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INTERACTIVE DESIGN EDUCATION VIA INTERNET: A CASE OF ARCHITECTURAL GRAPHICS AND TECHNICAL DRAWING COURSE

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ABSTRACT

Internet as a phenomenon of the 20th and 21st century, and a fast growing information technology effects every stage of our daily lives as well as education of people/students/professionals. In order to respond the growing need for education process, such new methods as distance learning are proposed additionally to traditional education methods

This study has been performed to investigate whether some architectural courses (both theoretical and practical) can be taught or not via internet.

At the ends of the case study: If proper technical infrastructure is provided, theoretic or applied (hands-on) architectural courses can be taught, and the result will be satisfactory. In addition, there were no significant differences (in terms of students' understanding and applying of the course materials) between two groups (traditional and online group). In order to have better results, team-work must be encouraged, hardware/software and other technical infrastructure must be upgraded, and educators must be well trained for this purpose.

Key Words: *Architecture Education, Distance Teaching and Learning, Online Education, Computer-Aided Design (CAD), Synchronize, Asynchronize, Computer Aided Education (CAE)*

INTRODUCTION

The education is a long term investment for our culture. The investment for the education must be done thinking technological possibilities of future.

Internet and information technologies accepted and affected our daily lives very fast and drastically throughout the mankind's' history. There is a high demand for education. Therefore, there is a need to answer this high demand: We should utilize distance learning technologies besides traditional education systems. As technological inventions increase very fast, application of distance learning is on the agenda and internet makes these techniques easy to apply.

The role model of the 21st century is essential specialty to catch times, to improve or renew oneself and to be in developing continuously. People tend to spend more time with their families, hobbies etc, and they tend to be more social, despite fast moving daily life. They also want to escape from the stress of work environment. Thus, different learning methods started to exist. The distance learning method is one of these quests. Since the distance education over internet is becoming widespread, many students who have not access to proper higher education will be able to have possibility to higher education. In such underdeveloped countries as Turkey, there is lack of well trained instructors in some part of the country. By the help of online education method, one can reach take courses from advanced universities without leaving his/her home. (Karakuzu, 2000). Additionally, distance learning has many benefits such as combining technology and education, increasing communion of information and usage from institution effectively (URL-1). Distance education can be executed in two ways: synchronous and asynchronous.

At synchronous distance learning, the students and the instructor are located in different places, but they communicate with each other at the same time. By doing this way, we eliminate one of the disadvantages of distance learning: the students and the instructor don't see each other (Koçer, 2001).

At asynchronous distance learning, the instructor distributes the information by any mean, the students can reach this information any time whenever they wish. There is no interactive participation. This is an education method that the instructor and the students interacts/communicates with each other at different time and place. The student is free to get information whenever she/he wants it. Or, she/he is free not to get information at all.

Internet and web technologies are used as tool for distance education in our days. There are many universities which experienced distance education and get positive feedback/results in Turkey and in the World (Bayam ve Karacadağ, 2002).

This study, aims to examine whether virtual environments, information technologies such as internet can be used for architectural education.

Everyone who is working in the architectural and engineering field must know the graphic language in order to communicate fast/effective/correct with each other. Therefore, such professionals as designers, engineers, craftsmen and others must know technical drawing and technical drawing tools. In many design groups, despite the fact that computer-aided design replaces traditional drafting methods, there is no change of basic rules of graphic language.

Architectural Graphics and Technical Drawings (AGTD) Course has been selected for testing synchronize method over internet. This would prove that theoretical courses, applied architectural courses would also be given at distance over internet. Because of the lack of technical infrastructure and time limitations, only one subject of the AGTD Course is selected. The topic of the lecture was: The perspective.

METHOD OF THE STUDY

Hypothesis of this research is that **AGTD** Course which has been taught in the first year of the Department of Architecture at the Karadeniz Technical University (KTU) at Trabzon-Turkey can be lectured via internet as synchronous.

The aim of this research is to investigate the following three issues:

1- Online teaching of AGTD Course is tested.

2- Opinions of the students who have participated in this study, about experiment,

3- In terms of teaching, differences between traditional face-to-face education and online education are investigated and compared with each other.

In order to obtain these aims experimental and survey research methods were selected.

Experimental study

1- Selection of the subjects

20 students who are in the freshman class at the Department of Architecture at KTU have been selected for the experiment. Out of 20 students, 10 students have been lectured as online method while the other 10 students have been lectured as face-to-face method. The lecture topic was "**perspective**" subject of **AGTD** course.

We took the students grade averages and homework performances into consideration during the selection process of the subjects for the experiment, we have listed students whose grade averages are between 80-100 (BB, BA and AA). Then we grouped them as AA's, BA's and BB's. Among these groups, the subjects have been selected randomly and at equal numbers.

2- Preparations before the experiment

We had made one announcement to student group that included 20 people and to be determined according to above principles. At the announcement was notified the aim of this experiment, time of class and space, the way of the class, lectured subject and needed materials to be used during the class. The announcement was made in the traditional classroom setting and also published on the web page. Additionally, before the online experiment following preparations were made;

a) Content of the course was arranged properly for online education on internet.
b) A detailed web page is designed and published in order to supply communication between students and teacher, to reach materials of the course, to declare announcements.
c) A manual of this online course is created in order to explain how the softwares are used.
d) An experimental setting was put together.

3- Experiment

In the experiment was paid attention following points: Schedule of the courses was determined according to students' regular school schedule. Exactly identical lectures were given by the same lecturer in order to compare equal the both groups' assignments and homeworks. Each group was asked to finish the same assignment and homework. For these

applications, equal time was given to each group. Gathered assignments and homeworks were evaluated by lecturer who taught the lecture topic. The experimental lecture was given by one of the authors (K. Sancar). The lectures were recorded with video and digital cameras without disturbing the students. The lectures were recorded by A. Aydin.

Face-to-face group

Ten students have been selected among first-year students at the Department of Architecture at KTU. Technical drawing methods of "**perspective**" was lectured to these students by using traditional materials such as drawing tables, T-square, ruler, pencil, marker etc. in traditional classroom environment. The lecture topic was introduced to face-to-face group in two steps:

In the first step; the topic was explained as theoretical manner and demonstrated how perspective would be depicted. Traditional blackboard and marker were used to underline important points, to sketch figures and to draw a perspective application. The time of the lecture was approximately 40 minutes.

In the second step; the students were asked to depict and draw a perspective as explained to them. A leaflet which included plan and elevation of this figure was handed out to the students. The students were allowed to use traditional materials such as T-square, rulers etc. for the application of perspective drawing. Lecturer had walked among the students and helped them during the application. Time of the application was 60 minutes. At the end of the given time (60 minutes) the assignment had been picked up and later they were evaluated. Additionally, homework was given to the students in order them to understand given topic.

Online group

Another ten students have been selected for the online experiment and they were divided into two groups: online-I and online-II, owing to the shortage of hardware and software availability. The number of students was equal in two groups.

The students were placed in big classroom which was divided into separate rooms. The rooms were sound-proofed and visually isolated from the environmental disturbances. Each student is assigned one room simulating his/her own home environment. One pc, one webcam, one headset and one drawing table were put into each room/partition. The lecturer was also assigned a separated bigger room as well. Two PC's (personal computers), one for audio-visual and written communication with students and the other for teaching , one webcam, one headset, one scanner and printer were put into the lecturer's partition. See Figure 1.

Figure 1: Plan and some photo of place to be used online experiment

Remote Admin Software that supplies remote sharing of desktop, audible-written messenger softwares (Paltalk and Yahoo) and visual (webcam, digital camera) materials for communication was used for this practice. Before teaching of the lecture general information was given to students about the software to be used.

Teaching of the lecture was made at two steps as it was done with face-to-face group.

In the first step, technical drawing method of perspective was taught over internet as synchronous. The lecture is recorded earlier. Then the students were asked to watch and take notes from the recorded lecture. The students had chance to ask questions to the lecturer if they had trouble with the drawing assignment. For this question-and-answer session they had

used audible-written Paltalk Messenger (commercial software) and visual (webcam, digital camera) materials.

During the presentation from time to time the video record was stopped and the students were checked if they understood the lecture. These controls were done by both verbal and written comments. If certain part of the lecture wasn't understood, the video record was rewinded and the topic was repeated. The teaching time was approximately 45 minutes.

In the second step, the students were asked to do one application related to the subject.. During application the students had used traditional drawing materials such as drawing table, T-square, setsquare, piece of paper, pencil, and so on.

Lecturer before had prepared the application as a video picture. When the students asked something about application parts which couldn't be understood by them it was taught over the video picture.

During of application students were monitored live via webcam by the lecturer. Time for the practice was 60 minutes.

At the end of the hand-on-experience, the students have sent their assignments to the lecturer as digital data (They scanned with scanner and/or taken a photograph with digital camera). See Figure 3. Furthermore, the assignments were collected manually for archive.

Additionally the students were asked to do homework because of understanding preferable the subject. Homeworks had been sent to lecturer via e-mail later.

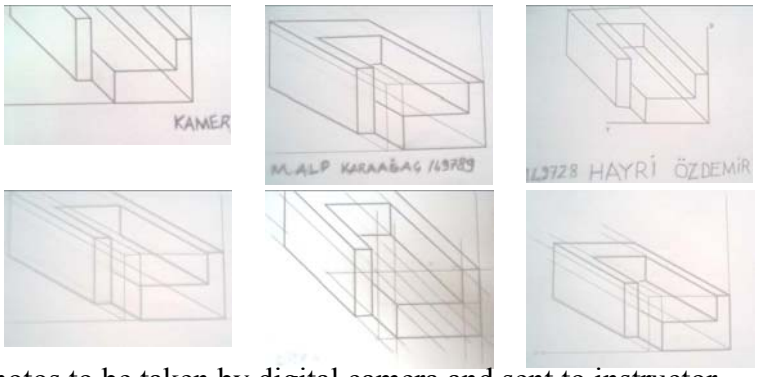

Figure 2: Photos to be taken by digital camera and sent to instructor

Survey study

A survey questionnaire was distributed to students who participated in the online experiment to express their views about this application. After finishing the lecture, questionnaire forms were handed out to students.

In the survey, data was obtained from open-ended questions, binary (yes-no) and quinary Likert scale questions (the best, better, gut, poor, the poorest). There were 23 questions in the questionnaire.

The survey consisted of four parts**. In the first part**, there were identity information and students were asked if they use the internet. **The second part** was about the students' opinion about the lecture taught via internet. **In the third part,** there were questions about communication during the online lecture. **In the fourth part,** the students' views about the environment of online class and instrument to be required.

Data, obtained from questionnaire, was evaluated with the help of Microsoft Excel software.

ANALYSIS AND INTERPRETATIONS OF THE RESULTS

To be obtained data in this research were grouped three main topics and the results were investigated:

- During the experiments, recorded sounding/soundless videotapes and document of audio and written were investigated,
- The applications and homeworks that were made by students who involved in the practice were evaluated,
- Survey that was performed to the students, participated in the online practice, to obtain opinions about experiment was analyzed.

1- Audio/video records;

Every phase of the experiments was recorded by video camera and all written interviews

which were realized on internet were saved.

Video pictures; video camera was used during the all experiment to observe attitudes of lecturer and students and to record data.

Audio records; this documents include some audio data that couldn't be obtained with video camera. They were recorded with assistance computer software.

Written records; this documents include chat of lecturer and students in the chat-room, to constitute for the online experiment, on internet.

Positive aspects of the face-to-face experiment;

- According to obtained data, students had asked questions about not to be understood point of class to lecturer. This made easy understanding of class.
- Students had got into touch with each other by taking and giving materials such as pencil, setsquare and eraser etc. Additionally students firstly had asked not to be understood points of class to each other, later to lecturer.
- Lecturer didn't erase figures on the blackboard. Therefore students could compare between topics to be taught.
- During the application of the face-to-face experiment lecturer had walked around among the students. So they had asked question what they wondered about class to lecturer. Furthermore while lecturer had been walking around among them she had warned students, drawn faulty, so they had understood much better the class.

Negative aspects of the face-to-face experiment;

- In the face-to-face experiment because of not using visual materials (3D figures, animations etc.) students had hardly figured out the class.
- Owing to not clearly drawing of the figures on the blackboard had made understanding of class difficult.
- The experiment was performed with ten students. So lecturer had controlled the students easily but this is difficult at the nowadays classrooms.
- Most of students, have participated in face-to-face experiment, had asked questions at the stage of application. So it has proved that students had figured out the class at the application not during teaching the class.

As a result, in this experiment in spite of the storage of visual materials class had been understood by students.

Positive aspect of online experiments;

- Content of class had been supported with 3D figures and video pictures. Therefore students had figured out easily it.
- Class was prepared as a video picture. At the certain stage of the class videotape was stopped and to call students' attention to class was asked questions to them. Answers were taken as a vowel and/or written. According to this answers class was figured out by them.
- Remote shared desktop software to have been used teaching of the class correctly was functioned. Therefore class was taught nonstop to students.
- Images of the students in the online experiment were reached to lecturer via webcam. So during the class general attitudes of them was observed by lecturer and students who hadn't listened carefully the lesson was warned as written and vowel.
- Students were continuously cautioned about taking notes. For this reason figures and text that had been taught at the class was waited for a while. Thus teaching hade made both by listening and seeing and by writing. To take a note instead of notebook that was prepared in webpage for this class or that existed in pc students had choused to use traditional materials such as pencil, paper sheet, etc. Later these documents of the class had been put on the webpage so that students could take them.
- Figure that students had drawn in the application was opened on the desktop share. Additionally this figure had been send via e-mail to students shortly after at the end of the teaching class.
- Drawing of figure which was given for application had been prepared as a video picture before teaching of the class. When the students had asked questions about the application lecturer had answered by using this video pictured.
- Students who finished their application had warned the lecturer as written and vowel. Before sending of applications lecturer had controlled them by aid of webcam. All over applications had been send to lecturer for evaluating as a digital data such as photographs, taken with digital camera, and documents, scanned by scanner.

Negative aspect of online experiments;

- Sound had been transmitted to students delayed a few minute because of internet connecting.
- Between the partitions on the place which was performed experiment soundproof hadn't exactly been supplied. Therefore sound had been transmitted firstly real time then on internet. This had caused to inattentiveness of students.
- Some students had not been familiar using of computer and internet. It was observed that they had experienced difficulty for communication.
- Students, participated online experiment, were worried when they met software that hadn't used before but they shortly had oriented one.

In the online experiment teaching of the class duration was longer than face-to-face experiment.

Students hadn't exceeded given time. But online group had finished their application shorter than face-to-face group.

As a result, even though we had met some technical problem online experiment had been successful according to students' application and interviews that was made at the end of the experiment.

2- Evaluation of students' applications and homeworks.

Homework and applications is important document to evaluate learning level of class. Therefore the results of analyses of this data are important indicator if this study succeeds or not. In data was used average of homework and applications that had been collected from students involved in online and face-to-face experiment. Collected homework and applications was evaluated by aid of Photoshop software. Data was evaluated by aid of Microsoft Excel software and showed as a graphics.

When the applications were investigated online groups was much better than face-to-face group. The students' grade averages of application assignment (over 100 points): face-to-face= 87,7; online= 88,6. When the homeworks were investigated face-to-face group was much better than online group. The students' grade averages of homeworks (over 100 points): face-to-face= 90,6; online= 82,4.

As a result between the online group and face-to-face group little differences were observed as score. Therefore this study had showed that online class could be taught in spite of some technical issues.

3- Evaluation of survey

Half of the students participate in the survey was women the other half was man. Duration of computer expertise of students is as follows: While 20 % of the students were using computers more than 6 years; 40 % less than 5 years; 10 % less than 4 years; and 30 % less than 1 year of experience.

All of students involved in study were using the internet for education (%30 of students was using chat software). See Figure 4.

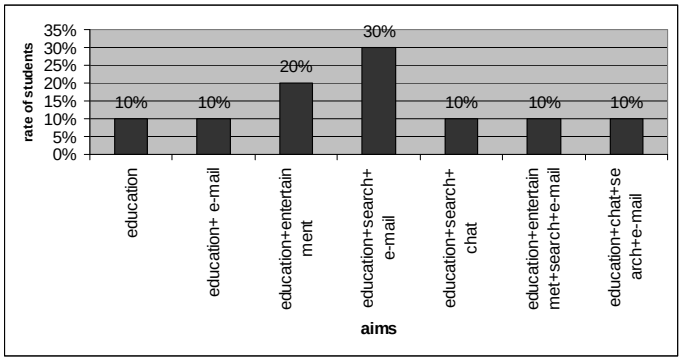

Figure 3: The students' statements of purpose of internet usage

The students are already using these softwares: 70 % of the students knows how to use a word processing software; 60 % knows a data processing software; 40 % knows ArchiCAD (a CAD software); 30 % knows AutoCAD (a CAD software); 40 % knows Power Point (a presentation software); and 20 % knows Photoshop (a photo editing software);

The survey showed that increasing concern of online course was 4.5, being attractive was 4.6, using 3D figures was 4.7 very good rate. Additionally it was indicated that the class was

understood, environment of teaching and teaching techniques were approved good rate by students (Figure 5).

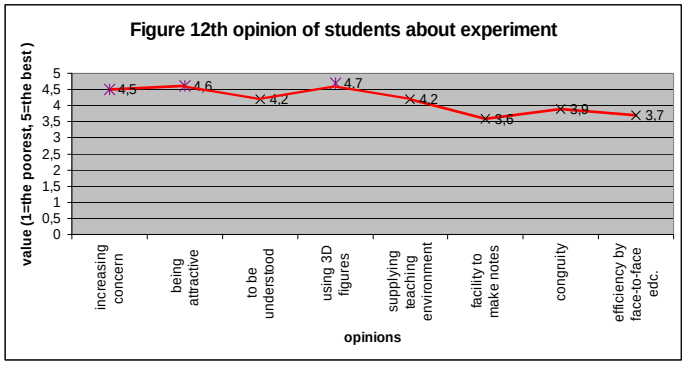

Figure 4: Opinions of students about experiment

During the online experiment students stated that they had used the network channel to communicate with each other and lecturer good rate (Figure 6).

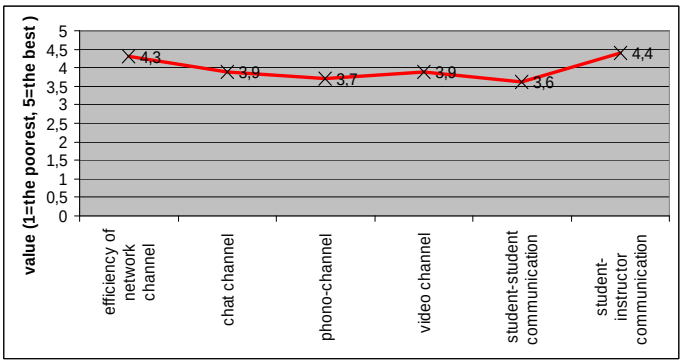

Figure 5: Scale of communication during the lecture

Opinions of students about environment of online class were showed Figure 7.

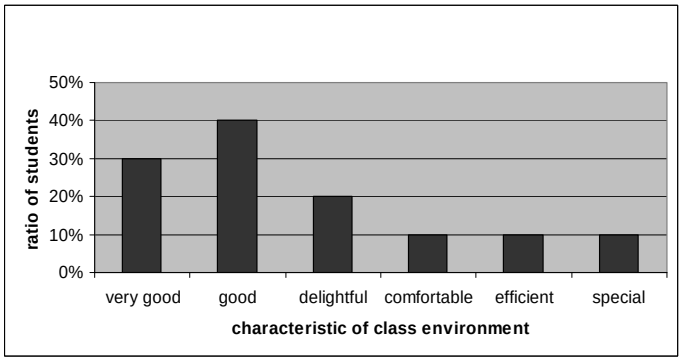

Figure 6: Evaluation of the environment of class

%80 of students had used video channel to follow the class and also they stated that video channels brought traditional teaching of class to mind (Figure 8).

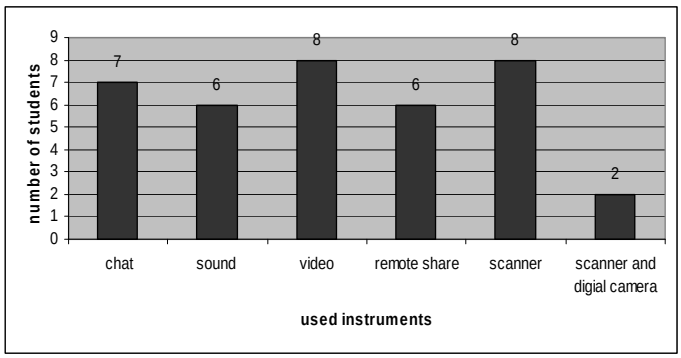

Figure 7: Instruments that are used during online class

RESULTS AND PROPOSALS

- The "perspective" subject is chosen to be lectured online for the distance learning case study/experiment within Architectural Graphics and Technical Drawings (AGTD) course at the school. The students found this subject very interesting, so that helped them to pay attention to the lecture. Besides this, when we compare with face-to-face lecture, the students expressed their pleasure with the method that we used.
- The ambience of the experimental setup is described by students as pleasant, comfortable, and free.
- Students are also emphasized that interaction between 'the instructor and the students' is better then interaction between 'students and students' during synchronized lecture over internet
- Scanner, digital camera, audio-video tool channels also needed for lecturing at a distance.
- At the end of lecture, homeworks and hands-on-experiences of students are evaluated by the instructor.

As a result, there were no significant differences between traditional education method and online synchronous education over internet. Briefly, if there is internet connection fast enough, if there is enough hardwares and softwares and if there is proper course materials the online education can be applicable and feasible for such applied professions as architecture.

- Since our case study of distance learning is executed online, the students were able to ask questions immediately to the instructor. Right after lecturing, there was a hand-on-experience. This made students to understand the lecture topic very well.
- Students who are familiar with personal computers and internet showed better performance.
- This case study showed that if proper technology, method and course contents prepared and if instructor-student, student-student communication is provided online distance education over internet is as effective and successful as traditional education.
- In the near future, there will be extended case studies to compare more traditional education and online education. In order to reach best results, this case study must be done with entire class and year round.
- Softwares and hardwares for this study is provided (and financed) by authors' personal efforts and budgets. Additionally, during preparation and case study period, there was necessity for teamwork. Unfortunately, the authors were not able to accomplish the teamwork because of varies reasons. Therefore, this kind of efforts must be supported and financed by institutions. Otherwise personal efforts may not reach to the overall goal.
- A web page is required for any kind of course, and the authors created a comprehensive web page which includes all the course materials, questions and answers of students. In spite of many incomplete parts, the course is given to the students as online method. And, according to the results of hand-on experience and homeworks of students, the online course was successful. In other words, the students understood the course material and they were able to put the information into the practice

Finally, other theoretical and applied courses in architecture can be given online over internet if the content of course and environmental factors organized accordingly.

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