using the expression 'we' while presenting the content (M=3.41) are evaluated as the most prominent factors which satisfy learners about the teacher's verbal immediacy behaviors.

On the other hand, teacher's nonverbal immediacy behaviors such as having eye contact with learners (M=4.06), acting in a natural way (M=4.27), and using facial expressions while presenting the content (M=3.91) are also appraised to be positive factors in increasing learners' satisfaction levels concerning the teacher. In parallel with the previous research findings in the literature, immediacy behaviors of teachers who address their students with their names, have eye contact, and smile while presenting the content contribute to learners' satisfaction and social presence levels in a positive way. (Christophel, 1990; Gorham, 1988; Neuliep, 1997; Sanders&Wiseman, 1990; Walker Heckman, 1991).

In addition to these findings, it can be seen that there is a high correlation between learners' perceptions of social presence and their satisfaction levels (.768). While this suggests that learners perceive Academic Tutoring services as an environment which enables them to be socially present, it may be inappropriate to reach conclusions merely based on the findings of this study. More detailed studies with the similar objectives should be conducted and their results should be compared with those of this study. Particularly, it is suggested that more qualitative studies investigating the effects of face-to-face environments in distance education on learners' social presence should be conducted to support quantitative findings. Besides, investigating the relationship between

the perception of social presence and other components of the OEF (television, internet, videoconferencing, etc) may provide more comprehensive information about future applications.

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USING AN ONLINE PORTFOLIO COURSE IN ASSESSING STUDENTS' WORK

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ABSTRACT
New developments and advancements in informational technology bring about several alternative avenues for educators to select in supporting and evaluating their students' learning. Online portfolio is a fairly new technique in this regard. As the online education grows, use of online portfolio becomes more vital for educational programs. At Virginia Tech, in the program of Instructional Technology Master's of Art Degree (ITMA), an online portfolio evaluation course is designed with the goals of reviewing and evaluating students' achievements throughout their master's degree education as well as evaluating the program itself. Evaluation standards put forward by Association for Educational Communication and Technology (AECT) are used as a framework in developing this course.

In this presentation, we first discuss types and content of portfolios and design principles for creating portfolios. Next, we describe the portfolio evaluation course and explain briefly evaluation processes involved in the course. We then discuss AECT standards and how the portfolio evaluation course was informed by these standards. Succeeding the close examination of this course and its use for the Virginia Tech case, we discuss which regulations and standards should be considered in order to successfully apply this online portfolio evaluation course in educational institutions in Turkey.

Keywords: Assessment, E-portfolio, Evaluation Standards.

INTRODUCTION

Portfolio is a fairly new concept in Higher Education in Turkey. It is commonly used in the field of financial investments and in describing an artist's collection of works. Portfolio, in general, can be defined as systematic

collection of materials for a certain purpose. In the field of education, this term is regarded as collection of students' works compiled with the guidance and directions of an instructor to indicate students' academic progress and success in their learning process (Arter, Spandel, & Culham, 1995).

As for the electronic portfolio, it is a collection of students' coursework or independent studies brought together on electronic environments. These environments are typically in the form of a CD-ROM/DVD or a web site, and they are convenient for storing texts, pictures, and audiovisual files. In the United States, from a professional standpoint, portfolios are used in job market for job applications, and in higher education for the promotion of faculty members or for determining and evaluating graduate students' knowledge and skills just before they graduate. When deciding on what works would go into a portfolio, it is imperative for a person to consider principles and standards of his/her institution or organization. This notion also plays a key role in evaluating a portfolio. We will further discuss types and content of portfolios in the succeeding section.

In Turkey, graduate students are assessed based on their coursework grading and the qualifying exam results (written and oral) in order to be eligible for conducting a thesis/dissertation. Since the exams take place in a short time period, student's performance may be affected by external or internal factors including class environment and student's psychological and physical health conditions. Given that education is generally regarded as a process of bringing desired change in behaviors; in the context of graduate programs, students' academic success and progress need to be evaluated in a more comprehensive way and should be spread over a wide-ranging time period. One way of achieving this is by utilizing portfolio in the evaluation process. It is important to note here that with the use of portfolio, focus is not on how much a student knows, but what a student knows (Hebert, 1998).

Another important point that needs to be considered is that a faculty member or student has to see portfolio as a tool to demonstrate students' growth along the whole learning process. Considering the portfolio as a final product prevents us from getting desired benefits out of it. As Garthwait and Verrill (2003) put it, "e-portfolios are part of the learning process, not a result of it" (p. 23).
Developing a portfolio is a lengthy process. In spite of this, developing a portfolio indicates students' knowledge and skills on the subject at hand, and provides opportunities for students to reflect on their learning and find out about their growth (Ahn, 2004).

PORTFOLIOS: TYPES, CONTENT, AND DESIGN PRINCIPLES

Types of Portfolios

In the literature, portfolios are categorized into three main groups according to their utilization (Smith & Tillema, 1998; Winsor, Butt, & Reeves, 1999):

Portfolio for giving detailed information. This type of portfolio is a compilation of course documents and assignments that shows students' performance on graduate courses. In this type, development of a portfolio does not have to be for the purpose of learning. Students' performance in this type of portfolio is evaluated on the basis of and to the extent of which the portfolio meets standards set by the institution.

Portfolio for learning. This type of portfolio is used for proving whether the previously designated principles and standards in the program are attained or not. Compilation of documents in the portfolio in keeping with the targeted knowledge and skills has a facilitative impact on the search for alternative paths in students' future success and growth, and their decision making mechanism (Messick, 1994). Portfolio for learning has important contributions to the evaluation process in the sense that it shows if students have acquired necessary knowledge and skills.

Reflective Portfolio. This type of portfolio is composed of a collection of systematic and continuous works which is directed by a professional or a person himself/herself to improve a person's comprehension capacity. This type of portfolio possesses evidence in finding out a person's professional work experience. (Smith, 1998).

An E-portfolio Template

In this section we will present a template for an e-portfolio. Although the template presented below is primarily designed for Master's and doctoral students, its content can be modified to fit into individuals from various disciplines and different levels of academic backgrounds.

Introduction: Students should articulate their goals in developing an e-portfolio in this section. Furthermore, this section can be a good place for students to give brief information about their curriculum vitae.

Accomplishments: Students should present their achievements and accomplishments in this section. This section can include awards, grants and other credentials students have received, as well as their work experiences such as internships and assistantships. Pictures and video clips can be used to evince these accomplishments.

Educational philosophy: Students should state their educational philosophy regarding their field of study.

Projects: In this section, students should present their projects, thesis and assignments coming from independent studies or from the courses that they are taking or have taken. Presenting abstracts of these documents on a page helps people who examine the e-portfolio.

Principles and standards. In this section, principles and standards which are set by institutions that the students attend should be presented. Essentially, it can be said that this section is the most important part of an e-portfolio, because by examining this section one can understand if the students meet the existing principles and standards. In this section, the students ought to give links to their projects, thesis, and assignments that are related to each principles and standards.

Curriculum Vitae: A comprehensive curriculum vitae written chronologically should be presented in this section. The point that needs to be taken into consideration in this section is that ordering of both professional positions held and academic publications needs to be from newest to oldest.

Reflections: Projects, assignments and other studies carried out up to that time and students' thoughts related to the field that they are in should be in this section (Sivakumaran & Wishart, 2003).

Design Principles to Consider in Developing an E-Portfolio

We discussed above types and content of an e-portfolio. Another crucial point that needs to be considered when developing an e-portfolio is design principles. These are given below in order:

1. Navigation – Can you go to wherever you want? There has to be a user-friendly and easily accessible navigation to be able to access sections and pages in the e-portfolio. Links among the pages have to work flawlessly.
2. Functionality – Can you view the content? The content of an e-portfolio has to be readable and structured in a way that does not make eyes feel tired. Use of unnecessary bright writing fonts should be avoided. If the content of the portfolio requires supplementary plug-ins and programs such as Flash Drive or QuickTime, they have to be embedded and checked to see if they are running properly. Providing links to the web sites where these programs can be downloaded would also be helpful.
3. Relevance – Is the content related to the field of study? The content of projects has to be relevant to the principles and standards.
4. Amount of content – Is the content adequate and accessible. There has to be as much as necessary amount of content in the project section that covers the principles and standards.
5. Appearance – Is everything attractive? In addition to existence of necessary content, the presented content also has to attract users' attention. Same design template should be used throughout the e-portfolio, and all the pages should be linked with one another (Portfolio Evaluation Course Notes, 2007).

IMPLEMENTATION OF PORTFOLIO EVALUATION COURSE

The Instructional Technology Master's of Arts Degree (ITMA) program is a distance learning program which was established in 1998. Although it was originally designed for K-12 practitioners in the State of Virginia, currently it is a nationwide program offering the degree for students who are educators in K-12, community colleges, and higher education, as well as corporate trainers and other instructional design and development professionals outside of the academic world. Since ITMA is a distance program, all courses are offered online and students are required to take 30 credits to complete their Master's degree.

There is a two-level assessment conducted in the ITMA program to assess student's performance (ITMA, 2007).

- The course level assessment which is conducted through course-related assignments.
- The program level assessment which is conducted through a summative review of the student's electronic portfolio.

In the ITMA program the portfolio also gives students a great opportunity to demonstrate their skills and knowledge in the following areas:

- Web page creation
- Multimedia production to support student's learning

- Development of educational research
- Electronic presentation development
- Software evaluation (ITMA, 2007)

The Portfolio Evaluation/Presentation is a required course for students who complete all coursework in the ITMA program.

Adhering to a summative evaluation method, ultimate goal for this course was to be able to determine the students' achievements over a period of time, to encapsulate the development and progress, and to report the results to related stakeholders (Scriven, 1991; Shambaugh & Magliaro, 1997). Student portfolios are evaluated according to the published standards established by the Association for Educational Communications and Technology (AECT). These standards have been used by the National Council for Accreditation of Teacher Education (NCATE) to review the academic programs in the United States and are divided into five interrelated domains: design, development, utilization, management, and evaluation. Also, each domain includes sub-domains which represent the major characteristics of each domain. These domains and sub-domains are represented in Figure 1 (Seels & Richey, 1994, p. 21).

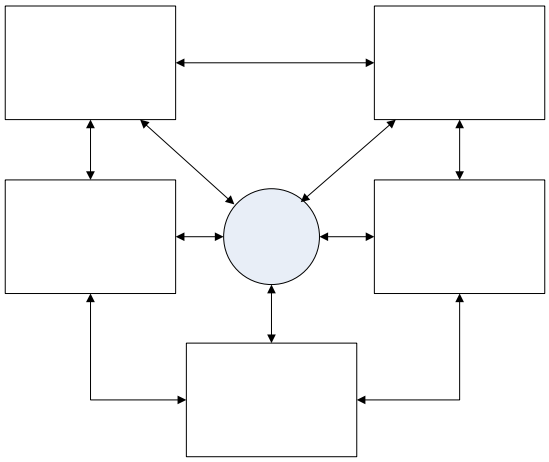

Figure 1. Domains of the field

According to Seels and Richey (1994), the design domain shows the necessary knowledge and skills for students to be able to design conditions for learning by applying principles of instructional design, message design, instructional strategies, and learner characteristics. The development domain refers to the actual creation of instructional materials and experiences, as well as products. The utilization domain includes the use of processes and resources for learning. The management domain focuses on the application of principles of projects, resources, delivery systems, and information management to the planning, organizing, coordination, and supervision of instructional technology. The evaluation domain refers to the application of the principles of problem analysis, criterion-referenced measurement, formative and summative evaluation, and long-range planning to the evaluation of the products and processes of learning.

Development
Print Technologies
Audiovisual Technologies
Computer-Based Technologies
Integrated Technologies

AECT has also provided a list of indicators which are associated with these domains and their sub-domains. More information about the domains and performance indicators can be found at www.aect-members.org/standards/initstand.html. These indicators are not only used to assess student performance and whether or not they comply with the AECT standard, but also provides the ITMA program a resource to present evidence of student outcomes to the accreditation body.

In the Portfolio Evaluation course, students need to develop their own portfolios that are aligned with the guidelines, formats, and standards. In order to develop their portfolios, students should be able to use some kind of web development software such as, Dreamweaver© and Frontpage©. Once a portfolio was developed, students should submit their work to a group of peers. They are responsible for evaluating their own portfolio, as well as some of their peers' portfolios. Therefore student can take advantage of peer evaluation to modify or enhance their portfolios before the final submission to the faculty. By having peer evaluation conducted in this course, students are expected to reflect on not only how evaluation is conducted in terms of formative and summative perspectives, but also how peer evaluation assists them in identifying deficiencies in their portfolios (Topping, Smith, Swanson, & Elliot, 2000).

Design
Instructional Systems Design
Message Design
Instructional Strategies
Learner Characteristics

After peer evaluation, students have to submit their portfolios to the faculty for final evaluation. In the Portfolio Evaluation course, peer evaluation can be considered as formative evaluation which is an ongoing evaluation to revise and improve the portfolio (Scriven, 1991; Weston, Mc Alpine, & Bordonaro, 1995). On the other hand, faculty evaluation can be viewed as summative evaluation which focuses on the final product to determine what has been achieved over a period of time, to summarize the progress, and to report the findings (Scriven, 1991; Shambaugh & Magliaro, 1997). In the final evaluation, faculty members decide if students meet the portfolio requirements. If students meet the requirements, they will be awarded with Master's of Arts degree in Instructional Technology.

In the Portfolio Evaluation course, AECT standards are used as advance organizers to determine the achievement of educational objectives (Stufflebeam, 2001). Accreditation history in the United States shows that standards establishment is the foundation of accreditation (Yilmaz, 2007). Today, within the accreditation process, special attention is given to assessment of student learning and outcomes (Miller, 2000). Therefore, using AECT standards and requiring students to organize their work in the portfolio according to these standards are crucial to show the evidence of the student learning and development.

PORTFOLIO IN TURKISH EDUCATIONAL INSTITUTIONS

The use of portfolio assessment in evaluating students' learning and development in Turkish higher education at the level of a course is sporadic and only exist as an effort of individual faculty members (Gulbahar & Tinmaz, 2006). Furthermore, existing practices suffer lack of systematic implementations of portfolio assessment. On the other hand, the use of portfolio assessment is absent at the program level.

However, the recent changes in curriculum and evaluation in the pre-college education call for use of alternative assessment methods to evaluate students learning process (MEB, 2003). Exhibits, portfolios, concept maps, or oral presentations are some of these alternative assessments (Herman, 1997). In this context, the authors of this article believe that the use of portfolio in tertiary education can also bring a new perspective to the assessment of student performance. This notion is also supported by the teacher qualification indicators, which were established by an Educational Commission in 2004. This Commission was composed of representatives from the related units of the Ministry of National Education, the pool of Turkish university representatives, teachers, superintendents, and measurement and evaluation specialists. The commission identified six main qualification domains, 31 sub-domains, and total 221 qualification indicators related to these domains and sub-domains. These qualifications were designed to improve not only teacher qualifications through pre-service and in-service training, but also student achievement. Of the six main domains, one is primarily germane to our work: "Monitoring and evaluating learning and development" (MEB, 2006, p.3). Under the heading of this qualification domain, the Commission documented several indicators by placing emphasis on the use of alternative assessment tools in teaching and learning. One of the indicators specifically states that teachers should identify and use alternative assessment tools (MEB, 2006). Additionally, this indicator raises the critical need for having teachers to get familiar with and comprehend different ways of using alternative assessment tools, including portfolio in their classrooms to assess student performance.

Even though some initiatives have been started and works have already been done in the direction of bringing standards to higher education in general and teacher education in specific such as, the creation of teacher education indicators; there is still a need for comprehensive and detailed guidelines and standards, like AECT standards in different disciplines. These standards certainly should be informed by and consider both international standards, and the requisites and realities of Turkish Educational context. We also believe that establishment of discipline specific standards based on aforementioned considerations will assist us in effectively utilizing portfolio evaluation courses in the Turkish higher education system.

CONCLUSION

The traditional assessment strategies that are perceived merely as a monitoring mechanism fail to address needed skills such as, problem solving, reasoning, connections, and cooperation. In response to this problem, alternative assessments have been developed. Portfolio, particularly electronic versions, can be regarded as one of these assessments. It allows students to see and control their academic development and success rather than just showing if students reach certain criteria in a quantitative sense. Our experiences in Virginia Tech showed that students can be able to actively participate in their own learning and so that the process of attaining to higher-order thinking and universally-accepted important skills may be easier and quicker. It is undoubtedly important in this sense that Turkish higher education should learn from international experiences and knowledge base.

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USING MOBILE PHONES TO PREPARE FOR UNIVERSITY LECTURES: STUDENT'S EXPERIENCES

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ABSTRACT
In this paper we present findings from a study of students' use of mobile phones in a biology course at the Norwegian University of Science and Technology (NTNU). Using a qualitative research approach we focus on how mobile phones can complement and add value to the educational challenge of encouraging university students to obtain some topic knowledge prior to their lectures. In the course material short video-recorded highlights of upcoming lectures were available on the university's learning management system (LMS). The students used WLAN / 3G mobile phones or PCs to view the videos. All in all, the participants were excited about the new learning opportunities in the course and the findings suggest that the use of videos and mobile phones contributes positively to student learning activities.

Keywords: Higher Education, Innovative Pedagogy, Learning Management System, M-learning, Virtual Learning Environment.

INTRODUCTION

In higher education we find a growing awareness of the need to develop teaching approaches to facilitate student learning. In the debates on teaching and learning methods at the university level in Norway, there is a concern about what is lost when students come unprepared to lectures. Thus, there is an interest to develop effective means to encourage students to prepare themselves for upcoming lectures. In educational literature, an underlying assumption is the belief that preparations prior to lectures may be a highly effective means of awakening student interest, increasing student involvement during lectures and thus improving their learning outcomes. Research findings also suggest that students who have some 'prior knowledge' learn more effectively than unprepared students (Alexander et.al. 1997; Alexander & Jetton, 2000). For example, students' prior knowledge about the topic of a text is found to contribute to their comprehension (Samuelsstuen & Bråten, 2005).

Use of technology in education may represent new opportunities for students to gain prior knowledge ahead of lectures. Many authors have argued that there is reason to believe that wireless portable technology will have a role to play, at a general level, in the way we learn (e.g Patten, Sanchez & Tangney, 2006). A definition of m-learning is "the provision of education and training on PDAs/palmtops/handhelds, smartphones and mobile phones" (Keegan 2005, p. 3). The concept envisions how students continually are on the move, always in a position to interact with fellow students, teachers, subject matter and various technologies. In this way m-learning combines individualized learning with anytime and anywhere learning (Quinn, 2001). Despite the tremendous growth and potential of wireless phones and handheld devices (W/H devices), wireless e-learning and m-learning are still in their infancy. There is little knowledge on how to tap the learning potential that is embedded in the latest mobile technologies.

Bearing this in mind, an interdisciplinary research and development project was launched. The project developed multimedia content, technology and educational designs that can support student learning processes in general and their preparations prior to lectures in particular. In this paper we discuss how the use of mobile phones may encourage students to gain some prior knowledge about subject matters ahead of lectures. Students enrolled in a biology course at Norwegian University of Science and Technology (NTNU) used mobile phones to access course material that was made available through the university's learning management system (LMS). The project is based on an overall understanding that learning on W/H devices will never replace classroom learning activities. Rather, our project explores how mobile technology can complement and add value to the current learning practices.

Method and arrangements

The Norwegian university of Science and Technology, located in Trondheim, has a long tradition of positioning itself at the technological cutting edge (www.ntnu.no). Virtually all students in Norway have private computers. Both students and staff have wireless broadband access at the indoor and outdoor campus areas.

Participants

Throughout the fall term of 2006 we studied seven students (one male, six female) enrolled in a biology course (histology) at NTNU. The students had studied biology for the same amount of time and were therefore considered to be an academically homogenous group. The group members, who on average were just under 24 years of age, were relatively skilled users of technology. Mobile telephones were already an integrated part of their social life, and they were frequent users of laptops or stationary computers both at home and on campus.

All the biology students had mobile phones with WLAN / 3G (Nokia N80) at their disposal during the course. They could use the mobile phones to access course material that was made available thorough the university's LMS. Using the LMS was already an integrated part of their study habits. The university expects students and the faculty to use LMS in their work on the subject. However, using the mobile phone to access the LMS was new to all students.

Subject matter

The subject matter in the biology course was histology (mammal tissue knowledge). The content is descriptive and does not require a high degree of synthesis and reflection. Nonetheless, there is much textbook material that must be recognized, remembered and systematized. Latin and Greek terms are used extensively and must be learned along with the terms in English and Norwegian. Visual studies of pictures and specimens are essential in this subject. The candidates are presented figures or pictures and microscope specimens, where they must explain the cell types that may be distinguished and their function in mammal tissues. Thus students must generally acquire factual knowledge and apply this in reasoning that is either correct or wrong.

Lectures and lab exercises were the basic components of the teaching. The lectures were traditional in the sense that the professor reviewed the day's topic, and also used visual aids such as pictures, film, figures and physical models. The lectures were followed by lab work where the students examined specimens under microscopes in connection with the topic of the day. The students also had to solve assignments posted on the LMS, and also had access to video footage for each lesson.

Designing videos

In the course material short video-recorded highlights (four to six minutes) of upcoming lectures were available on the university's learning management system, usually one day prior the lecture. In the video, the professor presented main themes and pointed at some key elements the students should look into prior to the next lecture.
The professor prepared the introduction video together with the university multimedia centre. In the videos the professor talked about selected topics using slides, while text and graphics, were gradually introduced in a Power-Point presentation. The video productions were recorded in a studio. The professor was seated in front of a lighted green screen, and using a technique called keying, the finished video appeared to show the professor in front of the various PP slides (http://en.wikipedia.org/wiki/Greenscreen). The result is was a composite picture that showed the professor in the foreground and the PowerPoint slides in the background.

A technician controlled the various PowerPoint slides the professor had prepared in advance from a control room, and these were displayed together with the video picture of the professor on three TV monitors facing the professor in the studio. The professor saw the composite picture live on these TV monitors, thus orienting his placement in relation to the text and images in the PowerPoint slides. The recording was done in the control

room, and converted to file formats for Internet display (.wmv) and mobile phone (.3GP) immediately afterwards.

The videos were digitally processed and posted on the LMS in three versions. One for PCs and two for mobile phones adapted to different bandwidths. Usability tests were conducted at the onset and half way through the project to test the mobile versions of the learning material, and the technology was adjusted accordingly. Three pilot videos were developed and tested and adjustments were made to colour, fonts and video length.

Technical arrangements
In collaboration with the developer of "it's learning" (www.itsolutions.no), the LMS used at NTNU, a version for mobile phones was developed. The LMS supplier adjusted the system according to the needs defined by the project group. After some initial technical problems, most LMS functions could be accessed in the mobile version and suitable telephone models could display most of the LMS functions.

The professor initially developed the LMS content on a PC. Then the content was reformatted to mobile phone use. This was done automatically with no need for special adaptation. The students were able to choose whether they wished to receive information, solve assignments or view the videos on either a PC or mobile phone.

A qualitative research approach to capture the students' experiences
A qualitative research approach allowed us to explore in depth how the use of mobile phones supported student learning activities. To collect data about how the students used mobile technology in their preparations for upcoming lectures, we combined observations and interviews. One main concern was to explore student experiences with the videos.

Observation of behaviour in a natural setting gives us the opportunity to develop insight into social phenomena (Silverman, 2002). Attending lectures gave us first-hand information about how the instruction was carried out and allowed us to explore how the video material was incorporated into the lecture. Altogether we observed 11 lectures (each of 45 minutes) in the histology course in the autumn of 2006. However, observation alone did not give us insight into what each student believed and thought about the programme in question. To gain a holistic understanding of the context it is necessary to gain insight into the experiences of the actors, and the reflections underlying the observed behaviour and actions (Patton, 1990). We therefore also conducted interviews with the students, which were held immediately after the lectures. We also carried out interviews (30-45 minutes) with each student toward the end of the semester. These interviews were based on the previous observations and enabled us to elaborate and clarify situations we had experienced together. Such a joint reference framework helped make our analyses more reliable when it came to the reality we wanted to describe. When the intention is to ascertain participant experiences, first-hand experience with how such media function is essential (Hine, 2000). Therefore, researchers, the professor and the students used the same mobile technology throughout the project period.

The data analysis is inspired by grounded theory, in that categories have been developed in order to identify that which is "significant to the respondents" (Strauss & Corbin, 1998). The categories that we developed were grounded in data and came about through an interplay between the researchers, transcribed data material and theory, and was undertaken both in the field and after the data were collected. Throughout the analysis, a theoretical assumption has been that learning comes about in the interaction between the students, the professor, subject matter and the technology used. The analysis has been inspired by how the students experience these interchanges and what it means to their learning opportunities.

FINDINGS AND DISCUSSION
All in all, the students were excited about the new learning opportunities in the course and the findings suggest that the use of mobile phones contributed positively to student learning activities. The mobile phones introduced new opportunities for learning. The observations and interviews show that the students now prepared before lectures and that they used the videos for this. All students had used the mobile phone to watch the videos. Some students used it on a regular basis while others did not. Students claimed that watching the video before attending the lecture raised their awareness of upcoming issues and may have contributed to active participation during lectures. The new arrangements also allowed for flexibility about when and where to prepare for lectures.
In the analysis we developed three categories about the uses of the mobile phone as a support to learning. It was evident that the mobile phone enabled the students to prepare for lectures in different ways. Firstly, the students used the mobile phone to view the videos without further preparation, that is, as a way of orienting themselves in the coming topic. Secondly, the students used the mobile phone to watch the videos before they read the subject

material proposed by the professor and the tasks he assigned. Thirdly, the students used the mobile phone to keep updated on news that was on the LMS.

Using the mobile phone to get an outline of the upcoming lecture
Sometimes, students used the mobile phone to view the videos ahead of lectures without further preparation. The mobile phone thus worked as a preparation tool for the purpose to familiarize themselves with the topic without using other study material. The students would often claim that lack of time was a factor in the cases where they used their mobile phone in this way. They could view the video over breakfast, on the bus or during breaks between classes. One student tells about what it means to be able to use the mobile phone in this way:
"I'm really bad at working on the material beforehand, so I think it's really good that we get these videos, if not I wouldn't have done more ... [...] ... so I view the video immediately before (the lecture) ... especially on Mondays because then I have a lecture from eight to ten, then the histology class starts at ten fifteen, and I usually forget to do it on Sundays, but then I only need to view the video." (Int.5:1)

Evidently, the mobile phone represented new opportunities to create time and find the opportunity to prepare. The utterance above confirms the basic assumption of this paper, which is that students do not habitually prepare for lectures. Furthermore it is illustrated that the mobile phone allows for last minute preparations. In actual fact this means the difference between preparing and not preparing at all.

These findings about the learning benefits from preparing ahead of lectures may thus add to debates about educational use of mobile technologies Although the students used the mobile phone to watch videos without further preparations, it is reason to believe that they come to the lecture with some prior knowledge about the topic. More specifically, watching the videos provides familiarity with some concepts and some general outline of the coming lecture. This was described as a being alerted and put in a state where they are ready to learn by "being brought into the modus of histology".

Using the mobile phone for more extensive preparations prior to lectures
Sometimes students used the mobile phone to do more extensive preparations prior to lectures. One main impression is that when the students were doing their preparation activities, they spent time on this work. They used a plethora of learning aids and information sources. The textbook, other books, the Internet, dictionaries and other reference works were used to prepare for the lectures. This was precisely the type of student activity the professor wished to facilitate with the video.

The students stated that they complied with the professor's instructions on the video. When they were performing preparation activities they also used the Internet or other sources of information:
"...he'll give some tasks, then I do the tasks, and then I'll read parts of the book and read the introduction to various chapters ... [...] ... and then occasionally I need to look up things in an encyclopaedia or something on the Internet." (Int. 3: 1-2).

In the data material we also see that the students had various opinions about weather the mobile phones where the appropriate technology to use for extensive preparations. All students stated that they had used their mobile phone to view the provided video followed by other preparation activities. However, one student did not see how the mobile phone could support preparations, since other learning materials were needed anyway. Along with this person's study habits, all preparations took place at the university within working hours at a desk with PC and books. This approach is contrasted by the following utterance:

"I found it smart to use it (the mobile phone) in the reading room, ...[...]... because I didn't have a laptop there, so it has useful to watch the video and do the exercises there, where I have the books in the reading room." (Int.3: 4)

In this utterance, the student appraises the mobile phone's handiness in accordance with other learning materials. Thus, the argument about the need for other learning material during extensive preparations is used both to reject and to include the mobile phone. This implies that the mobile phone is incorporated or rejected in accordance with the already established study habits.

Using the mobile phone for updates on the LMS
The new arrangements enabled students to connect to the LMS by mobile phone. Besides watching the videos, the students used the mobile phones for general updates about the latest news related to the subject. The students praised the opportunity to keep updated at any time and any place. Being able to connect to the LMS by mobile

phone brought about new opportunities. The interview material reveals that the technology enabled the students to keep informed about subject related matters of a more general kind:

"... and then it's really good to be able to check with "It's learning" (the LMS) whenever you want, check whether there's something new ...[...]... to see whether new messages have arrived on "It's learning", or mail, then it's really useful to have this option available, that you don't need a PC to, well, check mail or whether there are new exercises, and watch the video..." (Int.3: 4&8)

The mobile phone was used continually to log on to the learning platform to keep updated about changes and news. The students evidently valued this new possibility. It offered flexibility regarding time, place and which technical device to use. This third way of using the mobile phone during the biology course provided yet another learning supportive opportunity.

CONCLUSION

It is argued that it is reason to believe that wireless portable technology will have a role to play in the way we learn (e.g. Patten, Sanchez & Tangney, 2006). The technology and course arrangements in our project show three ways that technology may affect study habits and the way students learn. Students could do extended or limited preparations when they watched videos ahead of lectures. Besides, they could catch up with general updates about the subject. In this way the technical arrangements went along with students' needs and the educational considerations in the learning arrangements. Thus the arrangements allowed for students to put diverse efforts into preparations by means of three approaches to gain prior knowledge.

The students used the mobile phones for three purposes during preparations. This touches upon the role of LMS in teaching and learning in higher education. LMS provides the platform for web-based learning environments by enabling management, delivery and tracking of learning. Our findings suggest that LMS may exceed these functions. When students used the mobile phone to get an outline about the upcoming lecture, and for more extensive preparations prior to lectures, the LMS functioned as a learning tool. When the students used the mobile phone for updates within the subject, the management aspect of the LMS came into use.

As a result of this study we can say that affordance of constant access to LMS by mobile phones may represent new learning opportunities in higher education. One key issue is that the use of technology must be driven by pedagogical rather than technical reasons. Our findings about using the mobile phone to get an outline of the upcoming lecture, for more extensive preparations and for updates on the LMS, come about in a context with a balanced interrelationship between student, subject matter and the technology used.

AUTHOR NOTE

The two first authors, Rismark and Sølvberg, have contributed equally to the development of the ideas that are developed throughout the paper. They have designed the research study, collected and analyzed the data material, and written the main parts of the paper. The third author, Strømme, has developed the videos and provided text that describes the biology course and the procedures for producing the videos. He has also commented on drafts as the paper developed. The fourth author, Hokstad, has brought the project group together, conducted usability tests and commented on the final draft of this paper. We thank our cooperating partners Torleif Hallén and Martin Gaustad, both at the NTNU Multimedia centre, for their technical contributions throughout the project.

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WHAT IS THE ROLE OF EDUCATION TECHNOLOGIES IN INCREASING INFORMATION LEVELS ON NUTRITION AMONG PRIMARY SCHOOL TEACHERS?

Alpay SEZENLER, Mehmet ÇAĞLAR

SUMMARY
Nutrition is indispensable for human beings from the day they were born to the day they die. Besides having the right information for a balanced diet, it is also important to know how to use such information. This paper evaluates the nutritional knowledge of primary school teachers in Guzelyurt district. The questionnaire was given to 71 teachers in total and it was filled using face-to-face questionnaire techniques. The results have shown that 54.1% of the teachers in the district knew about a balanced diet and were informed about nutrition. However, it was confirmed that there is a need to organise a sustainable training programme for teachers in order to bring them up-to-date with new information and technological developments regarding nutrition.

Key Words: Nutrition, primary school teachers, technology

INTRODUCTION
Education starts at home by birth, moves to streets (outer environment) through childhood and then to school. Children's behaviour is fundamentally shaped in school as they spend most of their time there. Thus, evaluating the nutritional observations of teachers, who are in close contact with students, and updating their knowledge would help to change bad dietary habits and in turn prevent diseases like childhood obesity[1]. It is necessary to exploit technological advancements especially the IT, in order to ensure that our teachers acquire the precise information on nutrition so that they can orient the children rightly.

MATERIAL AND METHODOLOGY
This research was carried out as a population research under the T.R.N.C Ministry of Education among primary schools in the district of Guzelyurt. The research sample was identified as the primary school teachers in the district. Total of 71 teachers working in the district schools have volunteered to participate in the research. The aim was to try and identify the teachers' level of nutritional knowledge and information. The research questionnaire was filled using face-to-face questionnaire techniques with the teachers who volunteered to take part. The questions were prepared in consultation with two medical doctors and a nutritionist in order to ensure that they were easy to understand. There were 16 questions about nutritional knowledge and its implementation in total. When evaluating the results, teachers who answered less than 4 questions correctly were categorized as unsatisfactory; those who answered 4-5 and 6-7 were categorized as developable and satisfactory respectively.

FINDINGS
7 out of 16 questions in the questionnaire were related to nutrition and 9 were about implementation of the nutritional knowledge. The sample group, who volunteered to answer the questions, consisted of 48 female and 23 male teachers. 51 (% 71.8) out of 71 teachers were classroom teachers and 20 (% 28.1) of them were speciality teachers. When we look at the duration of their teaching experience, 16 (%22.5) were teachers over 20 years, 30 (%42.2) were between 10-20 years, and 25 (%35.2) have been teaching less than 10 years.

38 (%53.5) teachers gave the right answer to the first question and defined a healthy diet correctly.

37 (%52,1) teachers said that a healthy diet includes at least 5 meals a day.

When asked, which type of food need to be consumed more, 40 (%56.3) teachers said food with less fat and more fibre.

When asked about their daily dietary habits, 31(%43.6) teachers said they regularly eat vegetables and white meat, 24 (%33.8) of them said that they always eat home cooked meals, 14 (%19.7) teachers often eat home cooked meals and ready meals only during weekends, and finally, only 2 (%2.8) of them said they always eat ready meals.

When asked how long on average they spend for having breakfast, 44 (%61.9) teachers said 10 minutes, 13 (%18.3) said 20 minutes, 1 (%1.4) said 45 minutes and 9 (%12.6) said that they do not have breakfast.

When asked what kind of sport activities teachers themselves exercise, 9 (% 12.6) of them said that they walk regularly everyday, 31 (%43.6) said they walk when they have the chance, 14 (% 19.7) of them said that they do not do any kind of sports while 17 (%23.9) teachers stated that they do not have enough time for sports because of all the housework.

43 (%60.5) teachers who participated in the research said that in between classes students consume fruit juices and sandwiches, 10 (% 14.0) of them said students eat fresh fruits, 15 (% 21.1) said that they consume crisps and coke while 3 (% 4.2) stated that they don't have an opinion about the question.

24(% 33.8) teachers stated that they always talk about nutrition with their students, 36 (% 50.7) of them said they discuss it when they have the chance, 1 (%1.4) teacher said that she/he doesn't have the time and 11 (%15.4) stated that it's not included in the programme.

2 (% 2.8) teachers have stated that they obtain nutritional information from newspapers, 3 (% 4.2) from magazines, 5 (%7.0) from TV, 12 (%16.9) from doctors or nutritionist, 1 (% 1.4) from internet whereas 48 (% 67.6) teachers replied as 'all of above'.

When asked how frequently teachers talk about healthy nutrition during snack time, 25 (% 35.2) teachers said always, 37 (% 52.1) said when they have the chance, 1 (%1.4) said he/she does not have enough time, and 8 (% 11.2) said that its not included in the programme.

When asked about organising a training on new nutritional information, 3 (% 4.2) teachers in the working said it was not necessary, 37 (% 52.1) agreed that it was a good idea and 31 (% 43.6) thought it was necessary.

When asked about the sport activities available in school for students 40 (% 56.3) teachers stated that it was not enough, 20 (%28.1) said that it was satisfactory, 8 (% 11.2) of them stated that it was satisfactory but needed further planning, and 3 (% 4.2) teachers said that they do not have any information on the subject.

Table 1: Resources from which teachers acquire their knowledge on nutrition.

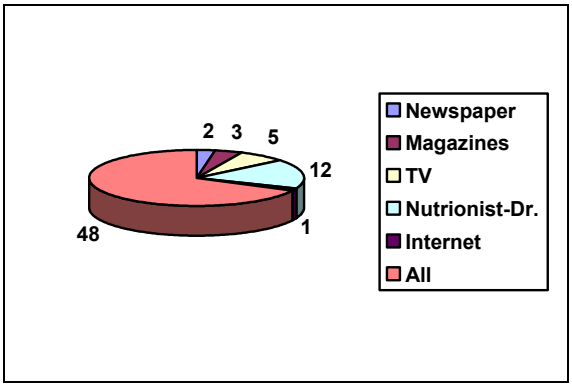


Table 2: Number of right answers.

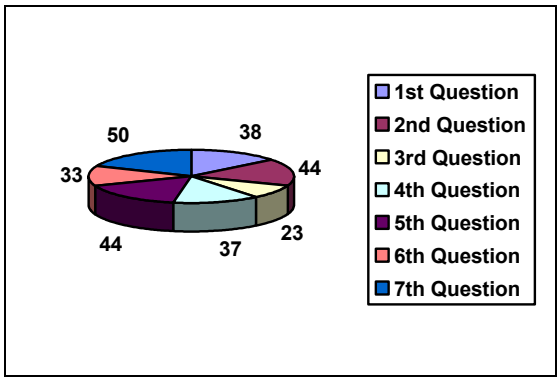
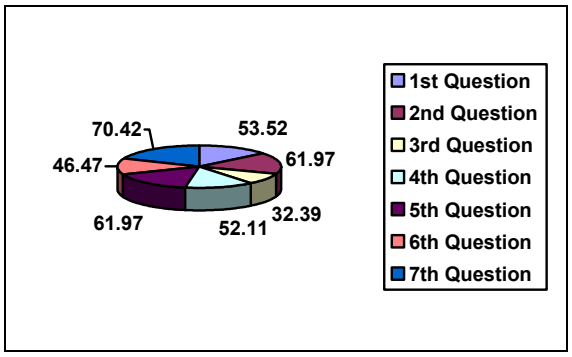


Table 3: Percentage of right answers.



ANALYSIS

The chosen sample of teachers for this questionnaire is not representative for all the primary school teachers. They are primary school teachers within the district of Guzelyurt who volunteered to take part in the research.

The 3rd question in the questionnaire, which asked about the right distribution of daily energy intake vis-à-vis various food types, obtained the least correct answers with %32.3. This shows that teachers need to explicate information on distribution of daily energy further. The 12th question about consuming food with more fibre and less fatty ingredients obtained 77.5% correct answers.

Dietary habits change depending on geography and culture. However, knowing which food types are to be consumed in smaller or larger amounts is important especially when considering today's dietary preferences which are rich in fats[2].

Various important factors like Cypriot food culture influence the dietary habits of the working group. Results show that a large proportion of people consume locally produced vegetables which are high in fibre and as an island in the Mediterranean Sea, fish is also consumed widely[3].

The research shows that only 2 out of 3 teachers have sufficient information on principal food. When asked about principal food and their consumption, 61.9% of the teachers rightly said that consumption of proteins, carbohydrates and fats are all necessary. However, the fact that the percentage of the correct answers was not a hundred proves lack of fundamental information.

According to some research, it is asserted that intake of fats has increased and it is this change in dietary composition that causes obesity. Besides energy intake and changes in dietary composition, another factor that influences obesity is the amount of energy spent[1,4]. Research carried out in recent years shows that there is a significant decrease, approximately up to 15% to 25%, in total energy spent among children[5]. The 5th question which aimed to examine this particular knowledge held by teachers was answered 61.9% correctly. Accordingly, this proves that %38 of the teachers need to be informed further on the subject.

Other researches have shown that % 57 of women of all age groups are overweight, %11.0 of children below the age of 5 are short, and %1.9 are underwieght[1,6].

Other than that, commercials used in visual and written media affect our dietary habits negatively.

For example, the research carried out by Baysal and his/her friends shows that coke, pizza, hamburgers and fries/chips have replaced ayran (youghurt drink), fruit juices and meat balls[7].

This research has also showed that %60.5,of the students eat sandwiches with fruit juices, %21.4 crisps with coke and only %14.0 eat fresh fruits during recess periods in school.

The research carried out by Dağ et al demonstrates that conveying information is not enough for attaining a healthy community, but chance in attitudes and habits is necessary[8].

Şaşmaz et al's research showed that although %71.8 of the teachers believed nutrition training would be effective, only 31.6% participated in regular trainings[9]. In our research, training demands of the teachers correspond with their daily practices.

The fact that there was 97.3% participation in the research, proves that majority of the teachers are interested in nutrition, and sharing and up-dating their nutritional knowledge. In general, 54.1% of the all questions, received correct answers. This figure, which is above average, is nevertheless pleasing. Providing a fast and sustainable training programme for our teachers, who demonstrated their enthusiasm for bringing their nutritional knowledge up- to-date, would help them draw a healthy picture of the future.

CONCLUSION AND SUGGESTIONS

Early habits for a healthy community with healthy individuals are formed firstly in schools through students' interaction with their teachers and it continues on. Thus, teachers, who with sufficient information can help developing a healthy community, assume a bigger responsibility than parents in this respect. It is important to exploit IT, internet and other educational technologies in order to support teachers self-training and also help them give their students nutritional education.

The research revealed that, even though more than half of the teachers acquire general nutritional knowledge and information from mass media tools such as newspapers, magazines and TV, other up-to-date or new nutritional information like daily energy intakes or numbers of daily meals are less widely known. Furthermore, as a few teachers can acquire such information via using internet, there is a significant need to convey new and up-to-date information to each and every teacher.

1-) There should be internal trainings provided for new teachers and especially for classroom teachers on children's nutrition needs, its importance and the role of education for a healthy nutrition.

2-) Teachers need to be encouraged to use computers actively. Teachers need to drive the benefits of IT and computers in order to acquire accurate and comparative information fast and continuously.

3-) Computer trainings should be organized in order to increase the use of computers among teachers.

4-) Internet access need to be provided in schools in order to ease teachers access to information.

5-) Seminars need to organized in collaboration with the respective ministries and the ministry of Health through out the school terms. Furthermore, teacher working groups should be establish in order to evaluate the results and encourage active participation

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