2.9. DISTANCE EDUCATION BASED ON A COMBINATION SYSTEM OF INTERNET AND TELEVISION

Abstract

Thanks to the rapid development of information and communication technology, new tools are being used by educational institutions. Using modern technological tools changes teaching methodology. Formerly, teachers dominated a big part of their courses while now students play a much more active role, either through centralized learning or self-learning methods. Distance education is a method commonly used because of the advantages of time and place independency.

There are various ways to give a lecture from a distance. Satellites, fiber optics, modems, routers, radio, television, computers, etc are the components of distance learning systems. Depending on the tools that are used, distance education can be renamed as Web Based Education, Videoconferencing, Teleconferencing, Radio-TV Based Education, and Distance Learning via Satellite etc. The tools that are used are very important but the usage efficiency of the tools is questionable. It is important to remember that better usage of the tool does not mean that a perfect lecture can be given over a distance.

We will discuss various factors of change in the combination of internet and television based distance education used at Firat University since 1992. A course is held on the Internet, which was taken by other students of other Turkish Universities. The National Informatics Committee of Higher Education Council of Turkey accredited this course.

Because robotics is a technical subject, there is a lot of discussion about offering this course via distance. We have proved the success of a
technical field course like robotics using modern informatics tools. All content of the course is held on-line using the creativeness of simulation, animation and multi-media facilities. All exams are taken on computers, with cameras acting as proctors, and the grading is done automatically and immediately.

This article will discuss the advantages and disadvantages of holding courses on line using some statistical results. This discussion will lead to recommendations towards a development and management framework for teaching and learning systems where the pedagogical sides of distance education will be considered more.

**Keywords:** Distance education based on Internet and Television, interactive learning environments, lifelong learning, pedagogical issues.

1. **Introduction**

As Heller., R.,S. (1999) says “Distance Education is a system and a process that connects learners with distributed learning sources and an interaction between the learner and the instructor using one ore more media”.

It is a fact that Information should be spread to all people because lifelong education is very important in developing the behavior and skills of the population. If people want to be well educated in order to adapt to their surroundings easily, they have to improve and develop themselves by using different ways and tools. There is not any perfect age for learning that limits human beings. Therefore a new concept is occurring in the world called lifelong education (Varol, C., 2000).

Technology is developing so rapidly that it cannot be followed easily. Especially the development in the field of communication and information technology is so fast, every day you can meet new kinds of
magic tools. These tools change the classical methods and thoughts of people. For example, if we compare the latest educational system with the oldest one, we can distinguish huge differences. The classical blackboards have given up their place to the electronic board while the overhead has been replaced with a web-linked projector.

The Internet, the most important of these new tools, is driven by communication. Sending a message all over the world takes only a few seconds. Lots of information can be obtained directly from the databases of the Web. In the last decade five or six times more knowledge has been stored on computers than all of the information that had been stored in all other formats since the beginning of human life.

The majority of the developing countries have difficulties with their educational systems. With a lack of well-organized schools and a lack of a sufficient number of qualified teachers, education cannot continue in a satisfactory manner. This situation brings some new ideas concerning the use of new technologies.

Distance education is one important phenomenon that is used by a lot of educational institutions. Distance Education began in the 19th century where the educational materials were posted to the students. The first application of distance education based on these posts was seen in countries like England, France, Germany, the US, etc. (Anderson, M., & Jackson, D. 2000). This kind of distance education was used first in 1974 by some colleges where the teachers for high schools were trained and educated in Turkey (Varol, N., 2001).

Distance education can be applied in two different ways. There are,

a) Synchronous education

b) Asynchronous education
Synchronous distance education is held at the same time. Although the places are different from each other, the courses are held at the same time-period. This type of distance education can be defined as live education. Video conferencing is a good example of synchronous distance education, because education continues at the same time where two ways of communication (data, voice and video) exist (Varol, C., 2002; Inoue, T., & Ueno, H., 2001).

For asynchronous distance education, web-based education is a good example. The course notes may be accessed at any time and this process can be repeated as much as needed (Pahl, C., 2003).

Computer supported cooperative learning (asynchronous education) emphasizes group or cooperative efforts among faculty and students and results in an active participation and interaction on the part of both students and instructors. Knowledge is viewed as a social construct of self-explanation, internalization and appropriation (see Heller, R., S., 1999).

If an exam of the web-based education is taken at the same time, this kind of education also can be defined as a synchronous education, because events occur at the same time. It means the synchronous and asynchronous distance education can be changed depending on the time.

After the year 1990 the usage of the Internet has been accelerated so that a lot of educational institutions have begun to use Internet facilities in order to give well-organized courses. Some well-known universities have begun offering many courses online related to their diploma and certificate programs.

The following items should be considered so that well-organized course material can be offered.

- The quality of the course material
- The usage of the course material

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- Students are supported by teachers
- The administration and management of the system
- The accessing onto computers
- Mechanisms of feedback and multimedia

The preparation of web based course material needs more work than a course offered in an in-class atmosphere. Animation and simulations are the best supportive tools to explain a topic on screen. Because a web based course is taken over the Internet, speed is very important. If the animation and simulation have very big sizes, some constraints can be met like opening or playing difficulties. Therefore each figure should be prepared effectively where the size is considered.

To keep the web site up-to-date is another important point. Because all information is given on the web, the web site should be maintained on a daily basis if possible. Well prepared course material should offer interactive access where the teacher and students react to each other (Pahl, C., 2001). According to the necessity, the computer should be completely interactive and make adjustments to simulations depending on the feedback taken from the side of students. At that point the automation will play a big role.

In the period from the planning stage of a web based course to the phase of broadcast on web the following features should be considered:

- **Determination of the aims and targets:** The target groups and the kinds of content should be fixed.
- **Research:** The literatures done in this field should be found and compared.
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- **Cooperation:** Teamwork should be encouraged between related institutions and units. Web designers, animation makers, expert people on the topic should collaborate together.

- **Preparation of the course materials:** The weekly curriculum and all supportive materials should be prepared using sound, video and data effects.

- **Preparation of the HTML pages:** Course content should harmonize with used tools. The course content should be kept up-to-date upon the demands of the students.

- **Pedagogical aspects:** The most important point in offering a course online is that student’s interest must remain active during the whole session in front of the computer screen. If the course content does not consist of some animation that keeps the student awake and acts as a lure centre, the course will be boring for the student and it is possible that the concentration of the students would be lost. To maintain this point some animation related to jokes or humor can be added into the course pages. The visual and individual effects can be a solution to prevent this obstacle (Varol, N., 2002).

- **Pages should contain some necessary sources:** The students can contact each other using e-mail, IRC, forums, e-groups facilities.

- **Software and Date Base Support:** A database management system should be established where all data of the student can be stored.

- **Access Control:** The students who visit the web pages and surf should be registered and kept on log automatically.

- **Testing the web site:** To ensure that each part of the web site works correctly, the content should be tested at certain intervals.

- **Up-To-Date of the web site:** If an interactive course wants to be held, it should be updated often.
2. Some advantages of web based education

According to statistical results students acquire one third of all knowledge by watching, one third by doing and the final one third by listening. If these aspects are considered, web based education becomes even more important because all three of these events occur during learning from the Internet (Yılmazçoban and Damkacı, 2001).

The advantages could be sequenced as follows:

- Thanks to web based education the opportunities between the people and different communities can be balanced.
- The expense of the printed materials decrease.
- Compared with a text course the course that is supported with multimedia (Sound, color, graphics, animation, simulation, etc) is much more effective.
- Education on the web has independency of time and place. Therefore an unlimited educational atmosphere comes out (Çabuk and Erdoğan, 2001).
- The ability of the self-learning of students occurs.
- The up-to-date concept of the courses offers a good facility to the students who can reach the latest information about a variety of topics.
- Accessing the source of information can be realized easily.
- Education is continued by the help of information technology.
- There are a lot facilities offered between the groups (teachers-students, students-students).
- The students, who hesitate to ask questions and join team-work in the classical classroom atmosphere, can have self-confidence and self-esteem in the virtual world.
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- All presentations submitted on the web have independencies from the atmosphere of the instructors, students and other environmental effect, shows educational consistency.
- The increasing of the interests is supplied because an individual and interactive relationship occurs (Özdil and Çelik, 2000).
- Except for the framework differences there do not occur any cultural or social differences between the students, and therefore a democratic and equal form of education comes out.
- These are the beneficial to the student because of the costs of travel, extra accommodation, and the production lost during the travel time disappear through distance education.
- The virtual interaction atmosphere located in different areas offers a team work facility to the students who own different and unequal possessions. The various aspects of the students from different virtual atmospheres increased the challenge of the students and brainstorming takes place.
- The students who take web based courses learn to surf deeply in the virtual world, which can change the behavior and attitudes of the students.

3. Some disadvantages of web based education

The disadvantages of the web based distance education can be itemed as following: (Özdil and Çelik, 2000; Yılmazçoban and Damkacı, 2001).

- Because of the rapid development of communication technology it costs a lot of money to change tools often.
- The students need to be skilled using the computer.
The students, who are not used to studying themselves, are bored to study in front of a screen alone.

Educators who prepare web based education should be able to use new tools or some other expert people should be in charge.

The teenagers who sit for a long time in front of a screen can feel them isolated and some misbehave situation can come out (Yılmazçoban and Damkacı, 1999).

If the Internet facility is not perfect, like very slow, the students lose a lot of time to access the computers.

For some students who are not breathing the traditional classroom atmosphere, distance education may be confusing.

Distance education may obstruct the development of the student’s skills.

4. Distance learning at Firat University

A project was proposed named “The control of the satellite dishes via computer and a case study of television broadcasting system” on March 23, 1991 to the Research Fund of Firat University by Varol and some his colleagues (Varol, A., 1993).

In order to convey the news in the university and also to make cultural and educational programs (distance education), the first of Firat TV’s own broadcasts began on October 2nd, 1992. The programs were increased day by day. By defining the policy of the Firat TV, it was planned to be an association. The television broadcasting system named Firat TV is the first local University television station in Turkey (Varol, A., 1993).

A new transmitting tower was constructed on a hill on the university campus in 1994. And also, there is a new modern studio, established from
Computer course sessions for TV broadcasting were prepared. Computers were rented to applicants who wanted to follow the programs. After the completion of the courses, examinations were set and the students who passed the exam were given certificates. In June 1995, the Higher Education Council/World Bank's Industrial Education Project's "Computer Systems Technologies" courses were performed. In these courses, the lectures were recorded and broadcast on the same night. Hence the students had the chance to follow the same lecture twice. These courses were followed by 32 lecturers by students from different universities in Turkey. The same courses were repeated for the teachers employed by The National Education Ministry. This time 132 teachers attended these courses. Therefore in Firat University, Distance Learning programs towards certificate started in 1995.

Firat University has prepared all the necessary hardware background for distance learning. One of the important tools of distance education is the local television broadcasting system called Firat TV. All kinds of the movies like animation and simulations related to the course materials are prepared in Firat TV’s studios.

Firat University has very high access to the Internet. There are a lot of computer laboratories that have Internet access. The Internet framework of the University was cabled by fiber optics.

5. Communication module in a virtual class

Each educational institution that wants to offer a qualified distance education and to compete and challenge with other similar institutions should establish a virtual class communication module (Varol, A., Türel,
Y., 2003). This virtual class communication module should be created on Web site by the course offered institution itself. All related people like teachers, students, experts and supportive technicians can interact each other in this module. These are the links of a chain that have to harmonize correctly with each other.

Communication between students and teachers should be realized in two ways. This module should be served 24 hours without having a break. A new virtual communication module was created and developed by us. One who has access into this module depending on the circumstances, can communicate with others and can send his negotiations to the forum using all kinds of communication styles like audio, video and data.

Depending on the wish of students, the students can use a code name created by them to submit their ideas freely without having any constraints. All kinds of communication are recorded and logged by tracing software.

5.1. Used Software and Tools

Prepared course notes, animation, graphics, simulations, etc. can be easily transferred into the module without having confusion. To increase and improve the facilities of the module parts, a lot of automation mechanisms were added to the software where the creativeness of the object oriented programs used like PHP, CGI and ASP. While this software is run by the servers, the other software called PWS, IIS and Apache must run by the PCs. The biggest advantages of object oriented software are its packets called script. By the design of the pages these packets are placed directly into codes which result in saving time. The big parts of the module are created using PHP software.
All kinds of the data that is stored on the server have to link to each other. Adding and deleting facilities should be easily done. All kinds of the statistical data could be obtained from the software immediately. Hence, MySql software was used for the database that can have some more facilities to link PHP.

Actually Mysql is database query software. Not only can the storage of the records but also the relations between records be stored, too. The database management software called Phpmyadmin interface was used to create fields in a manner of needs.

5.2. Access into Communication Module Application

A button called Communication was created in virtual class application. Pushing this button will open the communication module. For security reasons only those students only who have a userid and password can access the communication module.

5.3. Chat Room Module

This room offers all facilities to the users related to communication. The users can discuss and negotiate as if they are in a real classroom atmosphere. If necessary a user can open his/her private chat room. This module is very important for students because they can chat with their friends about the course materials and other things.

All types of communication like audio, video and data done in the chat room are stored on the server and the student can see later the formerly recorded conversations whenever they want. To prevent of the misuse of the chat room there are some constraints which are controlled by a manager of the modules.

5.4. Forum and Discussion Groups Module
Forum and discussion group module allows the students to discuss together at the same time and share their ideas with each other. Because of storage of all the discussions it is possible to access the old records anytime. Forum and discussion groups module is controlled by a manager who is able to give various restrictions to the students. In this profile it is possible to send a student a private instant message or e-mail.

5.5. E-mail List and Form Mail Module

In this section a student can use all kinds of e-mails facilities without giving more effort.

Form mail is a facility to send an e-mail on the web. This is very useful for the student if they are using a computer in another place who wants to see their mail boxes.

5.6. Classroom Notebook Module

Students can write their ideas, thoughts and knowledge in this platform. In this platform the students who are enrolled in the same course, can see some information of their classmates. This facility is especially important to make known who is enrolled to the same course.

6. Robotics course held on line at the Firat University

A new regulation called “Regulations on Inter-University Distance Higher Education Based on Communication and Information Technologies” about the Distance Education came into play on December 14, 1999 (Resmi Gazete, 1999).

The aims of distance higher education based on communication and information technologies at the vocational, undergraduate, and graduate levels are:

a) To facilitate academic cooperation by enabling the sharing of educational resources among universities,
b) To increase the effectiveness of education by making use of the interactive medium provided by information technologies, with multimedia features and the ability to access unlimited information,

c) To increase the efficiency of higher education and make it available to new student audiences.

Distance Higher Education Based on Communication and Information Technologies includes diploma programs at the vocational, undergraduate, and graduate levels in institutions of higher education, in which some or all of the courses are given using the Internet, other data communication networks, or radio. In this type of education, educational tools such as audio/video cassettes, audio/video CDs, books, and communication devices such as telephone, television and mail may also be used (Resmi Gazete, 1999).

A Robotics Course was one of the first web based courses that was accredited by the Higher Education Council of Turkey in the year 2000. This course can be taken by students of the other Turkish universities. Because the robotics course consists of technical topics, the idea of this course being held on the Internet is already questionable. Because subjects of a technical course are mostly related to experiments and implementations, one wonders how the experiments are applied in a virtual atmosphere.

The robotics course has been held on line since the year 2000 in Turkey. There are a lot of students who took this course at a distance from other universities. These students built an enrollment of about 25 people and their universities reserved a computer laboratory where they could visit when they wanted.

Some types of laboratories were well organized and controlled by cameras. Although you are working over a distance, you can see the
students in the classroom via the Internet. Here two types of distance education were used, which combined web+video conferencing together (Varol, A.; Das, R., 2003).

The universities which give the possibility to their students to take the robotics course at a distance entrust some instructors to help their students to solve problems occurring during the teaching. Especially, these people are very useful during the on line exam. They stay in the laboratory at the exam time and monitor the students although students are traced by the cameras.

**6.1. Distance Learning Center of Firat University**

A research center was built at Firat University to organize all work related to distance education. More than 20 people are occupied at this center. There are three main branches divided in software, hardware and Firat TV Unit in this center. The software branch consists of the various departments called Graphics, Animation, Simulation, Curriculum development, Measurement and Evaluation, software supplied unit while hardware branch consists of the departments named Maintain, Framework and Technical Support Team Unit.

The software branch is an important part of the chain. All kinds of visual and audio work are prepared in this unit. Each movement of a robot is animated and stimulated by a group whose members are instructors, expert lecturers and students. These people work together. But the big parts of the work are done by students using the method of the student centralized self learning system (Varol, C., 1999). The graphics group decides web format, color of the pages, the font of the letters and links status.

The curriculum development, Measurement and Evaluation department has a relation with the Education Faculty’s professors. Because
how a course material should be taught on line is very important to maintain the pedagogical aspects. The members of this unit analyze all topics of the robotics course considering in pedagogical sides, because the students should not be bored in front of the screen. Therefore they decide where and which kind of a joke, pictures or animation should be added onto web which has not doing with course material. The feedback of the students is evaluated by the experts. They apply from time to time surveys in order to figure out the not good working points of the distance education.

The software supply team decides which kind of software is necessary for developing the best of the course material. As much as possible the latest software is chosen. Revolving fund of the university supplies all kind of the software and hardware needs.

The maintain, Framework and Technical Support Team Unit is responsible all kinds of technical things. If a problem on network occurs, this unit finds solution immediately (Das, R., Varol, C., 2002). The computers and other instrument that are used for distance education are decided by this team. Hardware maintains are done by this team.

Firat TV is a television broadcasting unit where all kind of videos related to the course are prepared and broadcast on TV as mentioned above. Some videos are prepared in Firat TV studios in order to put into web based robotics course materials. The students take roles and play themselves according to the scenario written by the course developer teams.

**6.2. Methodology of Robotics Course Teaching**

Although there have been a lot of students who took robotics courses at a distance since 2000, there are two universities whose students enrolled onto robotics course as a group. These Universities are named Kahramanmaras, which is located in the southeast part of Turkey, while
Sakarya is located in the western part of Turkey, about 100 miles from Istanbul.

During the semesters the students could follow the weekly activated web pages from a distance. A book called “Robotics” was published in 2000 by the Ministry of National Education. This book and a CD contains of the videos, animation and simulation of the robotics course were sent to the enrolled students. All exams were taken on the web and thanks to automation the students could have their exam results immediately (Karabatak, M., Varol, A., 2002)

During the exam in the computer laboratory an assistant supervised the students. At the same time the laboratory was watched by cameras at a distance of about 1200 km. The whole time of the exam was recorded on the server that stayed at Firat University.

The multiple choice exams were delivered to the laboratories from the main servers of Firat University. Each student has the same exam contents but the placement of questions and selected items are changed with help of the automation software. This was useful to help prevent cheating.

There were fixed times at which the professor and students are on line and students can discuss the topics. At this special time, in addition to the web based distance education the video conferencing system were operated in parallel. Thanks to this facility the professor could see the laboratory at a distance while at the same time the students could see the professor. An interactive discussion could be had, similar to the classroom atmosphere.

There are electronic blackboards both at the laboratories where the course was held and the laboratories where the course was followed.
Thanks to this system the students could see what the professor wrote on the electronic blackboard at the same time.

A lot of surveys were taken on line, which were completed by students. These surveys were prepared by the Curriculum development, Measurement and Evaluation Department. After analyzing the surveys this department prepared a report which addressed the weaknesses of the course. They prepared a solution which can better the problems.

There are some automatic evaluation systems which compare all questions and fix the well known or worse known questions immediately. A report related to these results is sent directly to the professor for consideration. After having this report the professor can decide which course notes should be repeated.

6.4. The Final Evaluation Methodology of the Robotics Course

In addition to the above mentioned evaluation system there was a final test system to fix if the students have been taught enough. To examine the success a special week is reserved at the university whose students are enrolled in the robotics course. In this course the Fishertechnik robot set was used which is a carry bar and has small pieces like motors, switch, sensors, interface, building plastic materials etc.

This robot set has big advantages compared to classical industrial robots. The classical robots are designed for fixed purposes while educational robots like Fischertechnik are set flexible to mount a lot of various automation systems. Students can decide themselves which kind of automation system they want to mount.

The students were divided into groups in which there were 5-6 students. Each student composed a special automation project report where
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all detail should be given. The professor selects the best project to mount by the member of each group. The team work at this point is very important because one student prepares the power point pages while another one prepares animation and the others mount the robots.

After mounting the robots it is important that the robot is operated correctly by the coded computers. This is a result of the course contents. If the course material is taught enough and if the students learned well they should finish their mounting project successfully (Varol, A., Varol, C.; Gur, K.; Dogan, S.; Bulut, M.; Demir, F., 2002). This point is very important to measure the ability and skills of the students. If they learned enough at a distance they would mount the robot set using the information that they learned at a distance.

Statistical results showed that 85 percent of the robotics course given at a distance takers could successfully mount an automation system and operate it in 2000. At the beginning it was surprising to have such a high rate of success, because it was questionable to offer a technical course at a distance.

The following years we obtained this success again which supported the theses that technical subject can be taught at a distance too. To fix this result we applied a general survey to all students who enrolled distance held robotics course.

According to the survey on the success of the students the following items played big role:

- The robotics course is a new technology in which the students interested.
- The students who enrolled in the robotics course selected this course according to their own wishes while other face to face taken courses were obligatory.
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- Surfing in a virtual atmosphere was interesting to the students.
- During the web based distance education the jokes and animation that appeared on the screen were very exiting to them. Perhaps if the same jokes had done in classroom atmosphere would bother the students while on the screen they only laugh and smiled.
- Working interactively on simulation encouraged the students because they saw the results of their success on screen.
- Teamwork was for the students very interesting, because according to the Turkish education system they were not used to this kind of methodology where they submit first time their proceedings in front of the teachers, their friends and to the cameras which broadcast from Firat TV.
- They can see their videos later from the CD which will be a good memorandum for them in future.
- Mounting a robot was for them interesting because at the end they showed their product as working.
- To have the exam results that appeared as soon as after the finishing of the exam was a lure points because they could see the wrong answers at the same time which results in the learning while taking an exam.

Because of the above mentioned survey results the demand for taking this course increased year to year. But we have to bring a quota for selection of the robotics course despite the crowded of students.

7. Conclusion
Distance education can be a solution especially for the developing countries which do not have enough instructors and well qualified educational institutions.

A country like Turkey where only approximately 30 percent of the students can be enrolled in the university except the Faculty of Open Instruction, distance education in technical fields can give an opportunity to the students who do not win the main university entry exam.

Although there is a big university called Anatolia University offering distance education, in general in the field of social subjects using the governmental television broadcasting system, there aren’t enough technical disciplines where the students can earn a diploma in technical areas.

If the course material that is offered on the web is prepared carefully and considers all aspects of the pedagogical behaviors, the technical subjects can be offered successfully using sufficient animation, simulation and creativeness of the multimedia.

There are some Universities in Turkey that offer web based distance education to the students at their technical colleges. But the work facilities for two year graduate students are restricted. Therefore distance education should be established for the four years and more undergraduate branches.

If a cost per student is compared with a cost of distance education per student, the distance education course cost can be cheaper than classical education because of the quality and facility of an institution.

Web based distance education should be encouraged in the fields where the Turkey manpower needed.
If the often well prepared automation systems of a web based course exist, the beneficiary of the system will increase more.

Thanks to working on an occupational task, distance education can encourage adults to enroll in a program where it is not necessary to go a traditional university; because web based distance education is independent from time and place.

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